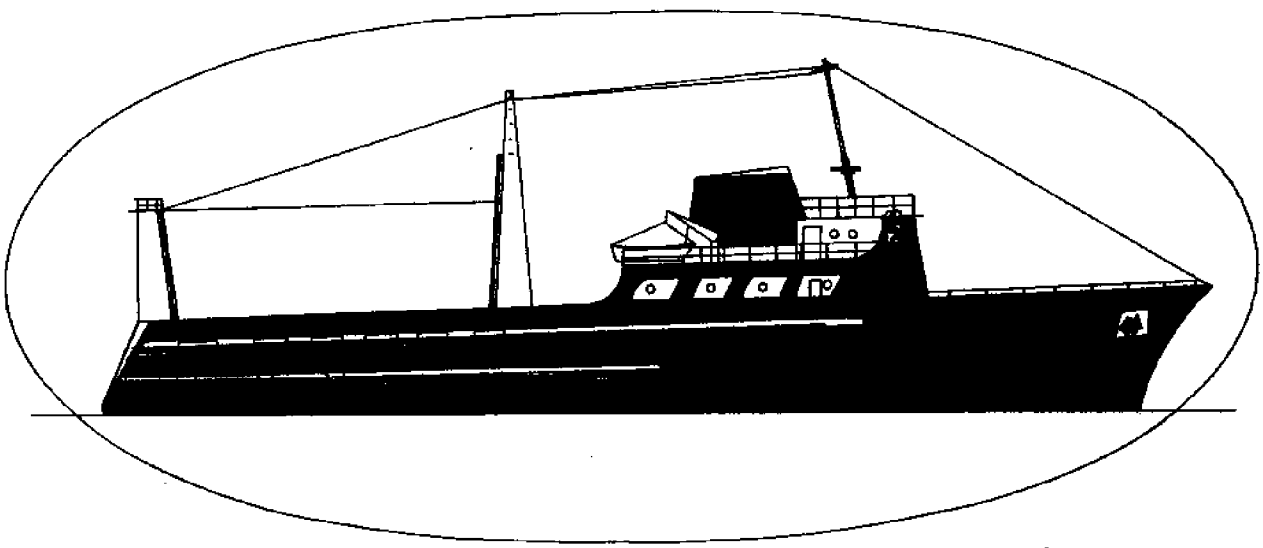
Manual for the Training of United States Fisheries Observer Corps Atlantic Region

Mark E. Merdinyan
Christine D. Mortimer



Fisheries and Marine Technology
NOAA/Sea Grant

University of Rhode Island
Marine Bulletin 33

$8.00

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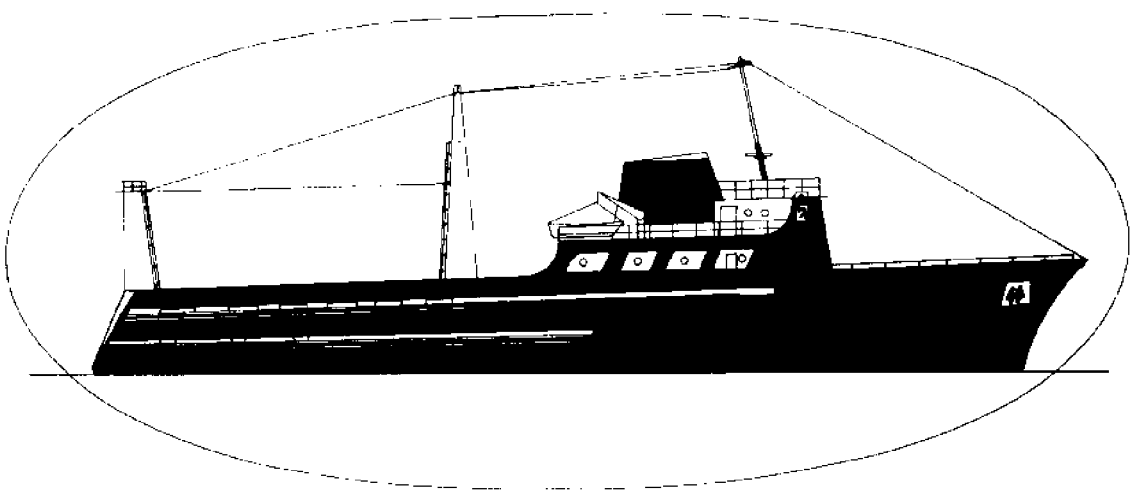
Mark E. Merdinyan, *Principal Investigator*
Christine D. Mortimer, *Associate Investigator*



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C O N T E N T S

Acknowledgments

From the Principal and Associate Investigators
Fisheries Observer Training Program

In addition to the curriculum development staff, which was responsible for the majority of the work associated with the curriculum digest and training manual formulation, several individuals are extremely noteworthy in their contribution to this project. The faculty and staff of the Department of Fisheries and Marine Technology offered invaluable criticism and support. Professors Cameron and Nixon of the Department of Geography and Marine Affairs were each responsible for an important chapter in the training manual. Mr. John Snyder provided his expertise as a fisheries technical artist. The operational observers program staff at Otis Air Force Base headed by Special Agent James Medeiros provided important information and materials necessary in the successful completion of this project's objectives.

Berlitz School of Language, Providence, Rhode Island are to be commended for their development efforts with regard to language training for future candidates.

Members of the observer corps itself deserve thanks for the first hand information about the observer experience aboard foreign vessels.

Special thanks is extended to Mr. William Gordon, Regional Director, Northeast Region, National Marine Fisheries Service for his coordination of the program objectives, and Captain G. A. Motte, Chairman, Department of Fisheries and Marine Technology, University of Rhode Island for his service as initial Principal Investigator and his overall guidance and support of the program.

INTRODUCTION

The Fisheries Observer Training Program has been designed to facilitate the comprehensive training of United States citizens in the duties and responsibilities of observers to be placed on foreign fishing vessels operating within the Fisheries Conservation Zone - Atlantic Region. This training program has been developed using funds supplied by the Office of Sea Grant, National Oceanic and Atmospheric Administration Department of Commerce with the approval of the Northeast Region - National Marine Fisheries Service.

The program is organized into four six-day weeks of combined theoretical and experiential education. Sections of this learning experience are further organized into chronology which will provide optimum coverage and reenforcement of the materials in the shortest possible time frame. Elements in the curriculum include historical considerations of fisheries regulation schemes; foreign language training; aspects of current management plans; seamanship terminology; fishing methods, gear and the biological considerations of species identification, sampling techniques and biodata recording. The curriculum is further supported by required reference materials, guest lecturers and integrated field experiences to include actual training aboard vessels at sea.

The observer candidate must be aware that with this type of intensive training, constant significant effort is required to complete the program successfully. Each candidate will be continually assessed during the training period and will be formally evaluated in writing. Certification for successful completion of this program is contigent upon specified criteria which will be related to you by the instructor group at the beginning and throughout the entire program.

CURRICULUM FORMAT

Fisheries Observer Training Program

WEEK I

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
0800 - 0900	Intro-duction	Language Section	Fishing Gear	Language Section	Fishing Gear	Field Experience
0900 - 1000	History - F.C.M.A.		History F.C.M.A		History F.C.M.A.	
1000 - 1100	Regula-tions F.M.F.S.		Regula-tions F.M.F.S.		Regula-tions F.M.F.S.	
1100 - 1200	Seaman-ship Terminology		Guest Lecturer		Seaman-ship Terminology	
1300 - 1400	Biological Section	Biological Section	Biological Section	Biological Section	Biological Section	
1400 - 1500						
1500 - 1600						

WEEK II

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
0800 - 0900	Fishing Gear	Language Section	Fishing Gear	Language Section	Fishing Gear	Field Experiance
0900 - 1000	History F.C.M.A.		History F.C.M.A.		History Exam	
1000 - 1200	Regula-tions F.M.P.S.		Regula-tions F.M.P.S.		Regula-tions. F.M.P.S.	
1100 - 1200	Seaman-ship Terminology		Guest Lecturer		Seaman-ship Terminology	
1300 - 1400	Biological Section	Biological Section	Biological Section	Biological Section	Biological Section	
1400 - 1500						
1500 - 1600						

CURRICULUM FORMAT

Fisheries Observer Training Program

WEEK III

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
0800 - 0900	Fishing Gear	Language Section	Fishing Gear	Language Section	Fishing Gear	Field Experience
0900 - 1000	Subjective Assessment		Subjective Assessment		Subjective Assessment	3 Domestic
1000 - 1100	Regula-tions F.M.P.S.		Regula-tions F.M.P.S.		Regula-tions F.M.P.S.	Fishing Trip
1100 - 1200	Seamanship Termin-ology		Guest Lecturer		Seamanship Termin-ology	
1300 - 1400	Biological Section	Biological Section	Biological Section	Biological Section	Biological Section	
1400 - 1500						
1500 - 1600						

WEEK IV

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
0800 - 0900	Fishing Gear Review	Language Section	Fishing Gear Exam	Language Section Exam	F.C.C. Test	Field Experience 4
0900 - 1000	Subjective Assessment		Subjective Assessment		Subjective Assessment	OR ALTERNATE
1000 - 1100	Regula-tions Seminar		Regula-tions and Review	Language Electronic Aids	Regula-tions Exam	Date - Domestic Fishing
1100 - 1200	Seminar Manual Reference Material		Guest Lecturer			Trip
1300 - 1400	Biological Section	Biological Section	Biological Section	Biological Section	Biological Section	
1400 - 1500						
1500 - 1600						

INTERNATIONAL LAW AND U.S. EXTENDED JURISDICTION

Dennis W. Nixon

Introduction

The Fishery Conservation and Management Act of 1976 (FCMA) has had a substantial impact on commercial fishing in the United States. Foreign fishing efforts within the 200-mile zone have decreased considerably since the law's effective date of March 1, 1977.

To understand the FCMA's impact on the international community at large, however, we must examine the historical basis for such a unilateral action in international law. This analysis will disclose that the FCMA was not an isolated instance of irresponsible unilateralism, but rather another step in an evolutionary process known as the "enclosure movement." The FCMA in the context of customary international law will also be examined to determine its impact on the ongoing Third United National Conference on the Law of the Sea (UNCLOS III).

Historical Development of Jurisdiction in the Oceans

The enclosure movement in the oceans, represented by 200-mile resource zones, is a compromise between two diametrically opposed doctrines of jurisdiction which have survived centuries of debate. The first doctrine advocates the closure of areas of the seas by states which use and have the power to defend them. The most famous proponent of the doctrine was the Englishman John Selden, who wrote his Mare Clausum in 1635.

South American scholars used this doctrine to support their extensions of jurisdiction in the late 1940's. Maxime Cisneros, Head of the Legal Department of the Peruvian Navy, argues that the first acts practiced by man on the sea were undoubtedly those of dominion:

> At the dawn of humanity, primitive man first becomes a fisherman and only later a sailor. In the coastal villages, the fishermen used primitive craft to catch fish by primitive means in the sea. Thus the idea of dominion of the seas preceded the idea of freedom in the genesis of the law.[2]

Cisneros argues that this "dominion of the seas" concept was predominant until at least the sixteenth century. Two examples are cited to demonstrate his point. First, after Pope Pius VI's Bull of May 14, 1493 and the Treaty of Tordesillas of 1494, Spain and Portugal claimed absolute dominion over the lands and seas discovered or to be discovered according to whether they were East or West of a meridian drawn 100 marine leagues (3 naut. miles) from the Cape Verde Islands and therefore denied any right of foreigners to use such waters for navigation and commerce. Second, England also endorsed the dominion of the seas thesis in the 17th century by granting titles of nobility to English pirates that attacked the freedom of navigation.

The opposing concept is obviously the "freedom of the seas" first expressed in the Mare Liberum of Grotius. Prior to 1976, this doctrine was used by the United States and other maritime nations to protest extensions of jurisdiction wherever they occurred.

In the early seventeenth century, the small state of Holland was a significant mercantile power with its Dutch East India Trading Company. Grotius was a lawyer for the Dutch company which commissioned him to write Mare Liberum.[3] The principles announced in the book were used by the Dutch East India Company to justify making war against Portugal whose claim of monopoly of trade with the Indies interfered with the rights of the Dutch to trade there.

Grotius is often incorrectly cited for the premise that the "freedom of the seas" precludes any extensions of jurisdiction for fisheries management purposes. Grotius based his idea of Freedom of Fishing as a part of the Freedom of the Sea on the premise of the inexhaustibility of the resources of the sea. Modern fishing methods have rendered this premise invalid. Grotius admitted the possibility that fish could be an exhaustible resource, in which case fishing would have to be regulated--but this would in no way affect the freedom of navigation. He stated:

> And if it were possible to forbid, for example fishing because it is, in a way, possible to maintain that fish are exhaustible, it would still be impossible to forbid navigation because the sea cannot be used up.[4]

Thus it is quite clear that the Grotian freedom of the seas relates to navigation and trade, which is not regulated by the FCMA or the 200-mile economic zone contemplated by the Law of the Sea Conference.

Modern Era Begins--Truman Proclamations of 1945

The Grotian view, enabling freedom of trade, was gradually embraced by the world's maritime powers, dependent upon sea routes, until almost everyone forgot that the"dominion of the seas" argument had ever existed. In 1945, the pendulum swung dramatically back towards the dominion concept. The nascent offshore oil industry in the U.S. wanted security of investment; coastal fisheries were in need of conservation measures. The result was the Truman Proclamations of September 28, 1945.[5]

The Truman Proclamation on Coastal Fisheries was the first announcement to implement unilateral conservation measures outside a state's territorial waters without claiming rights to exclusive fishing. The U.S. territorial sea was not extended, nor was an exclusive fishing zone set up. Instead, conservation zones in areas of the high seas contiguous to the coasts of the United States were established.

Kaldone Nweihed, a Venezuelan scholar, has stated that the importance of this proclamation stems from three facts.[6] First, it concerned itself with coast high sea fisheries, giving the impression that a coastal state had the obligation for protecting the fisheries nearest to its coast. Second, Truman's proclamation was a unilateral act, setting the precedent that such acts might generate international norms, at least if their motive were morally and scientifically acceptable.

Third, the simultaneous release of the Proclamation on the Continental Shelf, though intended not to mix one issue with the other, caused other nations to issue their own decrees with the issues blended together. The Shelf Proclamation provided for the exercise of the jurisdiction and control of the United States over the natural resources of the subsoil and seabed of the continental shelf beneath the high seas, but contiguous to the coasts of the United States. Read together, the two proclamations claimed the continental shelf under the high seas and the right to conserve coastal fisheries contained within the high seas.

The impact of these proclamations on the Law of the Sea has been enormous. Professor Nelson, of the London School of Economics, has stated:

> These two U.S. proclamations--especially the proclamation which concerned the continental shelf--in a sense heralded the end of the classical law of the sea and, to a certain extent, constituted the fons et origo of the extensive maritime claims which have been such a feature of the post--1945 world.[7]

There is nothing explicitly in the Truman Proclamations that can be read as a claim to exclusive authority over fishery exploitation in high seas areas.[8] Yet the Proclamations have served as models for countries which have made broad claims to the high seas off their coasts in the name of conservation policy.

Origins of the 200-mile Zone

Although many types of offshore zones have been established since 1945, there has been a remarkable degree of unanimity regarding the width--200 miles from the baselines demarcating a nation's internal waters. The 200 mile figure has been readily agreed to because within its limits lie most of the world's fish stocks and offshore oil reserves.

But how was the figure of 200 miles first decided upon? That question remained unanswered in the United States until 1977 when Ann Hollick of Johns Hopkins University investigated Chile's 200-mile zone, proclaimed on June 23, 1947.[9] Chile became the first country to proclaim national sovereignty over the continental shelf off its coasts and islands and over the seas above the shelf to a distance of 200 miles.

Hollick found three reasons for the type and distance of the zone claimed. The basic motivation for the expansion was the protection of the developing Chilean whaling industry. European and Japanese whaling in the area had been suspended during World War II, and the Chileans turned to whaling to supply their own soaps and oils. The end of the war meant the return of the mothballed whaling fleets and severe competition for the Chileans.

Because of the migratory patterns of the whales, a 50-mile zone would have been sufficient for protection, and this was in fact the distance the whaling company suggested to the Chilean government. The 200-mile figure was decided upon because of the second factor involved. Chilean lawyers wanted to base their claim on some precedent in law, and thought that a 200-mile claim was consistent with the security zone adopted in the 1939 Declaration of Panama.[10] This zone was established at U.S. initiative upon the outbreak of war in Europe to serve as a "safety zone". It ceased to be relevant when the U.S. became a belligerent two years later. The width of the zone around Chile was about 300-miles wide, but the map available to Chilean lawyers made it appear to be closer to 200 miles. Thus the 200-mile figure was born.

The third factor involved in the establishment of the Chilean 200-mile zone was the Truman Proclamation of 1945. The distinction in the claim between the continental shelf and the superjacent waters was added to strengthen Chile's assertion that the claim followed the precedents set by the United States in 1945. Hollick concludes, however, that the U.S. claims were not a direct stimulus to the Chilean 200-mile claim. Rather, it was the result of a weak whaling industry attempting to protect its exclusive access to a resource and the mistaken interpretation of a 1939 security zone.

Tunaboat Diploma--The Seizure of American Fishing Vessels by Ecuador

One of the most "visible" 200-mile zones in the world has been enforced by Ecuador since 1952. Hundreds of U.S. tunaboats have been seized and millions of dollars have been paid to secure their release.

Ecuador joined the "200-mile club" in 1952 when it joined with Penn and Chile to proclaim the Declaration of Santiago.[11] It remains the basis for Ecuador's seizure of U.S. fishing vessels.[12]

The Santiago Declaration pledges the three countries to a joint "international maritime policy" dedicated to the principle that each of the three possesses "sole sovereignty and jurisdiction over the area of sea adjacent to the coast of its own country and extending not less than 200 nautical miles from the said coast." In addition, within this maritime zone only the right of "innocent and inoffensive passage" is recognized--a right which is only identified with the territorial sea. Strictly read, the Declaration of Santiago went beyond a mere assertion of a specialized, functional competence over adjacent maritime area and in fact created very extensive territorial waters. However, it appears that this particular section was not meant to be strictly read.

Repeated interpretations by authorized representatives of the three countries, particularly in UN organs and conferences, confirm that the maritime zone is meant to be a "special jurisdiction" or "economic zone."[13] Thus the "innocent and inoffensive passage" in the maritime zone has been construed to mean freedom of navigation. The drafting was certainly inexact, but the current interpretation of the Santiago Declaration corresponds closely to the U.S. draft articles submitted to the Law of the Sea Conference, i.e., a 200-mile economic zone with 12-mile territorial sea.

Ecuador's interests in the tunaboat controversy are both political and economic. As a developing country, it views the United States tuna fishermen as representatives of a developed country exploiting resources off its shores.[14] The struggle with the United States over tuna is seen as an essential change in the balance of power over ocean resources between maritime powers like the United States and developing coastal states. A 1971 communique to the United States reaffirms this position:

> The old practice of maritime states delegating themselves to exercise protection over the ocean, over peoples or over properties which correspond to another given state, is today contrary to the foundations of international law and the Charter of the United Nations.[15]

The most dramatic and forceful way for Ecuador to demonstrate its belief in its preeminence over its coastal resources has been the seizure of U.S. fishing vessels. The protection of national honor has been a strong factor in its refusal to seek a compromise solution with the United States. There is a great deal of pride in being an early leader in the assertions of power being exercised by the developing states. One Latin American scholar has commented that the contribution of the Latin American countries "provides orientation for other developing countries" and that they can take credit for the "noteworthy change" forced upon developed countries in this area of the law.[16]

Ecuador claimed a 200-mile territorial sea by Decree No. 1542 of November 10, 1966, which amended the Civil Code.[17] As further amended by the Permanent Legislative Committee in 1970, Article 628 of that code states that "the adjacent sea, to a distance of 200 nautical miles...comprises the territorial sea and is of national domain.[18] According to the same article, "different zones of the territorial sea shall be established by executive decree and these shall be subject to the regime of free maritime navigation or of innocent passage for foreign ships."

David Loring, an American professor at the University of Costa Rica Law School, investigated the events immediately prior to the territorial sea declaration and discovered that the United States will occasionally go to great lengths to achieve its foreign policy objectives.[19] In 1963, the seizure problem had become very serious: 14 tunaboats had

been seized by the end of June; organized labor threatened an economic boycott against Ecuador; and the American Tuna-boat Association staged a dramatic protest by sending 19 boats sailing into Salinas, Ecuador. Yet the seizures continued.

Although Ecuador's government had been quite stable during the first half of 1963, it was suddenly overthrown in a military coup on July 11, 1963. The Kennedy Administration then recognized the military government only two weeks later--reversing a policy of not recognizing military governments. Shortly thereafter, negotiations were held on the fisheries question without any public agreement or announcement. Loring states that during this period the two governments entered into a secret agreement, or modus vivendi, in which Ecuador agreed to refrain from seizures beyond the 12-mile limit. He based his assertion on documents, still classified, made available to him by confidential sources. For more than two years, the agreement prevented major conflicts with Ecuador. Discovery of the modus vivendi in June 1965 created one of the major issues that later brought down the military junta in Ecuador. It is widely believed in Ecuador that the C.I.A. was responsible for the July 11, 1963 coup and the modus vivendi which followed. Those Ecuadorians involved with the secret agreement were stripped of their citizenship by the provisional government.[20] As soon as the provisional government was formed, it declared a full 200-mile territorial sea in retaliation.

If Loring's thesis is correct, Ecuador has good reason to suspect American foreign policy. But whether or not the United States was actually involved in the coup, the downfall of the junta sparked a wave of anti-Americanism. Within three years, six other South American countries had declared 200-mile limits.

The most visible interest of the United States in the tunaboat controversy is the survival of the American tuna fleet. Exclusive 200-mile fishery jurisdiction would give coastal states the power to tax the fleet out of existence. Since Ecuador's vessel seizures began, shortly after the Santiago Declaration in 1952, the United States has issued diplomatic protests,[21] attempted bilateral negotiations,[22] offered to submit the dispute to the International Court of Justice,[23] and threatened to cut off foreign aid.[24] Most of these efforts have only exacerbated the controversy. For example, after a number of tunaboat seizures by Ecuador in 1971, the United States responded by terminating arms sales to that country and threatened reconsideration of a $29 million aid program. At the same time the United States made its traditional plea for negotiations and again offered to submit the dispute to the World Court. Ecuqdor responded by seizing more tunaboats, expelling the United States military mission and charging the United States with economic coercion, a violation of Article 19 of the Organization of American States Charter.[25]

Since the Ecuadorians refused to be convinced of the error of their ways, and since the State Department discouraged the purchase of fishing licenses, Congress passed the Fishermen's Protective Act of 1954[26] to prevent the tuna fleet from being fined out of existence. The Act established the unique precedent of compensating vessel owners for fines paid to foreign governments as a result of unlawful seizures. This created an incentive not to purchase licenses for the 200-mile limits. Amended in 1967,[27] the Act now provides that tunaboat owners are also to be compensated for the value of any tuna confiscated while under seizure. These two acts have kept our tuna fleet alive at considerable expense to the federal overnment.

When 200-mile legislation was considered for the United States, many felt that the fishermen's Protective Act would be found inconsistent with the new law and would be repealed. Congress, however, took a middle ground and amended the Fishermen's Protective Act in Sec. 403 of the FCMA. Although the U.S. exercises complete management authority within its 200-mile zone, the U.S. will continue to pay the fines for its distant water fleet if a foreign zone's management plans:

(A) are unrelated to fishery conservation and management

(B) fail to consider and take into account traditional fishing practices of vessels of the United States

To a certain extent, the issues (and zones) overlap and have been considered as part of a "package" at Third U.N. Conference on Law of the Sea. Thus, to examine fisheries at UNCLOS III, and see U.S. extended jurisdiction in international law, a number of related issues must be discussed as well.

The Third Law of the Sea Conference has received a great deal of publicity since the first session was convened in 1973. Planners of the Conference were excited and optimistic about the prospects for achieving consensus on an agreement which would, among other things, redefine the limits of national jurisdiction in the oceans.

There was general agreement that the 1958 Geneva Conventions on the Law of the Sea[28] were inadequate to meet the plethora of new ocean uses and problems which had developed in the intervening fifteen years. The sinking of the Torrey Canyon in 1967 and the subsequent environmental tragedy dramatized the danger inherent in the operation of this new generation of "superships." The world-wide demand for oil sent explorers further and further offshore. Oil companies were suddenly drilling at depths and distances from shore that were unimagined in 1958. Today, many production experts do not believe that there is a maximum depth beyond which production is technically impossible. Presently, the industry can operate, drill, and produce oil in water depths up to 1000 feet.

Existing equipment could increase this capacity to 2000 feet. Much research and development is being done by the industry to develop new platforms, such as the new guyed tower concept, and remotely controlled sea-bottom completion units. Exxon is testing a working model bottom unit in the Gulf of Mexico designed for 3000-5000 foot operations. As the price of oil increases, justifying the enormous expense of drilling in deep water, production platforms will continue to move further offshore and into increasingly more hostile environments. In the 1960's, factory fishing fleets were developed, the largest from the Soviet Union and Japan. Operating on the high seas, perhaps only fifteen miles from the shore of another state, they perfected the technique of "pulse-fishing"--sweeping an area of the ocean clean of every size and type of fish. A dramatic decrease in the production of coastal nation inshore fishing fleets resulted.

Besides these resource-oriented conflicts which had developed since 1958, an entirely new non-resource use of the oceans had developed and become a critical element in the balance of power between the Soviet Union and the United States. In 1960, when the nuclear submarine USS George Washington was first deployed with the Polaris missile system, the oceans became a hiding place for weapons of mass destruction. The use of spy satellites to detect land-based launching sites has increased the intensity of underseas weapon research.

The USS Ohio, the first of the Trident submarine class, will be launched late this spring. It will displace 18,000 tons and operate as a fully mobile ICBM launching pad for 24 hydrogen-tipped missles capable of submerged firing at targets up to 6,000 miles. The submarine will be able to cruise eight years without refueling and will cost over a billion dollars.[29]

With the key role that nuclear submarines play in the balance of power, naval planners were concerned that a Law of the Sea Treaty might limit the mobility of forces through closures of straits or extensions of jurisdiction.[30] Coastal fishing nations wanted to extend their jurisdictions offshore to conserve their dwindling resources. Nations with extensive offshore oil reserves wanted their exploitation rights protected. Maritime powers opposed the efforts of coastal states to establish pollution zones. Marine scientists sought to continue their research in coastal waters without requiring the consent of the adjacent state.

The primary issue which brought representatives of the nations of the world together, however, was the ownership of the mineral resources of the deep seabed, beyond national jurisdiction. The existence of manganese nodules had been known since the famous Challenger oceanographic expedition of 1872.[31] Besides manganese, these nodules have high concentrations of commercially valuable copper and nickel.

It wasn't until the 1960's, however, that serious thought was given to recovering these mineral resources from the deep seabed; preliminary explorations were conducted by a U.S. company in the Pacific Ocean in August of 1964.[32]

In September of 1967, Ambassador Pardo of Malto delivered his now-famous speech to the U.S. General Assembly proclaiming the resources of the seabed to be "the common heritage of mankind." Pardo envisaged a scheme whereby developing nations would share in the revenues derived from nodule exploitation. On August 31, 1969, Deepsea Ventures, Inc., a U.S. corporation, discovered a commercially valuable 60,000 square kilometer tract in the Eastern Pacific Ocean.[33]

The law of deep-sea mineral exploitation was unclear, simply because deep-sea mining had never been done before. Faced with a serious ocean mining effort, the United Nations General Assembly took action regarding the legality of unilateral exploitation efforts. On Dec. 17, 1970, it passed General Assembly Resolution 2749 (XXV), entitled "Declaration of Principles Governing the Sea-Bed of the Ocean Floor, and the Subsoil Thereof, beyond the Limits of National Jurisdiction." This resolution declared that the seabed was the "common heritage of mankind," and should be managed by an international regime to be established by a UN-sponsored treaty.

The Assembly passed Resolution 2750 (XXV) the same day which called for the convening of a Third Law of the Sea Conference. Those two resolutions began a process which has dramatically changed that body of principles, state actions, and treaties we know as the Law of the Sea.

Those observers who sought to achieve a comprehensive Law of the Sea Treaty have been sorely disappointed. Formal negotiations have been in progress for over five years; yet the prospects for a comprehensive treaty appear increasingly remote. The failure of the conference to achieve its stated goal has been both a stimulus for and a product of the enclosure movement in the oceans.

Seven sessions of the Third Law of the Sea Conference (UNCLOS III) have been convened since 1973. The eighth session is scheduled to begin in March 1f 1979. A Single Negotiating Text was produced at the close of the third session in 1975; at the end of the fourth session in 1976, a Revised Single Negotiating Text was produced, amending and expanding upon the Articles of the original Text.[34]

A concerted effort in 1977 at the sixth session further refined the document which was renamed the Informal Composite Negotiating Text (ICNT). There are three hundred three individual Articles, divided into sixteen Parts plus seven Annexes. One cannot dispute the fact that the drafters of the Text have attempted to be comprehensive; new organizations have

been created (Art. 154, the International Sea-Bed Authority), new boundaries have been drawn (Art. 57, Breadth of the Exclusive Economic Zone), and old principles refined (Art. 111, Right of Hot Pursuit). However, this same comprehensiveness has produced a text that is so diverse and unwieldy that few believe a majority of the world's nations would sign and ratify it without substantial use of reservations.

The problems which occurred at the seventh session of the Conference in 1978 illustrate the reasons why a comprehensive treaty will not succeed and why the enclosure movement will continue to advance unilaterally.[35] The work of the session was divided among seven negotiating groups (NGs) concentrating on previously unresolved issues. The first three of these were concerned with Part XI of the ICNT on deep seabed mining. The new regime proposed for the seabed has been the most divisive of all conference issues. The other four negotiating groups discussed non-mining issues, all related to the enclosure movement in the oceans. The subject matter of the seven NGs were:

NG-1 ...System of exploration and exploitation of deep seabed minerals

NG-2 ...Financial arrangements for deep seabed mining

NG-3 ...Composition and voting of the Council of the Seabed Authority

NG-4 ...Access of landlocked and geographically disadvantaged states to fisheries within the economic zones of other states in the same region or subregion

NG-5 ...Settlement of disputes relating to the exercise of the sovereign rights of coastal states in the exclusive economic zone

NG-6 ...Definition of the outer limits of the continental shelf, and the question of revenue sharing

NG-7 ...Delimitation of maritime boundaries between adjacent and opposite states and the settlement of disputes thereon.

The first three NGs produced some proposed changes in the text regarding seabed mining, considered by many to be more favorable to the United States and other industrialized nations. Ambassador Elliot Richardson reported that the deliberations produced a text "sufficiently improved over (last year's) Informal Composite Negotiating Text" so as to"substantially enhance the prospect of consensus."[36] Yet Marne Dubs, of the Kennecott Copper ocean mining consortium, has stated emphatically that the new articles and the revised old ones are "worse than they were before." Dubs has charged that the Carter administration is attempting to "establish a new adult partnership with the third world by simply acceding to its demands . . ."[37]

The four remaining NGs, directly involved with specific aspects of the enclosure movement, achieved mixed results. Negotiating Group 4 had an exceptionally difficult issue to consider: access to the economic zones of other states by landlocked and geographically disadvantaged states of the same region. It must be remembered that the enclosure movement, as exemplified by the 200-mile economic zone concept, benefits a relatively small number of states with long shorelines. Those states with little or no shoreline, who have no coastal fishing stocks or continental shelf oil, have nothing to gain by the enclosure movement unless they are guaranteed this right to exploit some share of the resources. Articles 69 and 70 of the ICNT attempt to provide such a guarantee. However, efforts to refine these Articles were slowed when this issue was linked to revenue sharing with respect to continental margin exploitation beyond 200 miles from shore.

Negotiating Group 5 considered another problem presented by the enclosure movement: dispute settlement procedures when problems arise in the economic zone. Ambassador Richardson reported that after considerable debate, what emerged was the middle ground of compulsory conciliation of claims that the coastal state has abused its power.[38] This development was considered to be something of a breakthrough, and should form a basis for serious negotiations at subsequent UNCLOS III sessions.

In previous cases, coastal states had argued that foreign allocation of fish stocks within a conservation zone was purely a domestic issue. The recent U.S. 200-mile legislation, the Fishery Conservation and Management Act of 1976, clearly does not envisage compulsory conciliation.[39]

The most well-known consideration of this issue occurred as a result of the highly publicized "Cod Wars" between Iceland and Great Britain.[40] Frustrated by Iceland's repeated extensions of jurisdiction, Great Britain instituted proceedings before the International Court of Justice (ICJ) against Iceland, claiming that the latter was not entitled to the unilateral extension stated and that conservation of fish stocks off Iceland should be subject to bilateral arrangements agreed on between the two countries.[41] On July 25, 1974, the ICJ ruled against Iceland and in favor of the United Kingdom (Iceland had refused to plead its case, maintaining that the Court lacked jurisdiction in what Iceland held to be purely a domestic issue).[42] The Court found that "Iceland is not entitled unilaterally to exclude United Kingdom fishing vessels from areas between the 12-mile and 50-mile limits, or unilaterally to impose restrictions on their activities in such areas."[43] The recent change to the ICNT by Negotiating Group 5 closely follows the ruling of the ICJ, which removes the allocation of fish stocks from a fishery zone from the category of domestic issues.

This is unquestionably a major step which may be resisted for some time.

Reminiscent of the difficulties at UNCLOS I and II in 1958 and 1960 over the breadth of the territorial sea, Negotiating Group 6 was unable to reach a consensus on defining the outer limits of continental shelf jurisdiction. The issue was further complicated by a Soviet Union proposal that there be a distance limit of 300 nautical miles on national rights to seabed resources. Such a limit would obviously be more definite than the current "to the limits of exploitability" criterion of the 1958 Continental Shelf Convention, but would take the enclosure movement a step further than many feel is necessary. Whether or not a 300-mile seabed exploitation limit is a "rational" extension of the enclosure movement is a matter of opinion. A relatively small number of states have continental shelves with potential reserves which extend beyond 200 miles. It is unlikely that they will be able to establish a consensus on this point. They could, however, act unilaterally some time in the future if the conference fails and base their actions on a "logical extension of the exploitability criterion."

Negotiating Group 7, considering the delimitation of maritime boundaries between adjacent and opposite states, met with little success as well, All agreed that "equitable principles" should be used, but an attempt was made to go further, and establish a specific formula for boundary delimitation. Considering the complexity of factors in each major international boundary dispute, it may be unwise to

attempt to develop a specific formula for conflict resolution. The decision of the International Court of Justice in the North Sea Continental Shelf Cases[44] would tend to support such a flexible approach. In 1966 a dispute arose between the Federal Republic of Germany on one side and the Netherlands and Denmark on the other concerning the delimitation of the boundaries of the respective continental shelves in the North Sea. Denmark and the Netherlands contended that the dispute should be resolved through the application of the principle of equidistance set forth in Article 6 (1) of the Geneva Convention on the Continental Shelf.[45] By the time the case reached the I.C.J. in January of 1969, the Continental Shelf Convention was in force, having been ratified by 39 states--Germany, however, not being one of the parties. Denmark and the Netherlands argued that even if there was at the date of the Geneva Convention no rule of customary international law in favor of the equidistance principle, and no such rule was crystallized in Article 6 of the Convention, nevertheless such a rule had come into being since the Convention, partly because of its own impact and partly on the basis of subsequent state practice. The Court recognized that such a process could occur in the development of customary law, but concluded that neither the effect of the Geneva Convention nor state practice since its signing justified the

inference that the equidistance concept rose to the level of mandatory rule of customary law. Rather, the Court found that the applicable legal principles were (1) that delimitation must be the object of agreement between the states concerned and (2) that such agreement must be arrived at in accordance with equitable principles.[46] In reaching their decision, the Court utilized one of the most fundamental rules of conduct between nations in customary law--disputes should be settled by agreement in accordance in equitable principles. In the delicate area of boundary disputes, this is the only concept that could achieve complete acceptance.

The problems found by NG-7 are typical of the difficulties faced at every level of conference negotiations. As more and more new, controversial issues were added to the conference agenda, the likelihood of universal agreement diminished. The net result is that the conference may be closer to completing a draft treaty, but in a form that the U.S. Senate would never ratify without the liberal use of reservations, thus diminishing the treaty's impact in restructuring the law of the sea.

What impact, then, can UNCLOS III have on the prospects for a rational enclosure movement? If we accept as given that further negotiations will not produce an acceptable universal treaty, will UNCLOS III have any lasting impact at all?

The question must be answered resoundingly in the affirmative. The process of examining the law of the sea through the conference format has been highly instructive for the nations of the world. Each conference participant analyzed the existing body of ocean law and attempted to develop a new legal framework to control the increasing pressure on marine resources. The real success that conference participants achieved is in the Articles of the ICNT which are evolutionary in character. Many of the Articles express a consensus developed over years of negotiations based on state practice, the 1958 Geneva Convention, judicial decisions, and new technological developments. By expressing this consensus on a multitude of issues, the ICNT will serve as an important guide for individual state practice in ocean law. The Articles which are more revolutionary in character, primarily those dealing with seabed resources, may achieve significance at a later date when significant exploitation efforts have begun. It is sheer folly to set up another regulatory structure (the International Seabed Authority) before any commercial exploitation has begun. Economic factors may not make seabed mining worthwhile for another twenty years.

Thus the key to the significance of UNCLOS III for the enclosure movement is the degree of consensus achieved on this point.

The "new" development UNCLOS III presented with regards to the enclosure movement is found in Part V of the ICNT, the 200-Mile Exclusive Economic Zone. Prior to the conference only a handful of states, primarily South American, had claimed extended jurisdiction zones out to 200 miles. Since the Conference began in 1974, approximately 65 of the world's 130 coastal states have declared 200-mile resource zones of one type or another.[47] Without the conference negotiations bringing this concept under close scrutiny, it is doubtful that this "wave of unilateralism" would have occurred. Without the early consensus on the 200-mile figure, the enclosure movement might have advanced more erratically with claims far in excess of 200 miles. The early acceptance of the concept by the conference participants legitimized the figure and established a standard for guiding unilateral expansions. This will, perhaps, be the most important legacy of UNCLOS III.

Conclusion

Resource pressures and conflicts created the stimulus for the enclosure movement in much the same way they sparked colonialism in an earlier era. Hopefully, the comparison will stop there. For colonialism grew unchecked, without an international norm for what was considered a "reasonable" expansion. UNCLOS III has not produced a treaty, but it has produced a framework and a climate favorable to the development of customary international law, which is substantial contribution in itself.

Thus, if one accepts that the 200-mile economic zone is a reasonable extension of jurisdiction, designed to more effectively manage marine resources, the prospects for a rational enclosure movement in the wake of UNCLOS III is indeed good. Seen in this context, the Fishery Conservation and Management Act of 1976 is clearly not an irresponsible unilateral act, but rather part of the evolutionary development of the law of the sea.

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THE FISHERIES CONSERVATION AND MANAGEMENT ACT OF 1976: THE LEGAL FRAMEWORK

Francis X. Cameron*

INTRODUCTION

The fishery resources of the United States are not only of national importance, but are also important in terms of world protein supply.[1] It has become apparent that many of these stocks have been exhausted and others have been seriously threatened.[2] In turn, the future viability of the United States commercial and sport fishing industry is in question.[3] Moreover, in the long term, the impact of over-fishing may produce changes in ecological relationships which have even more serious and unforeseeable consequences than the loss of a food and protein supply.

Beginning in 1943, the federal government became active in respect to jurisdiction over coastal fisheries. The Truman Proclamation of 1943,[4] provided for the coastal nation's right to establish fisheries conservation zones on the high seas. This declaration of policy was implemented in 1966 when the United States adopted a 12-mile exclusive fisheries zone,[5] contiguous to the territorial sea, in which the United States would exercise "the same exclusive right in respect to fisheries . . . as it has in its territorial sea . . ."[6] Although the federal government did not attempt to regulate domestic fishermen in this nine

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*Associate Professor of Geography and Marine Affairs, University of Rhode Island. B.A., University of Pittsburgh, 1967; J. D., University of Pittsburgh, 1971, M.M.A., University of Rhode Island 1972.

mile zone, there is no doubt that it possessed the power to do so. The Act neither extended state jurisdiction to the new zone, nor did it diminish traditional state fisheries authority.[7]

In 1976, the federal government instituted a radical change in their approach to fisheries management by enactment of the Fisheries Conservation and Management Act (FCMA).[8] The legislation deviates from past United States fisheries policy in two important ways: (1) it unilaterally establishes a Fishery Conservation Zone of two hundred miles seaward of the coast within which the United States will exercise exclusive fisheries management authority,[9] and (2) it establishes a national fisheries management program and eight Regional Fisheries Management Councils to develop, under federal standards, management plans for the fishery resources of the Unites States.[10]

The Act has substantially changed the scope of United States authority by attempting to regulate both foreign and domestic fishermen in the Fishery Conservation Zone. Previously, the federal government did not exercise any general management authority over domestic fishermen. Control over the United States fleet was only exercised in selected cases pursuant to international treaties.[11]

Much of the blame for the depletion of United States fishery resources was placed on the technologically sophisticated foreign fleets that had appeared in ever increasing numbers off the United States coast, beginning in the 1950's. However, foreign fishing was only partially to blame. Depletion of United States

fish stocks has also resulted from the lack of any effective management scheme to control domestic fishermen. Congress, in establishing a 200 mile fishery zone, has attempted to deal with both the limitation of foreign fishing effort and the application of effective conservation measures to the United States fleet.

The FCMA establishes exclusive United States management authority over all fishery resources within a "Fishery Conservation Zone," extending out 200 miles from the seaward boundary of the coastal state. The United States will also exercise authority over continental shelf resources beyond the Fishery Conservation Zone, and over all anadromous species, such as salmon, throughout their migatory range.[12] Highly migratory species, specifically defined in the FCMA as tuna, are excluded from the coverage of the Act.[13]

THE REGIONAL FISHERY MANAGEMENT COUNCILS

Management of both domestic and foreign fishing will eventually be implemented through the Fishery Management Plans (FMP) prepared by the eight Regional Fishery Management Councils.[14] The Councils are designed to reflect various areas of expertise and interests. Voting members include the directors of each state fisheries agency in the region, the regional director of the National Marine Fisheries Service, and individuals selected by the Secretary of Commerce from lists submitted by Governors of the States in the Council's region. These individuals generally include commercial and recreational fishermen, processors, and consumers. Nonvoting members include Federal,

State, local representatives with an interest in fisheries management. The Councils will be assisted in their responsibilities by a scientific and statistical committee and by other advisory panels. Although the Councils do have the primary responsibility for fisheries management within their area, the Secretary of Commerce has final approval over any FMP prepared by a Council.[15] The Secretary may disapprove all or part of a Plan, and if the Council fails to change the Plan, the Secretary can prepare it directly.[16] To date this has not occurred. In reviewing a plan, the secretary must determine whether the plan is consistent with the Act's national standards, other provisions of the Act, and any other applicable laws. The Secretary of Commerce must consult with the Secretary of State with regard to foreign fishing and the Secretary of Transportation with respect to enforcement.

The Regional Councils have two direct responsibilities in relation to foreign fishing activities:

(1) Preparation of Fishery Management Plans which establish optimum yield for a fishery, the harvesting capacity of the United States fleet, and the resulting surplus that can be allocated to the foreign fleet; and

(2) preparing comments on individual specific applications for foreign fishing within the 200 mile limit.

FOREIGN FISHING

Each nation who desires to fish in United States waters must sign a Governing International Fishing Agreement (GIFA).[17] These GIFA's recognize the exclusive management authority of the Unites States and require the foreign nation and its vessels to comply with a number of regulations dealing with boarding and inspection, total allowable level of catch, gear damage and other management regulations promulgated by the Secretary of Commerce. Foreign fishing cannot be allowed for the vessels of any nation that does not extend substantially the same fishing privileges to the United States fleet as the United States extends to foreign fishing vessels. To date, fourteeen nations, including the U.S.S.R. and Japan, have signed GIFA's,[18] which will remain in effect for five years. Congressional review and approval is necessary before a GIFA is effective, and no GIFA may be approved before 60 days after its submission to Congress.[19] In order that foreign fleets would have an approved GIFA and be allowed to fish by the March 1, 1977, effective date of the Act, Congress enacted a joint resolution waiving the mandatory 60-day approval period, as well as some other requirements for a number of specific GIFA's.[20] These resolutions were subject to heavy criticism from the United States fishing industry, who cited them as further evidence of continuing government concessions to the foreign fleets.[21]

One an approved GIFA is in place, a foreign nation must apply for a permit for every harvesting and support vessel that will be operating in the United States fishery zone.[22]

These permits specify allowable catch for each species, zones of operation, fish size and sex restrictions, and types of gear allowed. (See Appendix I)

Applications for permits must specify:

1. the name and number of each fishing vessel;
2. a description of the vessel and type of fishing gear carried;
3. a specification of each fishery in which the vessel wishes to fish;
4. the amount of fish contemplated to be caught during the permit term;
5. the area and season in which the fishing will be conducted; and
6. other relevant information

When the foreign nation accepts the permit conditions, and pays any fees that are due, the United States must issue a permit to the specific vessels involved. Fee schedules are based on reasonableness, recovery of an approriate portion of management costs attributable to foreign fishing, nondiscrimination, simplicity in computation and collection, and function and size of the vessel. Current fees are based on size of the vessel and percentage of the market value of the catch.

The permit restrictions, most importantly, the foreign quota, are established in a Preliminary Management Plan (PMP) promulgated by the Secretary of Commerce.[23] For the most part the PMP's simply followed the quotas already in existence under various international agreements to which the United States was or has been a party.[24] In ordinary circumstances, the allowable foreign

catch would be set by a management plan prepared by a Regional Council. However, at the effective date of the Act, the Councils had not had the time to prepare any Management Plans. This made it necessary to use PMP's to allow the foreign fleets to fish as soon as possible after March 1, 1977.[25] The Department of Commerce prepared sixteen PMP's that:

1. determined the total allowable catch (optimum yield) for each fishery;
2. the portion of that total allowable catch that would be harvested by the United States fleet;
3. the allocation of the surplus, if any, to foreign fleets.

The FCMA established the following criteria for allocating the total surplus in a fishery to specific countries:

1. extent of traditional fishing activities;
2. contribution to fishery research
3. previous cooperation in respect to enforcement
4. previous cooperation with respect to conservation and management of fishery resources and
5. other factors including the need to minimize the economic dislocation to nations who have traditionally fished in the United States fishery zone.[26]

FISHERY MANAGEMENT PLANS

The FCMA's primary management tool is the Fishery Management Plan (FMP). The Act requires each Regional Council to prepare a FMP for selected fishery stocks within their jurisdiction.

These Plans regulate both foreign and domestic fishing. As of April 1979 the Secretary of Commerce had approved and implemented the following Fishery Management Plans:

- herring, Atlantic groundfish from the New England Council
- surf clam/ocean quahog from the mid-Atlantic Council
- salmon, anchovy[27] from the Pacific Council
- tanner crab[28], Alaskan groundfish from the North Pacific Council

Eventually about 70 FMP's will be developed and implemented (see Appendix II). FMP's when approved and implemented, replaces the corresponding Preliminary Management Plans that governs only fishing by foreign vessels and not the domestic fleet.

Management Plans must be designed to achieve the Act's primary objective of optimum yield[29] and to be consistent with the national standards for fishery conservation and management.[30] These national standards require that a Management Plan:

1. prevents overfishing and achieves optimum yield;
2. is based on the best scientific evidence available;
3. to the extent practicable, manages an individual stock of fish as a unit throughout its range, as well as coordinates the management of interrelated stocks.
4. does not discriminate between the residents of different states;
5. promotes efficiency in the utilization of fishery resources;

6. takes into account variations and contingencies in the fisheries; and

7. minimizes costs and avoids unnecessary duplication.

These standards are the first unified policy guidelines for fisheries management in the United States.

The primary objective of the Act is to achieve optimum yield, the amount of fish:

a. which will provide the greatest overall benefit to the Nation, with particular reference to food production and recreational opportunities; and,

b. which is prescribed as such by the maximum sustainable yield from such fishery, as modified by an relevant economic, social, or ecological factor.[31]

This is a fundamental change from the traditional management objective of maximum sustainable yield, a biological measurement of the highest catch that each stock could maintain without damage to the stock. Optimum yield attempts to intergrate economic, ecological, and social factors with this biological information. This would allow decision-makers to consider such factors as the interrelationships between various species, economic impact on the fishing industry, problems of efficiency and overcapitilization, and social impacts on fishing families and communities. However, there are difficulties in using the broad objective of optimum yield for fisheries management.[32] Part of the problem is the lack of more precise biological, economic and social data. A huge controversy is presently raging between the fishing industry and government scientists over the validity of government

data gathering techniques and the resulting biological estimates which are the basis for optimum yields in the North Atlantic groundfishery. While economic data is more readily ascertained than the biological assessments, the determination of social impacts is an area that is just beginning to be explored. Then remains the problem of how much weight should be given to each factor in determining the optimum yield. In addition, even with good information, the Regional Management Councils are going to making decisions on an ad hoc political basis. Faced with several management alternatives, the deciding factor may hinge on what particular interest group or geographical area has the most representation and influence on the Council.[33]

The determination of the optimum yield for a particular fishery in a Regional Council Management Plan, and the Plan's consistency with the national standards is subject to judicial review. The first major case to interpret the FCMA, Maine v. Kreps[34], indicates the Regional Councils and the Secretary of Commerce have considerable discretion in preparing and promulgating FMP's. This case involved a challenge by the State of Maine to the Preliminary Management Plan, prepared by the Department of Commerce to control the foreign fleets' participation in the herring fishery.[35] In order to establish the foreign quota in a PMP, the Department of Commerce must first estimate the optimum yield for the fishery and then estimate the portion of the optimum yield that the United States fleet will harvest.[36] The surplus, if any, between the optimum yield and the amount that the domestic fleet will harvest is allocated to the foreign

fleet.[37] By 1975, the herring stocks were in such bad shape that scientists feared that scientists feared that recruitment into the stock might fail entirely. Past management efforts by the International Commission on the Northwest Atlantic Fisheries (ICNAF) had attempted to rebuild the stocks at an incremental level. The stock in 1976 was 200,000 metric tons, and the point at which recruitment might fail was 225,000 metric tons. The ICNAF rebuilding efforts had increased the stock size to 235,000 metric tons and a quota of 33,000 metric tons was proposed for 1977. The Secretary of Commerce adopted this quota in the herring PMP. This would allow the stocks to rebuild by 10 to 13%, and would also maintain relations with foreign fishing interests by allocating them 21,000 metric tons of the quota. Maine argued that the optimum yield of 33,000 metric tons and the attendant allocation of 21,000 metric tons to the foreign fleet was too high. The contention was that all foreign fishing must be excluded in order to allow the stocks to recover at the fastest possible rate.[38]

The Court upheld the Secretary's determination and her consideration of the foreign policy interests of the United States in selling the optimum yield for a fishery. Although setting a lower optimum yield would allow a faster rebuilding of the stock, the Court found "nothing in the Act which prescribes a particular annual rate at which a below-par stock need be rebuilt."[39] The ^{OY} did allow a 10% increase in the stock and this was enough to promote the conservation purposes of the Act. This decision indicates that the statutory definition of optimum

yield is broad enough to allow the Secretary and the Regional Councils "substantial discretion in selecting the appropriate quota for a given fishery."[40]

This is particularly true since this determination is of a technical nature:

> Where congress has vested the authority to resolve technical questions of fact in a specialized administrative body with experience and expertise in that field, considerable deference is due its conclusions.[40]

In relation to foreign fishing specifically, the Circuit Court found that:

> Congress plainly did not intend the cardinal aim of the Act - the development of a United States controlled fishing conservation and management program designed to prevent overfishing and to rebuild depleted stocks - to be subordinated to the interests of foreign nation. But within a framework of progress towards this goal, the Secretary is limited and empowered within specified limits to accomodate foreign fishing.[42]

Factors such as the benefits from the scientific research conducted by foreign fleets, the negotiating needs of the United States at the Law of the Sea Conference, the need to gain the cooperation of other nations for fishery conservation efforts, and considerations related to our distant water fleet and our foreign fishery trade were legitimate in determining what was in the "greatest overall benefit to the Nation." The obvious fear that the conservation of fishery stocks off the coast of the United States would once again be subverted by foreign policy considerations must be allayed by the fact that 1977 was a transitional year: "What is reasonable now may be less so later."[43]

Regardless of whether the Kreps court was correct in allowing foreign policy considerations to be included in establishing optimum yield[44], it is clear that the courts will give the Councils and the Secretary of Commerce wide discretion in setting quotas. The question outstanding, however, is what the limits of this discretion are.

Optimum yield is a general concept that has not been precisely defined in the literature[45], or in the FCMA itself. It is clear that Congress was primarily concerned with the conservation of fishery stocks[46], particularly with the protection and rehabilitation of depleted stocks.[47] This concern led Congress to establish the basic starting point for determining optimum yield as maximum sustainable yield, a biological measurement. Once MSY is determined, the fishery managers must then consider possible modification for economic, social, or ecological reasons. The second important goal of the FCMA is to promote the development of the domestic fishing industry in order to maximize food production.[48] As the legislative history emphasizes:

> The concept of optimum sustainable yield is broader than the consideration of the fish stocks and takes into account the economic well-being of the commercial fishermen, the interests of recreational fishermen, and the welfare of the nation and its consumers.[49]

However, the obvious difficulty is where the goal of conserving the stocks' conflicts with the goal of promoting the commercial fishing industry. Such a conflict presently exists in the

Northeast where the status of the stocks has made it necessary for the Regional Council to impose severe quotas on the cod and haddock fisheries. These quotas have created a considerable amount of opposition, confusion, and bitterness in the New England fishing industry, because of the severe economic impacts that may result.

The New England Regional Council initially issued a Fishery Management Plan for the groundfishery in March of 1977.[50] This FMP was designed to cover the fishery until January, 1978. The FMP established optimum yield quotas of 25,000 metric tons (m.t.) for cod, 6,200 m.t. for haddock, and 14,000 m.t. for flounder. By August, it was clear that these quotas would be surpassed well before the end of the year and the Council was faced with the unpleasant decision of closing the fishery, with potentially severe economic consequences. Under pressure from the Industry, the FMP was amended to permit fishing to continue, even though the harvest would exceed the original optimum yield for the fishery.[51] In effect, the Regional Council authorized overfishing, the specific activity the FCMA was designed to prevent.[52]

In 1979, the same cycle was repeated. The Council would establish an optimum yield, that quota would be quickly reached and the fishery closed; the industry would successfully put pressure on the Council and the Department of Commerce to raise the optimum yield, and the fishery would reopen. The result of this process was that in 1977 approximately twice the amount of

groundfish were landed than the Council initially recommended. The industry, faced with substantial economic loss, is currently seeking to have the optimum yield of the Groundfish Management Plan raised upward again, even though this would exceed the biological limit for the fishery, assuming that the stock assessments are correct. The legislative history of the FCMA does indicate that the MSY can be exceeded.

Short-term deviations are within the permissible scope of action under the FCMA, especially in light of the flexibility that the decision-maker has under the Kreps decision. The important consideration is whether overfishing is permitted on a continuous basis:

> Although it may be conceivable that a situation may occur in which a yield higher than the maximum sustainable might be defensible, this would seem rare and should be only temporary. In almost every other instance, the optimum yield should be equal to or below the maximum sustainable yield.[53]

It's clear that if the Groundfish Management Plan continues to be amended upward as it has in the past, overfishing would take place on a continuous and sustained basis. This is outside of the statutory discretion of the administrator even under the reasoning of the Kreps decision. The only relief for the industry would come from revised stock assessment data which would validate the amended optimum yield.[54] Outside of that, when a clear and permanent conflict exists between the conservation and the economic well-being of the industry, conservation must prevail under the existing legislation. However, this is not to say that the long term conservation of the groundfishery will

not be postponed once again by Regional Council and Department of Commerce action.[55] (Note that any management decision by a Regional Council must be based on the "best scientific evidence available[56].) The process of establishing the ^{OY} for groundfish illustrates the difficulty of balancing conservation of the stock with maintaining the economic viability of the industry. The Herring FMP[57] involves a similar dilemma, but with the added problem of how much discretion a Council has to exempt a specific part of the fishery from the FMP's application. The Herring FMP is based on the migration and intermixing of three herring stocks: the Southwest Nova Scotia, the Gulf of Maine, and the Georges Bank/Southern New England. The primary objective of the FMP is to rebuild the Gulf of Maine stock, the smallest of the three, which is at a critically low level, due to intensive foreign fishing.[58] The three stocks migrate and intermix during different times of the year, and the rationale of the Management Plan is to allow the highest harvesting levels at the time of year and in the areas when the Gulf of Maine stock will be given the most protection.[59]

The migration patterns and intermixing of the stocks makes coordination of state and federal management efforts an absolute necessity for success of the Management Plan. Not only must state regulation further the conservation objectives of the Regional Council Plan, but the herring catch from state waters should logically be included in the overall herring quota established in the Plan. When the $_{OY}$ is reached, the fishery

within state waters, as well as in the FCZ, should be closed. In line with this logic, the FMP does expect all states, except Maine, the apply the Plan, including quotas, to their waters.[60] Maine, however, is free to establish its own management regulations, and the FMP sets aside 8,000 m.t. of adult herring above the OY for the Maine fishery. This 8,000 m.t. would include adults harvested incidental to the fixed year fishery for juveniles, and also those caught as part of a divested fishery for adults. The Council's treatment of Maine waters as a separate management unit recognizes the socioeconomic importance of the sardine fishery to Maine. However, the question still remains as to whether this justifies the relatively large harvest of adult herring excluded from the FMP's coverage[61] and the favorable treatment of Maine compared to the other states.[62]

Although the Council is legally obligated to pursue the long term objective of conserving fishery resources, they do have the flexibility to consider a broad range of management alternatives. The Kreps Court specifically found that ". . . nothing in the Act . . . prescribes a particular annual rate at which a below-par stock needs to be rebuilt."[63] As long as there is credible evidence that there will be rebuilding or stabilization of the herring stock under the Council Plan, and that the biological, economic, and social considerations have been rationally weighed in setting the quotas, the Management Plan will withstand legal challenge. The important consideration is the validity of the conclusion that the harvest of herring within Maine territorial waters will not violate the

assumptions of the stock assessment, which is the basis for the Plan's optimum yield.[64] This conclusion is based on a combination of two factors: one, that the incidental catch of adults in the fixed year juvenile harvest will not harm the stock since it is a reflection of year class abundance[65], and two, that the State of Maine will take appropriate measures to manage the herring stock within its waters consistent with Council objectives. The FCMA's broad grant of discretionary authority to the councils in establishing oy, along with the fact that this is essentially a "transition year" for management of the domestic herring fishery, will allow the Council the necessary flexibility to adopt this "wait and see" approach. However, the Plan itself notes that:

> Future assessments leading to area/period TAC's (Total Allowable Catches) for the adult fishery are expected to consider catches from all relevant fisheries (adult and juvenile), and in doing so, provide improved biological advice on the harvest of 3+ fish in the traditional juvenile fishery in relation to the regional utilization of ten herring resources.[67]

For legal and political reasons, the Council must pay careful attention in next year's herring FMP to how well Maine has managed their juvenile and adult herring fishery. Biological evidence that the absence of management efforts for the juvenile fishery, and too liberal a quota on the adult harvest, have resulted in overfishing, and will force the Council to end any favorable treatment for Maine in relation to the herring fishery.

ENFORCEMENT

The provisions of the FCMA one to be enforced by the Secretary of Commerce and the Secretary of the department in which the Coast Guard is operating. Both departments may authorize their personnel to exercise the arrest, boarding, search, seizure, and service of process powers of section 311(G). NMFS personnel will accompany the Coast Guard on most of their enforcement patrols to advise and arrest the Coast Guard in enforcing the FCMA. NMFS personnel will also be relied on as observers. The observers collect data on total catch, catch composition, level of fishing efforts, gear utilization, catch disposition, and marine mammal catch. The observers also perform biological sampling and monitor fleet compliance with foreign fishing regulations. In 1977 observers were on board about 36% of foreign vessels for 26% of the days that the vessels were off Alaska and the North Pacific and on 50% of the foreign vessels for 21% of the vessel days in the Atlantic. In 1978 an observer program was initiated to cover Japanese longline vessels which harvest billfish and sharks as incidental catch. Observers were on board these vessels about 11 to 14% of total vessel days in the Gulf of Mexico. The observer program is paid for through reimbursements from foreign nations.[68]

The major responsibility for fisheries enforcement rests with the Coast Guard. The Coast Guard is represented on each Regional Fishery Management Council as a non-voting member and is authorized to determine the types of position fixing and identification equipment that will be required of all nations who enter into GIFA's.[69] Application for foreign fishing permits

may not be granted by the Department of Commerce until consultation has taken place with the Coast Guard [70] and the Secretary of Commerce must also consult with the Coast Guard with respect to enforcement when reviewing any Fishery Management Plan.[71] Section 311 of the Act authorizes boarding search, inspection of any fishing vessel. Vessels may be seized if it "reasonably appears" that a violation has taken place[72] and arrest of a person is authorized if there is "reasonable cause to believe that such person has committed an act prohibited" by the FCMA.[73] However, the GIFA agreement includes a provision to permit boarding, search, or inspection at anytime without regard to probable or reasonable cause.[74]

The FCMA contains a number of sanctions against foreign fishing violations. Under Section 310 a fishing vessel and any or all of the fish may be forfeited to the United States for violation of the FCMA. There have already been a number of judicial proceedings to forfeit vessels and catch.[75] Criminal penalties are provided for in the form of prison terms and fines. For foreign fishing violations, the penalties of a $100,000 fine and/or up to one year imprisonment can be imposed.[76] However, the criminal sanction of imprisonment will probably not be used except in "aggravating circumstances."[77] Section 308 allows the Commerce Department to assess any penalities in amounts up to $25,000 per violation. The amount of the penalty depends upon the "nature, circumstances, extent and gravity of the prohibited acts committed and with respect to the violator, the degree of culpability, and history of prior offenses, ability

to pay, and . . . other matters . . .[78] Enforcement personnel may also issue a citation to the offending vessel instead of taking enforcement action.[79] This can be used for technical or minor violations. This has been employed a number of times in respect to foreign fishing since the effective date of the Act.[80]

In addition to these direct sanctions, Section 204(G)(12) of the FCMA allows administrative action against permits for foreign fishing under a GIFA. The Department of Commerce can revoke or suspend the permit of a foreign vessel for violation of the Act or for nonpayment of a fine.

SUMMARY

This chapter has touched on the basic provisions and issues of the Fisheries Conservation and Management Act of 1976. The reader should also be aware of new issues that are developing that are presently unresolved:

- the legality, and wisdom from a policy standpoint of allowing joint ventures where domestic harvesters sell United States quota fish to foreign processing vessels;
- the allocation of fishing quotas and management responsibility in the United States - Canadian boundary area; and
- the legality, and political feasability of the federal preemption of state fisheries management authority within the three mile territorial sea to prevent the frustration of national management objectives.

FOOTNOTES

1 See U.S. DEPT. OF COMMERCE, A MARINE FISHERIES PROGRAM FOR THE NATION 5, 11 (1976); COMPTROLLER GENERAL, General Accounting Office, N. B-177024, REPORT TO THE CONGRESS, THE U.S. FISHING INDUSTRY--PRESENT CONDITON AND FUTURE OF MARINE FISHERIES, 5 (1976).

2 The National Marine Fisheries Service listed the following stocks as depleted as of August 1975; abalones, Alaska Pollock, Atlantic herring, Atlantic salmon, Atlantic sea scallop, fluke, haddock, halibut, oysters, Pacific salmons, Pacific sardine, penaeid shrimp, Pismo clam, river herrings, rockfish, sea run trout, striped bass, yellowfin sole, yellowtail flounder, U.S. DEPT. OF COMMERCE, id. no. 1, at 6; see also COMPTROLLER GENERAL, id. note 1, at 63.

3 U.S. DEPT. OF COMMERCE, supra note 9, at 47; COMPTROLLER GENERAL, supra note 1, at 11; OFFICE OF TECHNOLOGY ASSESSMENT, ESTABLISHING a 200-MILE FISHERIES ZONE 93 (1977).

4 Policy of the United States with Respect to Coastal Fisheries in Certain Areas of the High Seas, Pres. Procl. No. 2668, 3 C.F.R. 68 (1943-1948 Comp.), reprinted in 13 DEPT. STATE BULL. 486 (1945). For a full treatment of international fisheries law, see KNIGHT, MANAGING THE SEAS LIVING RESOURCES (1977).

5 Exclusive Fisheries Zone Act, 16 U.S.C. Sec. 1091 et seq. (1970).

6 Id. The United States had exercised control over continental shelf fishery resources since the first 1945 Truman Proclamation which subjected all the natural resources of the shelf to the jurisdiction of the United States. Policy of the United States with Respect to the Natural Resources of the Subsoil and Seabed of the Continental Shelf, Pres. Procl. No. 2667, 3 C.F.R. 67 (1948-1948 Comp.), reprinted in 13 DEPT. STATE BULL. 485 (1945). In 1973 Congress declared the lobster as a creature of the continental shelf, Offshore Shrimp Fisheries Act of 1973, 16 U.S.C. 1085 et seq. (1973). This legislation was followed by the issuance of stringent enforcement guidelines for all continental shelf fishery resources, Guidelines for Enforcement of United States Rights to Continental Shelf Fishery Resources, Dept. State Press Release No. 363 (Sept. 12, 1974).

7 Exclusive Fisheries Zone Act, 16 U.S.C. Sec. 1094 (1970).

8 Pub. L. No. 94-265, 90 Stat. 331 (1976) (codified at 16 U.S.C.A. Secs. 1801-1882 (West Supp. 1977) (hereinafter cited as FCMA or "the act"). For a symposium on various aspects of the FCMA, see Symposium on the Fishery Conservation and Management Act of 1976, 52 WASH. L. REV. 427 (1977).

9 16 U.S.C. Sec. 1811 (West Supp. 1977).

10 Id. Sec. 1851-1856.

11 See e.g., the Convention for the Northwest Atlantic Fisheries, July 1949 (1950) 1 U.S.T. 477, T.I.A.S., No. 2089, 157 U.N.T.S. 157 and its implementing legislation, the Northwest Atlantic Fisheries Act of 1950, 16 U.S.C. Sec. 981 et. seq. (1974).

12 However, the U.S. does not claim jurisdiction when these fish are in another nations territorial sea or fishery conservation zone. This extended management authority over salmon stems from the fact that although they spend much of their lives in the ocean, they must return to the fresh-water stream where they were born in order to spawn. This type of life cycle requires exclusive management control by the country where they spawn. For a discussion of extended jurisdiction and the salmon fishery, see Rettig & Johnson, Andramous Species and Extraterritorial Jurisdiction, in ECONOMIC IMPACTS OF EXTENDED FISHERIES JURISDICTION 133 (1. Anderson ed. 1976).

13 16 U.S.C. Sec. 1802 (14) (West Supp. 1977). This reflects the current United States Law of the Sea position.

14 New England, Mid-Atlantic, South Atlantic, Caribbean, Gulf, Pacific, North Pacific, and Western Pacific.

15 16 U.S.C. Sec. 1854 (West Supp. 1977).

16 Id., Sec. 1854(c).

17 Id. Sec. 1921(c).

18 Bulgaria, Cuba, Federal Republic of Germany, France, Italy, German Democratic Republic, Japan, Poland, Repulbic of China, Republic of Korea, Rumania, U.S.S.R., and Spain. See also, United States - Canada Reciprocal Fishing Agreement, signed February 24, 1977, in force July 26, 1977.

19 16 U.S.C. Sec. 1982(a) (West Supp. 1977).

20 This Resolution also shortened the Regional Council review period of foreign permit applications from 45 days to 7 days, postponed the payment of foreign fishing fees, and no longer required the permit to be physically on board the foreign vessel.

21 For a similar controversy, see, Conference on the Enforcement of the Fishery Conservation and Management Act, American University, College of Public Affairs (Washington D.C., May, 1977). The issue discussed was the State Department role in advising the Coast Guard not to proceed with enforcement measures against certain foreign vessels in the early stages of the FCMA. This issue has recently surfaced again in the State Department decision not to allow the Coast Guard to

seize the Polish fishing vessel Laskara on September 10, 1977. The Laskara alledgedly hauled in 17 tons of squid in a herring zone when the Coast Guard boarded her. Both the National Marine Fisheries Service and the Coast Guard recommended seizure, as well as Justice Department, but the White House and the State Department ruled against it. This has cause considerable anger in the New England fishing community. They veiw the State Department action as injecting foreign policy considerations into fishery management, which is against the intent of Congress under the FCMA.

22 16 U.S.C. sec. 1924 (West Supp. 1977).

23 Id. sec. 1821 (g)

24 See note 11, although the United States withdrew from the International Commission for the Northwest Atlantic Fisheries (ICNAF), the quotas set in the PMP's followed the previous year's ICNAF quota arrangement.

25 Although the PMP's only apply to foreign fleets and not to domestic fishermen, a PMP can have a serious impact on the United State fleet.

26 16 U.S.C.A. sec. 1821 (e) (West Supp. 1977).

27 Approved but not yet implemented.

28 16 U.S.C.A. sec. 1821 (e) (West Supp. 1977).

29 Id., Sec. 1801 (b)(4)

30 Id., Sec. 1851. These standards are further elaborated in the Department of Commerce regulations for the preparation of Fishery Management Plans. 42 Fed. Reg. 34450 (1977).

31 Id., Sec 1802 (18).

32 Optimum yield has been termed "a recipe for achieving heaven or hell, and what is achieved will depend on how the definition is variously interpreted." Larkin, An Epitaph for the Concept of Maximum Sustainable Yield, 106 TRANSACTIONS OF AM. FISHERIES SOC'Y 1, 9 (1977).

33 79% of the Council members nationwide represent the fishing industry. See Pontecorvo, Fishery Management and the General Welfare: Implications of the New Structure, 52 WASH. L. REV. 641, 653 (1977). The composition of a Regional Council can result in management plans that favor one type of fishing over another, such as recreational fishing over commercial fishing, or favor one segment of the industry over another, such as large vessels over small vessels, or favor one geographical area over another. A good exaple of this last situation can be seen in the New England Council's Herring Management Plan, which treated Maine much more favorably than other states. See infra. notes 57 to 67.

[34] No. 77-45-SC (D. Mass., July 18, 1977) remanded, 563 F. 2d 1043 (1st Cir.), a'ffmd, 563 F. 2d 1052 (1st Cir. 1977).

[35] 42 Fed. Reg. 1811 (1977).

[36] 16 U.S.C. Sec. 1821 (d) (West Supp. 1977).

[37] Maine argued that FCMA did not permit the Secretary of Commerce to base her determination of domestic fleet capacity on economic factors such as whether the current price of herring made it profitable for the fleet to harvest more than a certain amount. Although, the Secretary did find that there was sufficient domestic capacity to harvest all of the optimum yield for the fishery, current prices would discourage a harvest of more than 12,000 metric tons. The court found that the Secretary's consideration of economic factors was justified by the statutory requirement to determine how much the domestic fleet will harvest, not how much they can harvest. Maine v. Kreps No. 77-45-SC, 54 (D. Mass., July 18, 1977).

[38] The State also challenged the PMP on its failure to meet the requirement of NEPA. The District Court found the Environmental Impact Statement (EIS) satisfactory:

> It is evident that the present EIS, although not perfect, was prepared in good faith, and discussed the advantages and disadvantages of the proposed agency action with sufficient information presented to permit the agency intelligently to choose from among the alternatives.

Maine v. Kreps, NO. 77-45-SD, (D. Mass., July 18, 1977).

[39] Maine v. Kreps, 563 F. 2d 1043, 1049 (1st Cir. 1977).

[40] Maine v. Kreps, 563 F. 2d 1052, 1055 (1st Cir. 1977).

[41] Maine v. Kreps, 563. 2d 1043, 1050 (1st Cir. 1977).

[42] Id., at 1049.

[43] Maine v. Kreps, 563, F. 2d 1052 (1st Cir. 1977)

[44] See, Comment: Foreign Fishing Quotas and Administrative Discretion Under 200 Mile Limit Act, 58 BOSTON UNIV. L. R. 95 (1978). A related problem is the legality of a Regional Council intentionally setting the optimum yield below maximum sustainable yield in order to exclude foreign fleets and protect export markets for U.S. fishermen, see Brewer, The Interaction of Science and Economics in the Determination of Optimum Yield, PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE (1978).

[45] One commentator noted that "no two speakers have described it (optimum yield) exactly the same, and if they are confused, imagine how puzzled a layman would be." Croker, Usefulness of the Optimum Yield Concept, in ROEDEL (ed.) OPTIMUM USTAINABLE YIELD AS A CONCEPT IN FISHERIES MANAGEMENT 75 (1975).

[46] See SENATE COMMITTEE ON COMMERCE, A LEGISLATIVE HISTORY OF THE FISHERY CONSERVATION AND MANAGEMENT ACT OF 1976, 94th Cong., 2d Sess. 685, 1098 (1976) (hereinafter LEGISLATIVE HISTORY).

[47] Id. at 1087, 1149-51.

[48] 16 U.S.C. Sec. 1801 (B) (3) (West Supp. 1977).

[49] LEGISLATIVE HISTORY, supra note[46], at 1099.

[50] 42 Fed. Reg. 18999 (1977).

[51] 42 Fed. Reg. 58412 (1977). The amendment increased the oy for haddock to 10,500 m.t., for cod to 30.650 m.t., and for flounder to 16,000 m.t. The amendment was implemented through the emergency action provision of the FCMA, 16 U.S.C. Sec. 1855 (e). This provision allowed the Secretary to act in situations where there was any emergency involving a fishery resource. Using this provision to avoid an economic impact on the industry clearly quesionable in light of the legislative history. See LEGISLATIVE HISTORY, supra note 46, at 694, 1124.

[52] The actual catch for 1977 far exceeded the original optimum yield, with 39,617 m.t. of cod, 14,114 m.t. of haddock, and 16,459 m.t. of flounder harvested.

[53] LEGISLATIVE HISTORY, supra note 46, at 677.

[54] Whether the scientific data that is used as a basis for determining the optimum yield and thus overfishing is correct, is a serious point of conflict between the manager and the fishery industry.

[55] As late as July of 1978, the Regional Council was still reacting to the situation with short-term solutions, such as starting the optimum yield for groundfish over again in the middle of the year in order to alleviate the economic impact on the industry.

[56] 16 U.S.C. Sec. 1851 (a)(2) (West Supp. 1977).

57 NEW ENGLAND REGIONAL FISHERY MANAGEMENT COUNCIL, FINAL ENVIRONMENTAL IMPACT STATEMENT/FISHERY MANAGEMENT PLAN FOR THE ATLANTIC HERRING FISHERY OF THE NORTHWESTERN ATLANTIC (1978).

58 The optimum size for this stock is at 100,000 m.t.. The present stock size is at about 60,000 m.t.. See id. at 2-8.

59 In the past almost all of the U.S. catch has been composed of the Gulf of Maine stock, harvested by pair trawlers in the winter/spring and by purse seiners in the summer/fall. The most mixing of the stocks in the Gulf of Maine occurs in the winter/spring, and consequently this is the time when the quotas may behigher, since more protection is offered to the depleted Gulf of Maine stock. This means that the purse seiners, who do their fishing in the summer/fall, will suffer a larger negative economic impact than the pair trawlers, who do their fishing in the winter/spring when quotas are higher. The Regional Council hopes to alleviate this economic impact on the purse seiners by allowing a large summer/fall quota on the more abundant Georges Bank stock. However, the U.S. catch on Georges Bank has been virtually nonexistent, due to the relationship between the distance offshore and delivery of a product suitable for export.

60 Although the Herring FMP does treat the fishery within Maine waters differently than the fisheries inside other states, it would not violate the FCMA National Standard preventing discrimination against the residents of different states. 16 U.S.C. Sec. (851)(s) (4) (West Supp. 1977). This standard is concerned with the equal access to a fishery by the fleets of all states, something the herring Plan does not interfere with. See also LEGISLATIVE HISTORY, supra note 46 at 686, 1114.

61 The toal allowable catch of the Gulf of Maine stock for the entire area outside of Maine waters is only 8,000 m.t.

62 Some have charged that the FMP is more a product of the Council membership being weighted towards Maine interests, rather than a product of adequate scientific information. The Council's Herring Oversight Committee is comprised entirely of Maine representative, and the majority of the voting members on the New England Council have a substantial interest in the welfare of the Maine sardine industry.

63 Maine v. Kreps, 563 F. 2d 1052, 1068 (1st Cir. 1977)

64 NEW ENGLAND REGIONAL FISHERY MANAGEMENT COUNCIL, supra Note 60, at 3-8.

65 Id. at 2-73.

66 Id. at 2-74. Maine has recently taken steps to institute a management plan for these herring stocks. It would limit the harvest of adult herring (defined as 4 years and older, 10 inches and longer) to 3,500 m.t.. This is a reduction from the 8,000 m.t. of adult herring (defined as 3 years and older, 9 inches and longer) allowed to Maine by the Regional Council Herring Plan. However, the Maine Plan does not set any quota for the juvenile fishery. See STATE OF MAINE, DEPARTMENT OF MAINE RESOURCES, FISHERY MANAGEMENT PLAN FOR THE MAINE HERRING FISHERY (1978).

67 Id.

68 COMPTROLLER GENERAL, General Accounting Office, PROGESS AND PROBLEMS OF FISHERIES MANAGEMENT UNDER THE FCMA, 9, (1979).

69 16 U.S.C.A. Sec. 1861 (c) (2) (c). (West Supp. 1977).

70 Id. Sec. 1824 (G)(6).

71 Id. Sec. 1854 (G)(2).

72 Id. Sec. 1861 (b)(1)(C).

73 Id. Sec. 1861 (G)(1)(A).

74 Id. Sec. 1821 (c)(2)(A)(i). As of 1978, 1,700 foreign vessels have been boarded and 613 infractions have been documented.

75 See Fidell, "Developments in the Law: The FCMA of 1976", OCEANS 78, Marine Technology Society. (1978).

76 For refusal to permit an authorized boarding, forcible assual of an authorized officer, or resisting arrest, the penality is six months imprisonment and/or $50,000 fine.

77 Fidell, "The Policeman's Lot", 52 WASH. L. REV. 513, 545 (1977).

78 16 U.S.C.A. Sec. 1858 (a) (West Supp. 1977).

79 Id. Sec. 1861(c) (West Supp. 1977).

80 See Supra, n. 21.

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EXAM

1. Explain what factors are involved in the establishment of optimum yield under the FCMA.

2. What national standards are a Fishery Management Plan guided by?

3. Explain the relationship between a Preliminary Management Plan (PMP) and a Fishery Management Plan (FMP).

4. Who is responsible for enforcing the FCMA?

5. What is usually contained in a Governing International Fisheries Agreement (GIFA).

6. What types of sanctions are provided for violation of the FCMA?

7. How would a foreign nation go about gaining permission to fish in the United States Fishery Conservation Zone (FCZ)?

8. Explain the composition of a Regional Fishery Management Council.

9. What criteria does the federal government use in allocating surplus fish to individual foreign nations?

10. Discuss Maine v. Kreps in relation to foreign fishing.

APPENDIX I: FOREIGN FISHERY REGULATIONS

50 CODE OF FEDERAL REGULATIONS PART 611
(see latest revision 43 Fed. Reg. 5929 3, December 19, 1978)

SUBPART A: GENERAL

611.1 Purpose
611.2 Definition
611.3 Permits for Foreign Fishing
611.4 Vessel Reporting
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611.70 Washington, Oregon, California trawl fishery.

*The regulations and allocations for specific fisheries will be revised as the optimum yield (OY) and the total allowable level of foreign fishing (TALFF) are revised in each Preliminary Management Plan (PMP) or Fishery Management Plan (FMP) that are promulgated on an annual basis.

APPENDIX II: FMP STATUS

Fishery	Date Began
New England Council:	
Sea herring	8/77
Scallop	8/77
Pollock	1/78
Red fish (ocean perch)	1/78
Hake (silver)	10/77
Other hake	4/78
Red crab	6/78
Northern shrimp	Plan not yet scheduled
New England groundfish (cod, haddock, and yellowtail flounder)	Plan adopted
Revised FMP for 1978	Plan adopted
Comprehensive FMP for 1979	6/78
Lobster	1979
Mid-Atlantic Council:	
Squid	4/77
Mackerel	9/77
Butterfish	12/77
Fluke	5/78
Sharks	12/77
Scup	9/78
Sea bass	Plan not yet scheduled
Surf clam and ocean quahog	Plan adopted
Bluefish	6/78
American lobster	Plan not yet scheduled
American shad, hickory shad, and river herring	Plan not yet scheduled
Dogfish	Plan not yet scheduled
Tilefish	Plan not yet scheduled
South Atlantic Council:	
Swordfish	6/78
Billfish	3/78
Snapper-grouper complex	9/77
King and Spanish mackerel	2/78
Corals	7/78
Spiny lobster	7/78
Calico scallops	11/78

Caribbean Council:

Spiny lobster	6/77
Shallow water reef fish	7/77
Migratory coastal pelagics	6/78
Mollusk	1979
Precious corals	1979
Deep water reef fish	1979

Gulf of Mexico Council:

Groundfish	10/77
Shrimp	11/77
Coastal migatory pelagics	6/78
Reef fishes	11/77
Coastal herrings	10/78
Precious corals	10/78
Gulf swordfish	1978
Spiny lobster	8/78
Squid	Plan not yet scheduled
Sharks	6/78
Stone crab	5/76

Western Pacific Council:

Spiny lobster	4/77
Precious corals	4/77
Seamount resources	4/77
Billfish	4/77
Bottomfish	4/77

Pacific Council:

Comprehensive salmon	6/77
Groundfish	4/77
Dungeness crab	9/77
Pink shrimp	9/77
Anchovy	Plan adopted
Squid	9/77
Jack Mackerel	4/78
Pacific herring	7/78
Commercial and Recreational salmon, 1977	Plan adopted
Revised FMP for 1978	Plan adopted
Revised FMP for 1979	10/78

North Pacific Council:

King crab	4/77
Bering Sea groundfish	4/77
Bering Sea clam	7/77
Snail	1982
Dungeness crab	1981
Tanner crab	Plan adopted
Groundfish-Gulf of Alaska	Plan adopted
Commercial troll fishery	Plan withdrawn
High seas salmon east of 175° E will replace commercial troll fishery	4/77
Bering Sea shrimp	4/78
Bering Sea herring	1978
Scallops	1979
Shrimp (except Bering Sea)	1980
Corals	1983
Halibut	6/78
Ocean salmon	Plan not yet scheduled

Public Law 94-265
94th Congress, H.R. 200
April 13, 1976

AN ACT

To provide for the conservation and management of the fisheries, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act, with the following table of contents, may be cited as the "Fishery Conservation and Management Act of 1976".

Fishery Conservation and Management Act of 1976. 16 USC 1801 note.

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TITLE IV--MISCELLANEOUS PROVISIONS

SEC. 2. FINDINGS, PURPOSES AND POLICY

(a) FINDINGS.--The Congress finds and declares the following: 16 USC 1801.

(1) The fish off the coasts of the United States, the highly migratory species of the high seas, the species which dwell on or in the Continental Shelf appertaining to the United States, and the anadromous species which spawn in United States rivers or estuaries, constitute valuable and renewable natural resources. These fishery resources contribute to the food supply, economy, and health of the Nation and provide recreational opportunities.

(2) As a consequence of increased fishing pressure and because of the inadequacy of fishery conservation and management practices and controls (A) certain stocks of such fish have been overfished to the point where their survival is threatened, and (B) other such stocks have been so substantially reduced in number that they could become similarly threatened.

(3) Commercial and recreational fishing constitutes a major source of employment and contributes significantly to the economy of the Nation. Many coastal areas are dependent upon fishing and related activities, and their economies have been badly damaged by the overfishing of fishery resources at an ever-increasing rate over the past decade. The activities of massive foreign fishing fleets in waters adjacent to such coastal areas have contributed to such damage, interfered with domestic fishing efforts, and caused destruction of the fishing gear of United States fishermen.

(4) International fishery agreements have not been effective in preventing or terminating the overfishing of these valuable fishery resources. There is danger that irreversible effects from overfishing will take place before an effective international agreement on fishery management jurisdiction can be negotiated, signed, ratified, and implemented.

(5) Fishery resources are finite but renewable. If placed under sound management before overfishing has caused irreversible effects, the fisheries can be conserved and maintained so as to provide optimum yields on a continuing basis.

(6) A national program for the conservation and management of the fishery resources of the United States is necessary to prevent, and to realize the full potential of the Nation's fishery resources.

(7) A national program for the development of fisheries which are underutilized or not utilized by United States fishermen including bottom fish off Alaska, is necessary to assure that our citizens benefit from the employment, food supply, and revenue which could be generated thereby.

(b) PURPOSES.--It is therefore declared to be the purposes of the Congress in this Act--

(1) to take immediate action to conserve and manage the fishery resources found off the coasts of the United States, and the anadromous species and Continental Shelf fishery resources of the United States, by establishing (A) a fishery conservation zone within which the United States will assume exclusive fishery management authority over all fish, except highly migratory species, and (B) exclusive fishery management authority beyond such zone over such anadromous species and Continental Shelf fishery resources:

(2) to support and encourage the implementation and enforcement of international fishery agreements for the conservation and management of highly migratory species, and to encourage the negotiation and implementation of additional such agreements as necessary:

(3) to promote domestic commercial and recreational fishing under sound conservation and management principles;

(4) to provide for the preparation and implementation, in accordance with national standards, of fishery management plans which will achieve and maintain, on a continuing basis, the optimum yield from each fishery:

(5) to establish Regional Fishery Management Councils to prepare, monitor, and revise such plans under circumstances (A) which will enable the States, the fishing industry, consumer and environmental organizations, and other interested persons to participate in, and advise on, the establishment and administration of such plans, and (b) which take into account the social and economic needs of the States; and

(6) to encourage the development of fisheries which are currently underutilized or not utilized by United States fishermen, including bottom fish off Alaska.

(c) POLICY.--It is further declared to be the policy of the Congress in this Act--

(1) to maintain without change the existing territorial or other ocean jurisdiction of the United States for all purposes other than the conservation and management of fishery resources, as provided for in this Act;

(2) to authorize no impediment to, or interference with, recognized legitimate uses of the high seas, except as necessary for the conservation and management of fishery resources, as provided for in this Act;

(3) to assure that the national fishery conservation and management

program utilizes, and is based upon, the best scientific information available: involves, and is responsive to the needs of interested and affected States and citizens; promotes efficiency; draws upon Federal, State, and academic capabilities in carrying out research, administration, management, and enforcement; and is workable and effective:

(4) to permit foreign fishing consistent with the provisions of this Act; and

(5) to support and encourage continued active United States efforts to obtain an internationally acceptable treaty, at the Third United Nations Conference on the Law of the Sea, which provides for effective conservation and management of fishery resources.

SEC. 3. DEFINITIONS 16 USC 1802.

As used in this Act, unless the context otherwise requires--

(1) The term "anadromous species" means species of fish which spawn in fresh or estuarine waters of the United States and which migrate to ocean waters.

(2) The term "conservation and management" refers to all of the rules, regulations, conditions, methods, and other measures (A) which are required to rebuild, restore, or maintain, and which are useful in rebuilding, restoring, or maintaining, andy fishery resource and the marine environment; and (B) which are designed to assure that--

(i) a supply of food and other products may be taken, and that recreational benefits may be obtained, on a continuing basis;

(ii) irreversible or long-term adverse effects on fishery resources and the marine environment are avoided; and

(iii) there will be a multiplicity of options available with respect to future uses of these resources.

(3) The term "Continental Shelf" means the seabed and subsoil of the submarine areas adjacent to the coast, but outside the area of the territorial sea, of the United States, to a depth of 200 meters or, beyond that limit, to where the depth of the super-jacent waters admits of the exploitation of the natural resources of such areas.

(4) The term "Continental Shelf fishery resources" means the following:

Colenterata

Bamboo Coral -- Acanella spp.;
Black Coral --- Antipathes spp.;
Gold Coral--- Callogorgia spp.;

Precious Red Coral--Corallium spp.;
Bamboo Coral--Keratoisis spp.; and
Gold Coral--Parazoanthus spp.

Crustacea

Tanner Crab--Chionoecetes tanneri;
Tanner Crab--Chionoecetes opilio;
Tanner Crab--Chionoecetes angulatus;
Tanner Crab--Chionoecetes bairdi;
King Crab--Paralithodes camtschatica;
King Crab--Paralithodes platypus;
King Crab--Paralithodes brevipes;
Lobster--Homarus americanus:
Dungeness Crab--Cancer magister;
California King Crab--Paralithodes californiensis;
California King Crab--Paralithodes rathbuni;
Golden King Crab--Lithodes aequispinus;
Northern Stone Crab--Lithodes maja;
Stone Crab--Menippe mercenaria; and
Deep-sea Red Crab--Geryon quinquedens.

Mollusks

Red Abalone--Haliotis rufescens;
Pink Abalone--Haliotis corrugata;
Japanese Abalone--Haliotis kamtschatkana;
Queen Conch--Strombus gigas;
Surf Clam--Spisula solidissima; and
Ocean Quahog--Artica islandica.

Sponges

Glove Sponge--Hippiospongia canaliculata;
Sheepswool Sponge--Hippiospongia lachne;
Grass Sponge--Spongia graminea; and
Yellow Sponge--Spongia barbera.

Publication in Federal Register.

If the Secretary determines, after consultation with the Secretary of State, that living organisms of any other sedentary species are, at the harvestable stage, either--

(A) immobile on or under the seabed, or

(B) unable to move except in constant physical contact with the seabed or subsoil,

of the Continental Shelf which appertains to the United States, and publishes notice of such determination in the Federal Register, such sedentary species shall be considered to be added to the foregoing list and included in such term for purposes of this Act.

(5) The term "Council" means any Regional Fishery Management Council established under section 302.

(6) The term "fish" means finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals, birds, and highly migratory species.

(7) The term "fishery" means--

(A) one or more stocks of fish which can be treated as a unit for purposes of conservation and management and which are identified on the basis of geographical, scientific, technical, recreational, and economic characteristics; and

(B) any fishing for such stocks.

(8) The Term "fishery conservation zone" means the fishery conservation zone established by section 101.

(9) The term "fishery resource" means any fishery, any stock of fish, any species of fish and any habitat of fish.

(10) The term "fishing" means--

(A) the catching, taking, or harvesting of fish;

(B) the attempted catching, taking, or harvesting of fish;

(C) any other activity which can reasonably be expected to result in the catching, taking, or harvesting of fish; or

(D) any operations at sea in support of, or in preparation for, any activity described in subparagraphs (A) through (C).

Such term does not include any scientific research activity which is conducted by a scientific research vessel.

(11) The term "fishing vessel" means any vessel, boat, ship, or other craft which is used for, equipped to be used for, or of a type which is normally used for--

(A) fishing; or

(B) aiding or assisting one or more vessels at sea in the performance of any activity relating to fishing, including, but not limited to, preparation, supply, storage, refrigeration, transportation, or processing.

(12) The term "foreign fishing" means fishing by a vessel other than a vessel of the United States.

(13) The term "high seas" means all waters beyond the territorial sea of the United States and beyond any foreign nation's territorial sea, to the extent that such sea is recognized by the United States.

(14) The term "highly migratory species" means species of tuna, which in the course of their life cycle, spawn and migrate over great distances in waters of the ocean.

(15) The term "international fishery agreement" means any bilateral or multilateral treaty, convention, or agreement which relates to fishing and to which the United States is a party.

(16) The term "Marine Fisheries Commission" means the Atlantic States Marine Fisheries Commission, the Gulf States Marine Fisheries Commission, or the Pacific Marine Fisheries Commission.

(17) The term "national standards" means the national standards for fishery conservation and management set forth in section 301.

(18) The term "optimum", with respect to the yield from a fishery, means the amount of fish--

(A) which will provide the greatest overall benefit to the Nation, with particular reference to food production and recreational opportunities; and

(B) which is prescribed as such on the basis of the maximum sustainable yield from such fishery, as modified by any relevant economic, social, or ecological factor.

(19) The term "person" means any individual (Whether or not a citizen or national of the United States), any corporation partnership, association, or other entity (whether or not organized or existing under the laws of any State), and any Federal, State, local, or foreign government or any entity of any such government.

(20) The term "Secretary" means the Secretary of Commerce or his designee.

(21) The term "State" means each of the several States, the District of Columbia, the Commonwealth of Puerto Rico, American Samoa, the Virgin Islands, Guam, and any other Commonwealth, territory, or possession of the United States.

(22) The term "stock of fish" means a species, subspecies, geographical grouping, or other category of fish capable of management as a unit.

(23) The term "treaty" means any international fishery agreement which is a treaty within the meaning of section 2 of article II of the Constitution.

USC prec. title 1.

(24) The term "United States", when used in a geographical context, means all the States thereof.

(25) The term "vessel of the United States" means any vessel documented under the laws of the United States or registered under the laws of any State.

TITLE I--FISHERY MANAGEMENT AUTHORITY OF THE UNITED STATES

16 USC 1811. SEC. 101. FISHERY CONSERVATION ZONE

There is established a zone contiguous to the territorial sea of the United States to be known as the fishery conservation zone. The inner boundary of the fishery conservation zone is a line coterminous with the seaward boundary of each of the coastal States, and the outer boundary of such zone is a line drawn in such a manner that each point on it is 200 nautical miles from the baseline from which the territorial sea is measured.

16 USC 1812. SEC. 102. EXCLUSIVE FISHERY MANAGEMENT AUTHORITY

The United States shall exercise exclusive fishery management authority, in the manner provided for in this Act, over the following:

(1) All fish within the fishery conservation zone.

(2) All anadromous species throughout the migratory range of each such species beyond the fishery conservation zone; except that such management authority shall not extend to such species during the time they are found within any foreign nation's territorial sea or fishery conservation zone (or the equivalent), to extent that such sea or zone is recognized by the United States.

(3) All Continental Shelf fishery resources beyond the fishery conservation zone.

16 USC 1813. SEC. 103. HIGHLY MIGRATORY SPECIES

The exclusive fishery management authority of the United States shall not include, nor shall it be construed to extend to, highly migratoary species of fish.

16 USC 1811 note. SEC. 104. EFFECTIVE DATE.

This title shall take effect March 1, 1977.

TITLE II--FOREIGN FISHING AND INTERNATIONAL FISHERY AGREEMENTS

16 USC 1821. Sec. 201. FOREIGN FISHING.

(a) In General.--After February 28, 1977, no foreign fishing is authorized within the fishery conservation zone, or for anadromous species or Continental Shelf fishery resources beyond the fishery conservation zone, unless such foreign fishing--

(1) is authorized under subsection (b) or (c);

(2) is not prohibited by subsection (f); and

(3) is conducted under, and in accordance with, a valid and applicable permit issued pursuant to section 204.

(b) Existing International Fishery Agreements.--Foreign fishing described in subsection (a) may be conducted pursuant to an international fishery agreement (subject to the provisions of section 202(b) or (c), if such agreement--

(1) was in effect on the date of enactment of this Act; and

(2) has not expired, been renegotiated, or otherwise ceased to be of force and effect with respect to the United States.

(c) Governing International Fishery Agreements.--Foreign Fishing described in subsection (a) may be conducted pursuant to an international fishery agreement (other than a treaty) which meets the requirements of this subsection if such agreement becomes effective after application of section 203. Any such international fishery agreement shall hereafter in this Act be referred to as a "governing international fishery agreement". Each governing international fishery agreement shall acknowledge the exclusive fishery management authority of the United States, as set forth in this Act. It is the sense of the Congress that each agreement shall incluse a binding commitment, on the part of such foreign nation and its fishing vessels, to comply with the following terms and conditions: Terms and conditions.

(1) The foreign nation, and the owner or operator of any fishing vessel fishing pursuant to such agreement, will abide by all regulations promulgated by the Secretary pursuant to this Act, including any regulations promulgated to implement any applicable fishery management plan or any preliminary fishery management plan.

(2) The foreign nation, and the owner or operator of any fishing fishing vessel fishing pursuant to such agreement, will abide by the requirement that--

(A) any officer authorized to enforce the provisions of this Act (as provided for in section 311) be permitted-- Post, p. 358.

(i) to board, and search or inspect, any such vessel at any time,

(ii) to make arrests and seizures provided for in section 311(b) whenever such officer has reasonable cause to believe, as a result of such a search or inspection, that any such vessel or any person has committed an act prohibited by section 307, and Post, p. 355.

(iii) to examine and make notations on the permit issued pursuant to section 204 for such vessel;

(B) the permit issued for any such vessel pursuant to section 204 be prominently displayed in the wheelhouse of such vessel;

(C) transponders, or such other appropriate position-fixing and identification equipment as the Secretary of the department in which the Coast Guard is operating determines to be appropriate, be installed and maintained in working order on each such vessel;

(D) duly authorized United States observers be permitted on board any such vessel and that the United States be reimbursed for the cost of such observers;

(E) any fees required under section 204(b)(10) be paid in advance;

(F) agents be appointed and maintained within the United States who are authorized to receive and respond to any legal process issued in the United States with respect to such owner or operator; and

(G) responsibility be assumed, in accordance with any requirements prescribed by the Secretary, for the reimbursement of United States citizens for any loss of, or damage to, their fishing vessels, fishing gear, or catch which is caused by any fishing vessel of that nation;

and will abide by any other monitoring, compliance, or enforcement requirement related to fishery conservation and management which is included in such agreement.

(3) The foreign nation and the owners or operators of all of the fishing vessels of such nation shall not, in any year, exceed such nation's allocation of the total allowable level of foreign fishing, as determined under subsection (e).

(4) The foreign nation will--

(A) apply, pursuant to section 204, for any required permits;

(B) deliver promptly to the owner or operator of the appropriate fishing vessel any permit which is issued under that section for such vessel; and

(C) abide by, and take appropriate steps under its own laws to assure that all such owners and operators comply with, section 204(a) and the applicable conditions and restrictions established under section 204(b) (7).

(d) **TOTAL ALLOWABLE LEVEL OF FOREIGN FISHING**.--The total allowable level of foreign fishing, if any, with respect to any fishery subject to the exclusive fishery management authority of the United States, shall be that portion of the optimum yield of such fishery which will not be harvested by vessels of the United States, as determined in accordance with the provisions of this Act.

(e) **ALLOCATION OF ALLOWABLE LEVEL** .--The Secretary of State, in cooperation with the Secretary, shall determine the allocation among

foreign nations of the total allowable level of foreign fishing which is permitted with respect to any fishery subject to the exclusive fishery management authority of the United States. In making any such determination, the Secretary of State and the Secretary shall consider--

(1) whether, and to what extent, the fishing vessels of such nations have traditionally engaged in fishing in such fishery;

(2) whether such nations have cooperated with the United States in, and made substantial contributions to, fishery research and the identification of fishery resources.

(3) whether such nations have cooperated with the United States in enforcement and with respect to the conservation and management of fishery resources; and

(4) such other matters as the Secretary of State, in cooperation with the Secretary, deems appropriate.

(f) RECIPROCITY.--Foreign fishing shall not be authorized for the fishing vessels of any foreign nation unless such nation satisfies the Secretary and the Secretary of State that such nation extends substantially the same fishing privileges to fishing vessels of the United States, if any, as the United States extends to foreign fishing vessels.

(g) PRELIMINARY FISHERY MANAGEMENT PLANS.--The Secretary, when notified by the Secretary of State that any foreign nation has submitted an application under section 204(b), shall prepare a preliminary fishery management plan for any fishery covered by such application if the Secretary determines that no fishery management plan for that fishery will be prepared and implemented, pursuant to title III, before March 1, 1977. To the extent practicable, each such plan--

Post, p. 346.

(1) shall contain a preliminary description of the fishery and a preliminary determination as to the optimum yield from such fishery and the total allowable level of foreign fishing with respect to such fishery;

(2) shall require each foreign fishing vessel engaged or wishing to obtain a permit from the Secretary;

(3) shall require the submission of pertinent data to the Secretary, with respect to such fishery, as described in section 303(a)(5); and

(4) may, to the extent necessary to prevent irreversible effects from overfishing, with respect to such fishery, contain conservation and management measures applicable to foreign fishing which--

(A) are determined to be necessary and appropriate for the conservation and management of such fishery,

(B) are consistent with the national standards, the other provisions of this Act, and other applicable law, and

(C) are described in section 303(b)(2), (3), (4), (5), and (7).

Each preliminary fishery management plan shall be in effect with respect to foreign fishing for which permits have been issued until a fishery management plan is prepared and implemented, pursuant to title III, with respect to such fishery. The Secretary may, in accordance with section 553 of title 5, United States Code, also prepare and promulgate interim regulations with respect to any such preliminary plan. Such regulations with respect to any such preliminary plan. Such regulations shall be in effect until regulations implementing the applicable fishery management plan are promulgated pursuant to section 305. Regulations

SEC. 202. INTERNATIONAL FISHERY AGREEMENTS. 16 USC 1822.

(a) NEGOTIATIONS.--The Secretary of State--

(1) shall renegotiate treaties as provided for in subsection (b);

(2) shall negotiate governing international fishery agreements described in section 201(c);

(3) may negotiate boundary agreements as provided for in subsection (d);

(4) shall, upon the request of and in cooperation with the Secretary, initiate and conduct negotiations for the purpose of entering into international fishery agreements--

(A) which allow fishing vessels of the United States equitable access to fish over which foreign nations assert exclusive fishery management authority, and

(B) which provide for the conservation and management of anadromous species and highly migratory species; and

(5) may enter into such other negotiations, not prohibited by subsection (c), as may be necessary and appropriate to further the purposes, policy, and provisions of this Act.

(b) TREATY RENEGOTIATION.--The Sectretary of State, in cooperation with the Secretary, shall initiate, promptly after the date of enactment of this Act, the renegotiation of any treaty withich pertains to fishing within the fishery conservation zone (or within the area that will constitute such zone after February 28, 1977), or for anadromous species or Continental Shelf fishery resources beyond such zone or area, and which is in any manner inconsistent with the purposes, policy, or provisions of this Act, in order to conform such treaty to such purposes, policy, and provisions. It is the sense of Congress that the United States shall withdraw from any such treaty, in accordance with its provisions, if such treaty is not so renegotiated within a reasonable period of time after such date of enactment.

(c) INTERNATIONAL FISHERY AGREEMENTS.--No international fishery agreement (other than a treaty) which pertains to foreign fishing within the fishery conservation zone (or within the area that will constitute such zone after February 28, 1977), or for anadromous species or Continental Shelf fishery resources beyond such zone or area--

(1) which is in effect on June 1, 1976, may thereafter be renewed, extended, or amended; or

(2) may be entered into after May 31, 1976;

by the United States unless it is in accordance with the provisions of Section 201(c).

(d) Boundary Negotiations.--The Secretary of State, in cooperation with the Secretary, may initiate and conduct negotiations with any adjacent or opposite foreign nation to establish the boundaries of the fishery conservation zone of the United States in relation to any such nation.

(e) Nonrecognition.--It is the sense of the Congress that the United States Government shall not recognize the claim of any foreign nation to a fishery conservation zone (or the equivalent) beyond such nation's territorial sea, to the extent that such sea is recognized by the United States, if such nation--

(1) fails to consider and take into account traditional fishing activity of fishing vessels of the United States;

(2) fails to recognize and accept that highly migratory species are to be managed by applicable international fishery agreements, whether or not such nation is a party to any such agreement; or

(3) imposes on fishing vessels of the United States any conditions or restrictions which are unrelated to fishery conservation and management.

16 USC 1823.

SEC. 203. CONGRESSIONAL OVERSIGHT OF GOVERNING INTERNATIONAL FISHERY AGREEMENTS.

Transmittal to Congress.

(a) In General.--No governing international fishery agreement shall become effective with respect to the United States before the close of the first 60 calendar days of continuous session of the Congress after the date on which the President transmits to the House of Representatives and to the Senate a document setting forth the text of such governing international fishery agreement. A copy of the document shall be delivered to the Clerk of the House of Representatives, if the House is not in session, and to the Secretary of the Senate, if the Senate is not in session.

(b) Referral to Committees.--Any document described in subsection (a) shall be immediately referred in the House of Representatives to the Committees on Commerce and Foreign Relations.

(c) Computation of 60-Day Period.--For purposes of subsection (a)--

(1) continuity of session is broken only by an adjournment of Congress sine die; and

(2) the days on which either House is not in session because of an adjournment of more than 3 days to a day certain are excluded in the computation of the 60-day period.

(d) Congressional Procedures.--

(1) Rules of the House of Representatives and Senate.--The provisions of this section are enacted by the Congress--

(A) as an exercise of the rulemaking power of the House of Representatives and the Senate, respectively, and they are deemed a part of the rules of each House, respectively, but applicable only with respect to the procedure to be followed in that House in the case of fishery agreement resolutions described in paragraph (2), and they supersede other rules only to the extent that they are inconsistent therewith; and

(B) with full recognition of the constitutional right of either House to change the rules (so far as they relate to the procedure of that House) at any time, and in the same

manner and to the same extent as in the case of any other rule of that House.

(2) Definition.--For purposes of this subsection, the term "fishery agreement resolution" refers to a joint resolution of either House of Congress--

(A) the effect of which is to prohibit the entering into force and effect of any governing international fishery agreement the text of which is transmitted to the Congress pursuant to subsection (a); and

(B) which is reported from the Committee on Merchant Marine and fisheries of the House of Representatives or the Committee on Commerce or the Committee on Foreign Relations of the Senate, not later than 45 days after the date on which the document described in subsection (a) relating to that agreement is transmitted to the Congress.

(3) Placement on Calendar.--Any fishery agreement resolution upon being reported shall immediately be placed on the appropriate calendar.

(4) Floor Consideration in the House.--

(A) A motion in the House of Representatives to proceed to the consideration of any fishery agreement resolution shall be highly privileged and not debatable. An amendment to the motion shall not be in order, nor shall it be in order to move to reconsider the vote by which the motion is agreed to or disagreed to.

(B) Debate in the House of Representatives on any fishery agreement resolution shall be limited to not more than 10 hours, which shall be divided equally between those favoring and those opposing the resolution. A motion further to limit debate shall not be debatable. It shall not be in order to move to recommit any fishery agreement resolution or to move to reconsider the vote by which any fishery agreement resolution is agreed to or disagreed to. Debate limitation.

(C) Motions to postpone, made in the House of Representatives with respect to the consideration of any fishery agreement resolution, and motions to proceed to the consideration of other business shall be decided without debate.

(D) All appeals from the decisions of the Chair relating to the application of the Rules of the House of Representatives to the procedure relating to any fishery agreement resolution shall be decided without debate.

(E) Except to the extent specifically provided in the preceding provisions of this subsection, consideration of any fishery agreement resolution shall be governed by the Rules of the House of Representatives applicable to other bills and resolutions in similar circumstances.

(5) Floor Consideration in the Senate--

(A) A motion in the Senate to proceed to the consideration of any fishery agreement resolution shall be privileged and not debatable. An amendment to the motion shall not be in order, nor shall it be in order to move to reconsider the vote by which the motion is agreed to or disagreed to.

(B) Debate in the Senate on any fishery agreement resolution and on all debatable motions and appeals in connection therewith shall be

limited to not more than 10 hours. The time shall be equally divided between, and controlled by, the majority leader and the minority leader or their designees.

(C) Debate in the Senate on any debatable motion or appeal in connection with any fishery agreement resolution shall be limited to not more than 1 hour, to be equally divided between, and controlled by, the mover of the motion or appeal and the manager of the resolution, except that if the manager of the resolution is in favor of any such motion or appeal, the time in opposition thereto shall be controlled by the minority leader or his designee. The majority leader and the minority leader, or either of them, may allot additional time to any Senator during the consideration of any debatable motion or appeal, from time under their control with respect to the applicable fishery agreement resolution.

(D) A motion in the Senate to further limit debate is not debatable. A motion to recommit any fishery agreement resolution is not in order.

16 USC 1824. SEC. 204. PERMITS FOR FOREIGN FISHING.

(a) In General.--After February 28, 1977, no foreign fishing vessel shall engage in fishing within the fishery conservation zone, or for anadromous species or Continental Shelf fishery resources beyond such zone, unless such vessel has on board a valid permit issued under this section for such vessel.

(b) Applications and Permits Under Governing International Fishery Agreements.--

(1) Eligibility.--Each foreign nation with which the United States has entered into a governing international fishery agreement shall submit an application to the Secretary of State each year for a permit for each of its fishing vessels that wishes to engage in fishing described in subsection (a).

(2) Forms.--The Secretary, in consultation with the Secretary of State and the Secretary of the department in which the Coast Guard is operating, shall prescribe the forms for permit applications submitted under this subsection and for permits issued pursuant to any such application.

(3) Contents.--Any application made under this subsection shall specify--

(A) the name and official number or other identification of each fishing vessel for which a permit is sought, together with the name and address of the owner thereof;

(B) the tonnage, capacity, speed, processing equipment, type and quantity of fishing gear, and such other pertinent information with respect to characteristics of each such vessel as the Secretary may require;

(C) each fishery in which each such vessel wishes to fish;

(D) the amount of fish or tonnage of catch contemplated for each such vessel during the time such permit is in force; and

(E) the ocean area in which, and the season or period during which, such fishing will be conducted;

and shall include any other pertinent information and material which the Secretary may require.

Publication in Federal Register.

(4) Transmittal for Action.--Upon receipt of any application which complies with the requirements of paragraph (3), the Secretary of State shall publish such application in the Federal Register and shall promptly transmit--

(A) such application, together with his comments and recommendations thereon, to the Secretary;

(B) a copy of the application to each appropriate Council and to the Secretary of the department in which the Coast Guard is operating; and

Transmittal to congressional committees.

(C) a copy of such material to the Committee on Merchant Marine and Fisheries of the House of Representatives and to the Committees on Commerce and Foreign Relations of the Senate.

Written comments.

(5) Action by Council.--After receipt of an application transmitted under paragraph (4)(B), each appropriate Council shall prepare and submit to the Secretary such written comments on the application as it deems appropriate. Such comments shall be submitted within 45 days after the date on which the application is received by the Council and may include recommendations with respect to approval of the application and, if approval is recommended, with respect to appropriate conditions and restrictions thereon. Any interested person may submit comments to such Council with respect to any such application. The Council shall consider any such comments in formulating its submission to the Secretary.

(6) Approval.--After receipt of any application transmitted under paragraph (4) (A), the Secretary shall consult with the Secretary of State and, with respect to enforcement, with the Secretary of the department in which the Coast Guard is operating. The Secretary, after taking into consideration the views and recommendations of such Secretaries, and any comments submitted by any Council under paragraph (5), may approve the application, if he determines that the fishing described in the application will meet the requirements of this Act.

(7) Establishment of Conditions and Restrictions.--The Secretary shall establish conditions and restrictions which shall be included in each permit issued pursuant to any application approved under paragraph (6) and which must be complied with by the owner or operator of the fishing vessel for which the permit is issued. Such conditions and restrictions shall include the following:

(A) All of the requirements of any applicable fishery management plan, or preliminary fishery management plan, and the regulations promulgated to implement any such plan.

(B) The requirement that no permit may be used by any vessel other than the fishing vessel for which it is issued.

(C) The requirements described in section 201(c) (1), (2), and (3).

(D) Any other condition and restriction related to fishery conservation and management which the Secretary prescribes as necessary and appropriate.

(8) Notice of Approval.--The Secretary shall promptly transmit a copy of each application approved under paragraph (6) and the conditions and restrictions established under paragraph (7) to--

(A) the Secretary of State for transmittal to the foreign nation involved;

(B) the Secretary of the department in which the Coast Guard is operating;

(C) any Council which has authority over any fishery specified in such application; and

Transmittal to congressional committees.

(D) the Committee on Merchant Marine and Fisheries of the House of Representatives and the Committees on Commerce and Foreign Relations of the Senate

(9) Disapproval of Applications.--If the Secretary does not approve any application submitted by a foreign nation under this subsection, he shall promptly inform the Secretary of State of the disapproval and his reasons therefore. The Secretary of State shall notify such foreign nation of the disapproval and the reasons therefor. Such foreign nation, after taking into consideration the reasons for disapproval, may submit a revised application under this subsection.

(10) Fees.--Reasonable fees shall be paid to the Secretary by the owner or operator of any foreign fishing vessel for which a permit is issued pursuant to this subsection. The Secretary, in consultation with the Secretary of State, shall establish and publish a schedule of such fees, which shall apply nondiscriminatorily to each foreign nation. In determining the level of such fees, the Secretary may take into account the cost of carrying out the provisions of this Act with respect to foreign fishing, including, but not limited to, the cost of fishery conservation and management, fisheries research, administration, and enforcement.

(11) Issuance of Permits.--If a foreign nation notifies the Secretary of State of its acceptance of the conditions and restrictions established by the Secretary under paragraph (7), the Secretary of State shall promptly transmit such notification to the Secretary. Upon payment of the applicable fees established pursuant to paragraph (10), the Secretary shall thereupon issue to such foreign nation, through the Secretary of State, permits for the appropriate fishing vessels of that Nation. Each permit shall contain a statement of all conditions and restrictions established under paragraph (7) which apply to the fishing vessel for which the permit is issued.

(12) Sanctions.--If any foreign vessel for which a permit has been issued pursuant to this subsection has been used in the commission of any act prohibited by section 307 the Secretary may, or if any civil penalty imposed under section 308 or any criminal fine imposed under section 309 has not been paid and is overdue the Secretary shall--

(A) revoke such permit, with or without prejudice to the right of the foreign nation involved to obtain a permit for such vessel in any subsequent year;

(B) suspend such permit for the period of time deemed appropriate; or

(C) impose additional conditions and restrictions on the approved application of the foreign nation involved and on any permit issued under such application.

Any permit which is suspended under this paragraph for nonpayment of a civil penalty shall be reinstated by the Secretary upon the payment of such civil penalty together with interest thereon at the prevailing rate.

(c) Registration Permits.--The Secretary of State, in cooperation with the Secretary, shall issue annually a registration permit for each fishing vessel of a foreign nation which is a party to an international fishery agreement under which foreign fishing is authorized by section 201(b) and which wishes to engage in fishing described in subsection (a). Each such permit shall set forth the terms and conditions contained in the agreement that apply with respect to such fishing, and shall include the additional requirement that the owner or operator of the fishing vessel for which the permit is issued shall prominently display such permit in the wheelhouse of such vessel and show it, upon request, to any officer authorized to enforce the provisions of this Act (as provided for in section 311). The secretary of State, after consultation with the Secretary and the Secretary of the department in which applications for registration permits may be made, and the forms of such permits. The Secretary of State may establish, require the payment of, and collect fees for registration permits; except that the level of such fees shall not exceed the administration costs incurred by him in issuing such permits.

SEC. 025. IMPORT PROHIBITIONS. 16 USC 1825.

(a) Determinations by Secretary of State.--If the Secretary of State determines that--

(1) he has been unable, within a reasonable period of time, to conclude with any foreign nation an international fishery agreement allowing fishing vessels of the United States equitable access to fisheries over which that nation asserts exclusive fishery management authority, as recognized by the United States, in accordance with traditional fishing activities of such vessels, if any, and under terms not more restrictive than those established under nation has (A) refused to commence negotiations, or (B) failed to negotiate in good faith;

(2) any foreign nation is not allowing fishing vessels of the United States to engage in fishing for migratory species in accordance with an applicable international fishery agreement, whether or not such nation is a party thereto;

(3) any foreign nation is not complying with its obligations under any existing international fishery agreement concerning fishing by fishing vessels of the United States in any fishery

over which that nation asserts exclusive management authority; or

(4) any fishing vessel of the United States, while fishing in waters beyond any foreign nation's territorial sea, to the extent that such sea is recognized by the United States, is seized by any foreign nation--

(A) in violation of an applicable international fishery agreement;

(B) without authorization under an agreement between the United States and such nation; or

(C) as a consequence of a claim of jurisdiction which is not recognized by the United States;

he shall certify such determination to the Secretary of the Treasury.

(b) Prohibitions.--Upon receipt of any certification from the Secretary of State under subsection (a), the Secretary of the Treasury shall immediately take such action as may be necessary and appropriate to prohibit the importation into the United States--

(1) of all fish and fish products from the fishery involved, if any; and

(2) upon recommendation of the Secretary of State, such other fish or fish products, from any fishery of the foreign nation concerned, which the Secretary of State finds to be appropriate to carry out the purposes of this section.

(c) Removal of Prohibition.--If the Secretary of State finds that the reasons for the imposition of any import prohibition under this section no longer prevail, the Secretary of State shall notify the Secretary of the Treasury, who shall promptly remove such import prohibition.

(d) Definitions.--As used in this section--

(1) The term "fish" includes any highly migratory species.

(2) The term "fish products" means any article which is produced from or composed of (in whole or in part) any fish.

TITLE III--NATIONAL FISHERY MANAGEMENT PROGRAM

16 USC 1851.

SEC. 301. NATIONAL STANDARDS FOR FISHERY CONSERVATION AND MANAGEMENT

(a) In General.--Any fishery management plan prepared, and any regulation promulgated to implement any such plan, pursuant to this title shall be consistent with the following national standards for fishery conservation and management;

(1) Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery.

(2) Conservation and management measures shall be based upon the best scientific information available.

(3) To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

(4) Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

(5) Conservation and management measures shall, where practicable, promote efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

(6) Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

(7) Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

(b) Guidelines.--The Secretary shall establish guidelines, based on the national standards, to assist in the development of fishery management plans.

SEC. 302. REGIONAL FISHERY MANAGEMENT COUNCILS.

16 USC 1852. Establishment

(a) Establishment.--There shall be established, within 120 days after the date of the enactment of this Act, eight Regional Fishery Management Councils, as follows:

(1) New England Council.--The New England Fishery Management Council shall consist of the State of Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut and shall have authority over the fisheries in the Atlantic Ocean seaward of such States. The New England Council shall have 17 voting members, including 11 appointed by the Secretary pursuant to subsection (b) (1) (C) (At least one of whom shall be appointed from each such State).

(2) Mid-Atlantic Council.--The Mid-Atlantic Fishery Management Council shall consist of the States of New York, New Jersey, Delaware, Pennsylvania, Maryland, and Virginia and shall have authority over the fisheries in the Atlantic Ocean seaward of such States. The Mid-Atlantic Council shall have 19 voting members, including 12 appointed by the Secretary pursuant to subsection (b) (1) (C) (at least one of whom shall be appointed from each such State).

(3) South Atlantic Council.--The South Atlantic Fishery Management Council shall consist of the States of North Carolina, South Carolina, Georgia, and Florida and shall have authority over the fisheries in the Atlantic Ocean seaward of such States. The South Atlantic Council shall have 13 voting members, including 8 appointed by the Secretary pursuant to subsection (b) (1)

(at least one of whom whall be appointed from each such State.)

(5) Gulf Council.--The Gulf of Mexico Fishery Management Council shall consist of the States of Texas, Louisiana, Mississippi, Alabama, and Florida and shall have authority over the fisheries in the Gulf of Mexico seaward of such States. The Gulf Council shall have 17 voting members, including 11 appointed by the Secretary pursuant to subsection (b) (1) (C) (at least one of whom shall be appointed from each such State).

(6) Pacific Council.--The Pacific Fishery Management Council shall consist of the States of California, Oregon, Washington, and Idaho and shall have authority over the fisheries in the Pacific Ocean seaward of such States. The Pacific Council shall have 13 voting members, including 8 appointed by the Secretary pursuant to subsection (b) (1) (C) (at least one of whom shall be appointed from each such State).

(7) North Pacific Council.--The North Pacific Fishery Management Council shall consist of the States of Alaska, Washington, and Oregon and shall have authority over the fisheries in the Arctic Ocean, Bering Sea, and Pacific Ocean seaward of Alaska. The North Pacific Council shall have 11 voting members, including 7 appointed by the Secretary pursuant to subsection (b) (1) (C) (5 of whom shall be appointed from the State of Alaska and 2 of whom shall be appointed from the State of Washington).

(8) Western Pacific Council.--The Western Pacific Fishery Management Council shall consist of the State of Hawaii, American Samoa, and Guam and shall have authority over the fisheries in the Pacific Ocean seaward of such States. The Western Pacific Council shall have 11 voting members, including 7 appointed by the Secretary pursuant to subsection (b) (1) (C) (at least one of whom shall be appointed from each such State).

Each Council shall reflect the expertise and interest of the several constituent States inthe ocean area over which such Council is granted authority.

(b) Voting Members.--(1) The voting members of each Council shall be:

(A) The principal State official with marine fishery management responsibility and expertise in each constituent State, who is designated as such by the Governor of the State, so long as the official continues to hold such position, or the designee of such official.

(B) The regional director of the National Marine Fisheries Service for the geographic area concerned, or his designee, except that if two such directors are within such geographical area, the Secretary shall designate which of such directors shall be the voting member.

(C) The members required to be appointed by the Secretary shall be appointed by the Secretary from a list of qualified individuals submitted by the Governor of each applicable

constituent State. With respect to the initial such appointments, such Governors hall submit such lists to the Secretary as soon as practicable, not later than 45 days after the date of the enactment of this Act. As used in this subparagraph, (i) the term "list of qualified individuals" shall include the names (including pertinent biographical data) of not less than three such individuals for each applicable vacancy, and (ii) the term "qualified individual" means an individual who is knowledgeable or experience with regard to the management, conservation, or recreational or commercial harvest, of the fishery resources of the geographical area concerned.

"List of qualified individuals."

"Qualified individual."

(2) Each voting member appointed to a Council pursuant to paragraph (1) (C) shall serve for a term of 3 years; except that, with respect to the members initially so appointed, the Secretary shall designate up to one-third thereof to serve for a term of 1 year, up to one-third thereof to serve for a term of 1 year, up to one-third thereof to serve for a term of 2 years, and the remaining such members to serve for a term of 3 years.

Term.

(3) Successors to the voting members of any Council shall be appointed in same manner as the original voting members. Any individual appointed to fill a vacancy occurring prior to the expiration of any term of office shall be appointed for the remainder of that term.

(c) Nonvoting Members.--(1) The nonvoting members of each Council shall be:

(A) The regional or area director of the United States Fish and Wildlife Service for the geographical area concerned, or his designee.

(B) The commander of the Coast Guard district for the geographical area concerned, or his designee; except that, if two Coast Guard districts are within such geographical area, the commander designated for such purpose by the commandant of the Coast Guard.

(C) The executive director of the Marine Fisheries Commission for the geographical area concerned, if any, or his designee.

(D) One representative of the Department of State designated for such purpose by the Secretary of State, or his designee.

(2) The Pacific Council shall have one additional nonvoting member who shall be appointed by, and serve at the pleasure of, the Governor of Alaska.

(d) Compensation and Expenses.--The voting members of each Council, who are not employed by the Federal Government or any State or local government, shall receive compensation at the daily rate for GS-18 of the General Schedule when engaged in the actual performance of duties for such Council. The voting members of each Council, any nonvoting member described in subsection (c) (1) (C), and the nonvoting member appointed pursuant to subsection (c) (2) shall be reimbursed for actual expenses incurred in the performance of such duties.

5 USC 5332 note.

(e) Transaction of Business.--

(1) A majority of the voting members of any Council shall consititue a quorum, but one or more such members designated by the Council may hold hearings. All decisions of any Council shall be by majority vote of the voting members present and voting.

(2) The voting members of each Council shall select a Chairman for such Council from among the voting members.

(3) Each Council shall meet in the geographical area concerned at the call of the Chairman or upon the request of a majority of its voting members.

(4) If any voting member of a Council disagrees with repect to any matter which is transmitted to the Secretary setting forth the reasons for such disagreement.

(f) Staff and Administration.--

(1) Each Council may appoint, and assign duties to, an executive director and such other full- and part-time administrative employees as the Secretary determines are necessary to the performance of its functions.

(2) Upon the request of any Council, and after consultation with the Secretary, the head of any Federal agency is authorized to detail to such Council, on a reimbursable basis, any of the personnel of such agency, to assist such Council in the performmance of its functions under this Act.

(3) The Secretary shall provide to each Council such administrative and technical support services as are necessary for the effective functioning of such Council.

(4) The Administrator of General Servicess shall furnish each Council with such offices, equipment, supplies, and services as he is authorized to furnish to any other agency or instrumentality of the United States.

(5) The Secretary and the Secretary of State shall furnish each Council with relevant information concerning foreign fishing and international fishery agreements.

(6) Each Council shall determine its organization, and prescribe its practices and procedures for carrying out its functions under this Act, in accordance with such uniform standards as are prescribed by the Secretary. Each Council shall publish and make available to the public a statement of its organization, practices, and procedures.

(7) The Secretary shall pay--

(A) the compensation and expenses provided for in subsection (d);

(B) appropriate compensation to employees appointed under paragraph (1);

(C) the amounts required for reimbursement of other Federal agencies under paragraphs (2) and (4);

(D) the actual expenses of the members of the committees and panels established under subsection (g); and

(E) such other costs as the Secretary determines are necessary to the performance of the functions of the Councils.

(g) Committees and Panels--

(1) Each Council shall establish and maintain, appoint the members of, a scientific and statistical committee to assist it in the development, collection, and evaluation of such statistical, biological, economic, social, and other scientific information as is relevant to such Council's development and amendment of any fishery management plan.

(2) Each Council shall establish such other advisory panels as are necessary or appropriate to assist it in carrying out its functions under this Act.

(h) Functions.--Each Council shall, in accordance with the provisions of this Act--

(1) prepare and submit to the Secretary a fishery management plan with respect to each fishery within its geographical area of authority and, from time to time, such amendments to each such plan as are necessary; Fishery management plan.

(2) prepare comments on any application for foreign fishing transmitted to it under section 204(b) (4) (B), and any fishery management plan or amendment transmitted to it under section 304(c) (2); Comments

(3) conduct public hearings, at appropriate times and in appropriate locations in the geographical area concerned, so as to allow all interested persons an opportunity to be heard in the development of fishery management plans and amendments to such plans, and with respect to the administration and implementation of the provisions of this Act; Public hearings.

(4) submit to the Secretary Reports.

(A) a report, before February 1 of each year, on the Council's activities during the immediately preceding calendar year,

(B) such periodic reports as the Council deems appropriate, and

(C) any other relevant report which may be requested by the Secretary;

(5) review on a continuing basis, and revise as appropriate, the assessments and specifications made pursuant to section 303(a) (3) and (4) with respect to the optimum yield from, and the total allowable level of foreign fishing in, each fishery within its geographical area of authority; and Review.

(6) conduct any other activities which are required by, or provided for in, this Act or which are necessary and appropriate to the foregoing functions.

SEC. 303. CONTENTS OF FISHERY MANAGEMENT PLANS. 16 USC 1853.

(a) Required Provisions.--Any fishery management plan which is prepared by any Council, or by the Secretary, with respect to any fishery, shall--

(1) contain the conservation and management measures, applicable to foreign fishing and fishing by vessels of the United States, which are--

(A) necessary and appropriate for the conservation and management of the fishery;

(B) described in this subsection or subsection (b), or both; and

(C) consistent with the national standards, the other provisions of this Act, and any other applicable law;

(2) contain a description of the fishery, including, but not limited to, the number of vessels involved, the type and quantity of fishing gear used, the species of fish involved and their location, the cost likely to be incurred in management, actual and potential revenues from the fishery, and recreational interests in the fishery, and the nature and extent of foreign fishing and Indian treaty fishing rights, if any;

(3) assess and specify the present and probable future condition of, and the maximum sustainable yield and optimum yield from, the fishery, and include a summary of the information utilized in making such specification;

(4) assess and specify--

(A) the capacity and the extent to which fishing vessels of the United States, on an annual basis, will harvest the optimum yield specified under paragraph (3), and

(B) the portion of such optimum yield which, on an annual basis, will not be harvested by fishing vessels of the United States and can be made available for foreign fishing; and

(5) specify the pertinent data which shall be submitted to the Secretary with respect to the fishery, including, but not limited to, information regarding the type and quantity of fishing gear used, catch by species in numbers of fish or weight thereof, areas in which fishing was engaged in, time of fishing, and number of hauls.

(b) Discretionary Provisions.--Any fishery management plan which is prepared by any Council, or by the Secretary, with respect to any fishery, may--

(1) require a permit to be obtained from, and fees to be paid to, the Secretary with respect to any fishing vessel of the United States fishing, or wishing to fish, in the fishery conservation zone, or for anadromous species or Continental Shelf fishery resources beyond such zone;

(2) designate zones where, and periods when, fishing shall be limited, or shall not be permitted, or shall be permitted only by specified types of fishing vessels or with specified types and quantities of fishing gear;

(3) establish specified limitations on the catch of fish (based on area, species, size, number, weight, sex, incidental catch, total biomass, or other factors), which are necessary and appropriate for the conservation and management of the fishery;

(4) prohibit, limit, condition, or require the use of specified types and quantities of fishing gear, fishing vessels, or equipment for such vessels, including devices which may be required to facilitate enforcement of the provisions of this Act;

(5) incorporate (consistent with the national standards, the other provisions of this Act, and any other applicable law) the relevant fishery conservation and management measures of the coastal States nearest to the fishery;

(6) establish a system for limiting access to the fishery in order to achieve optimum yield if, in developing such system, the Council and the Secretary take into account--

(A) present participation in the fishery,

(B) historical fishing practices in, and dependence on, the fishery,

(C) the economics of the fishery,

(D) the capability of fishing vessels used in the fishery to engage in other fisheries,

(E) the cultural and social framework relevant to the fishery, amd

(F) any other relevant considerations; and

(7) prescribe such other measures, requirements, or conditions and and restrictions as are determined to be necessary and appropriate for the conservation and management of the fishery.

(c) Proposed Regulations.--Any Council may prepare any proposed regulations which it deems necessary and appropriate to carry out any fishery management plan, or any amendment to any fishery management plan, which is prepared by it. Such proposed regulations shall be submitted to the Secretary, together with such plan or amendment, for action by the Secretary pursuant to sections 304 and 305.

(d) Confidentiality of Statistics.--Any statistics submitted to the Secretary by any person in compliance with any requirement under subsection (a) (5) shall be confidential and shall not be disclosed except when required under court order. The Secretary shall, by regulation, prescribe such procedures as may be necessary to preserve such confidentiality, except that the Secretary may release or make public any such statistics in any aggregate or summary form which does not directly or indirectly disclose the identity or business of any person who submits such statistics.

SEC. 304. ACTION BY THE SECRETARY. 16 USC 1854.

(a) Action By The Secretary After Receipt Of Plan.--Within 60 days after the Secretary receives any fishery management plan, or any amendment to any such plan, which is prepared by any Council, the Secretary shall--

(1) review such plan or amendment pursuant to subsection (b); and

(2) notify such Council in writing of his approval, disapproval, or or partial disapproval of such plan or amendment.

In the case of disapproval or partial disapproval, the Secretary shall include in such notification a statement and explanation of the Secretary's objections and the reasons therefor, suggestions for improvement, a request to such Council to change such plan or amendment to satisfy the objections, and a request to resubmit the plan or amendment, as so modified, to the Secretary within 45 days after the date on which the Council receives such notification.

(b) Review By The Secretary.-- The Secretary shall review any fishery fishery management plan, and any amendment to any such plan, prepared by any Council and submitted to him to determine whether it is consistent with the national standards, the other provisions of this Act, and any other applicable law. In carrying out such review, the Secretary shall consult with--

(1) the Secretary of State with respect to foreigh fishing; and
(2) the Secretary of the department in which the Coast Guard is operating with respect to enforcement at sea.

(c) Preparation By The Secretary.--(1) The Secretary may prepare a fishery management plan, with respect to any fishery, or any amendment to any such plan, in accordance with the national standards, the other provisions of this Act, any any other applicable law, if--

(A) the appropriate Council fails to develop and submit to the Secretary, after a reasonable period of time, a fishery management plan for such fishery, or any necessary amendment to such a plan, if such fishery requires conservation and management; or

(B) the Secretary disapproves or partially disapproves any such plan or amendment, and the Council involved fails to change such plan or amendment in accordance with the notification made under subsection (a) (2).

In preparing any such plan or amendment, the Secretary shall consult with the Secretary of State with respect to foreign fishing and with the Secretary of the department in which the Coast Guard is operating with respect to enforcement at sea.

(2) Whenever, pursuant to paragraph (1), the Secretary prepares a fishery management plan or amendment, the Secretary shall promptly transmit such plan or amendment to the appropriate Council for consideration and comment. Within 45 days after the date of receipt of such plan or amendment, the appropriate Council may recommend, to the Secretary, changes in such plan or amendment, consistent with the national standards, the other provisions of this Act, and any other applicable law. After the expiration of such 45-day period, the Secretary may implement such plan or amendment pursuant to section 305.

(3) Notwithstanding paragraph (1), the Secretary may not include in any fishery management plan, or any amendment to any such plan, prepared by him, a provision establishing a limited access system described in section 303 (b) (6), unless such system is first approved by a majority of the voting members, present and voting, of each appropriate Council.

(d) Establishment Of Fees.--The Secretary shall by regulation establish the level of any fees which are authorized to be charged pursuant to section 303(b) (1). Such level shall not exceed the administrative costs incurred by the Secretary in issuing such permits. Regulations

(e) Fisheries Research.--The Secretary shall initiate and maintain a comprehensive program of fishery research to carry out and further the purposes, policy, and provisions of this Act. Such program shall be designed to acquire knowledge and information, including statistics on fishery conservation and management, including, but not limited to, biological research concerning the interdependence of fisheries or stocks of fish, the impact of pollution on fish, the impact of wetland and estuarine degradation, and other matters bearing upon the abundance and availability of fish.

(f) Miscellaneous Duties.--(1) If any fishery extends beyond the geographical area of authority of any one Council, the Secretary may--

(A) designate which Council shall prepare the fishery management plan for such fishery and any amendment to such plan; or

(B) may require that the plan and amendment be prepared jointly by the Councils concerned.

No jointly prepared plan or amendment may be submitted to the Secretary unless it is approved by a majority of the voting members, present and voting, of each Council concerned.

(2) The Secretary shall establish the boundaries between the geographical areas of authority of adjacent Councils.

SEC. 305. IMPLEMENTATION OF FISHERY MANAGEMENT PLANS. 16 USC 1855.

(a) In General.--As soon as practicable after the Secretary-- Publication in Federal Register.

(1) approves, pursuant to section 304 (a) and (b), any fishery management plan or amendment; or

(2) prepares, pursuant to section 304 (c), any fishery management plan or amendment;

the Secretary shall publish in the Federal Register (A) such plan or amendment, and (B) any regulations which he proposes to promulgate to implement such plan or amendment. Interested persons shall be afforded a period of not less than 45 days after such publication within which to submit in writing data, views, or comments on the plan or amendment, and on the proposed regulations. Written Comments.

(b) Hearing.--The Secretary may schedule a hearing, in accordance with section 553 of title 5, United States Code, on any fishery management plan, any amendment to any such plan, and any regulations to implement any such plan or amendment. If any such hearing is scheduled, the Secretary may, pending its coutcome--

(A) postpone the effective date of the regulations proposed to implement such plan or amendment; or

(B) take such other action as he deems appropriate to preserve the rights or status of any person.

(c) Implementation.--The Secretary shall promulgate regulations to implement any fishery management plan or any amendment to any such plan-- Regulations.

(1) after consideration of all relevant matters--

(A) presented to him during the 45-day period referred to in subsection (a), and

(B) produced in any hearing held under subsection (b); and

(2) if he finds that the plan or amendment is consistent with the national standards, the other provisions of this Act, and any other applicable law.

To the extent practicable, such regulations shall be put into effect in a manner which does not disrupt the regular fishing season for any fishery.

(d) Judicial Review.--Regulations promulgated by the Secretary under this Act shall be subject to judicial review to the extent authorized by, and in accordance with, chapter 7 of title 5, United States Code, if a petition for such review is filed within 30 days after the date on which the regulations are promulgated; except that (1) section 705 of such title is not applicable, and (2) the appropriate court shall only set aside any such regulation on a ground specified in section 706(2) (A), (B), (C), or (D) of such title. 5 USC 701 et seq.

(e) Emergency Actions.--If the Secretary finds that an emergency involving any fishery resources exists, he may-- Emergency

(1) promulgate emergency regulations, without regard to subsections (a) and (c), to implement any fishery management plan, if such emergency so requires; or

(2) promulgate emergency regulations to amend any regulation which implements any existing fishery management plan, to the extent required by such emergency.

Any emergency regulation which changes any existing fishery management plan shall be treated as an amendment to such plan for the period in which such regulation is in effect. Any emergency regulation promulgated under this subsection (A) shall be published in the Federal Register together with the reasons therefor; (B) shall remain in effect for not more than 45 days after the date of such publication, except that any such regulation may be repromulgated for one additional period of not more than 45 days; and (C) may be terminated by the Secretary at any earlier date by publication in the Federal Register of a notice of termination. Publication in Federal Register.

(f) Annual Report.--The Secretary shall report to the Congress and the President, not later than March 1 of each year on all activities of the Councils and the Secretary with respect to fishery management plans, regulations to implement such plans and all other activities relating to the conservation and management of fishery resources that were undertaken under this Act during the preceding calendar year. Report to Congress and President.

(g) Responsibility Of The Secretary.--The Secretary shall have general responsibility to carry out any fishery management plan or amendment approved or prepared by him, in accordance with the provisions of this Act. The Secretary may promulgate such regulations, in accordwith section 553 of title 5, United States Code, as may be necessary to discharge such responsibility or to carry out any other provision of this Act. Regulations

SEC. 306. STATE JURISDICTION. 16 USC 1856.

(a) In General.--Except as provided in subsection (b), nothing in

this Act shall be construed as extending or diminishing the jurisdiction or authority of any State within its boundaries. No State may directly or indirectly regulate any fishing which is engaged in by any fishing vessel outside its boundaries, unless such vessel is registered under the laws of such State.

(b) Exception.--(1) If the Secretary finds, after notice and an opportunity for a hearing in accordance with section 554 of title 5, United States Code, that-- Notice, hearing.

(A) the fishing in a fishery, which is covered by a fishery management plan implemented under this Act, is engaged in predominately within the fishery conservation zone and beyond such zone; and

(B) any State has taken any action, or omitted to take any action, the results of which will substantially and adversely affect the carrying out of such fishery management plan;

the Secretary shall promptly notify such State and the appropriate Council of such finding and of his intention to regulate the applicable fishery within the boundaries of such State (other than its internal waters), pursuant to such fishery management plan and the regulations promulgated to implement such plan.

(2) If the Secretary, pursuant to this subsection, assumes responsibility for the regulation of any fishery, the State involved may at any time thereafter apply to the Secretary for reinstatement of its authority over such fishery. If the Secretary finds that the reasons for which he assumed such regulation no longer prevail, he shall promptly terminate such regulation.

SEC. 307. PROHIBITED ACTS. 16 USC 1857.

It is unlawful--

(1) for any person--

(A) to violate any provision of this Act or any regulation or permit issued pursuant to this Act;

(B) to use any fishing vessel to engage in fishing after the revocation, or during the period of suspension, of an applicable permit issued pursuant to this Act;

(C) to violate any provision of, or regulation under, an applicable governing international fishery agreement entered into pursuant to section 201 (c);

(D) to refuse to permit any officer authorized to enforce the provisions of this Act (as provided for in section 311) to board a fishing vessel subject to such person's control for purposes of conducting any search or inspection in connection with the enforcement of this Act or any regulation, permit, or agreement referred to in subparagraph (A) or (C);

(E) to forcibly assault, resist, oppose, impede, intimidate, or interfere with any such authorized officer in the conduct of any search or inspection described in subparagraph (D);

(F) to resist a lawful arrest for any act prohibited by this section;

(G) to ship, transport, offer for sale, sell, purchase, import, export, or have custody, control, or possession of, any fish taken or retained in violation of this Act or any regulation, permit or agreement referred to in subparagraph (A) or (C); or

(H) to interfere with, delay, or prevent, by any means, the apprehension or arrest of another person, knowing that such other person has committed any act prohibited by this section; and

(2) for any vessel other than a vessel of the United States, and for the owner or operator of any vessel other than a vessel of the United States, to engage in fishing--

(A) within the boundaries of any State; or

(B) within the fishery conservation zone, or for any anadromous species or Continental Shelf fishery resource beyond such zone, unless such fishing is authorized by and conducted in accordance with, a valid and applicable permit issued pursuant to section 204 (b) or (c).

16 USC 1858. SEC. 308. CIVIL PENALTIES

(a) Assessment Of Penalty.--Any person who is found by the Secretary, after notice and an opportunity for a hearing in accordance with section 554 of title 5, United States Code, to have committed an act prohibited by section 307 shall be liable to the United States for a civil penalty. The amount of the civil penalty shall not exceed $25,000 for each violation. Each day of a continuing violation shall constitute a separate offense. The amount of such civil penalty shall be assessed by the Secretary, or his designee, by written notice. In determining the amount of such penalty, the Secretary shall take into account the nature, circumstances, extent, and gravity of the prohibited acts committed and, with respect to the violator, the degree of culpability, any history of prior offenses, ability to pay, and such other matters as justice may require.

(b) Review Of Civil Penalty.--Any person against whom a civil penalty is assessed under subsection (a) may obtain review thereof in the appropriate court of the United States by filing a notice of appeal in such court within 30 days from the date of such order and by simultaneously sending a copy of such notice by certified mail to the Secretary. The Secretary shall promptly file in such court a certified copy of the record upon which such violation was found or such penalty imposed, as provided in section 2112 of title 28, United States Code. The findings and order of the Secretary shall be set aside by such court if they are not found to be supported by substantial evidence, as provided in section 706 (2) of title 5, United States Code.

(c) Action Upon Failure To Pay Assessment.--If any person fails to pay an assessment of a civil penalty after it has become a final and unappealable order, or after the appropriate court has entered final

judgement in favor of the Secretary, the Secretary shall refer the matter to the Attorney of the United States, who shall recover the amount assessed in any appropriate district court of the United States. In such action, the validity and appropriateness of the final order imposing the civil penalty shall not be subject to review.

(d) Compromise Or Other Action By Secretary.--The Secretary may compromise, modify, or remit, with or without conditions, any civil penalty which is subject to imposition or which has been imposed under this section.

SEC. 309. CRIMINAL OFFENSES. 16 USC 1859.

(a) Offenses.--A person is guilty of an offense if he commits any act prohibited by--

(1) section 307 (1) (D), (E), or (H); or
(2) section 307 (2).

(b) Punishment.--Any offense described in subsection (a)(1) is punishable by a fine of not more than $50,000, or imprisonment for not more than 6 months, or both; except that if in the commission of any such offense the person uses a dangerous weapon, engages in conduct that causes bodily injury to any officer authorized to enforce the provisions of this Act (as provided for in section 311), or places any such officer in fear of imminent bodily injury, the offense is punishable by a fine of not more than $100,000, or imprisonment for not more than 10 years, or both. Any offense described in subsection (a) (2) is punishable by a fine of not more than $100,000, or imprisonment for not more than 1 year, or both.

(c) Jurisdiction.--There is Federal jurisdiction over any offense described in this section.

SEC. 310. CIVIL FORFEITURES. 16 USC 1860.

(a) In General.--Any fishing vessel (including its fishing gear, furniture, appurtenances, stores, and cargo) used, and any fish taken or retained, in any manner, in connection with or as a result of the commission of any act prohibited by section 307 (other than any act for which the issuance of a citation under section 311 (c) is sufficient santion) shall be subject to forfeiture to the United States. All or part of such vessel may, and all such fish shall, be forfeited to the United States pursuant to a civil proceeding under this section.

(b) Jurisdiction Of Courts.--Any district court of the United States which has jurisdiction under section 311 (d) shall have jurisdiction, upon application by the Attorney General on behalf of the United States, to order any forfeiture authorized under subsection (a) and any action provided for under subsection (d).

(c) Judgement.--If a judgment is entered for the United States in a civil forfeiture proceeding under this section, the Attorney General may seize any property or other interest declared forfeited to the

United States, which has not previously been seized pursuant to this Act or for which security has not previously been obtained under subsection (d). The provisions of the customs laws relating to--

(1) the disposition of forfeited property,
(2) the proceeds from the sale of forfeited property,
(3) the remission or mitigation of forfeitures, and
(4) the compromise of claims,

shall apply to any forfeiture order, and to any case in which forfeiture is alleged to be authorized, under this section, unless such provisions are inconsistent with the purposes, policy, and provisions of this Act. The duties and powers imposed upon the Commissioner of Customs or other persons under such provisions shall, with respect to this Act, be performed by officers or other persons designated for such purpose by the Secretary.

(d) Procedure.--(1) Any officer authorized to serve any process in rem which is issued by a court having jurisdiction under section 311 (d) shall--

(A) stay the execution of such process; or
(B) discharge any fish seized pursuant to such process;

unpon the receipt of a satisfactory bond or other security from any person claiming such property. Such bond or other security shall be conditioned upon such person (i) delivering such property to the appropriate court upon order thereof, without any impairment of its value, or (ii) paying the monetary value of such property pursuant to an order of such court. Judgment shall be recoverable on such bond or other security against both the principal and any sureties in the event that any condition thereof is breached, as determined by such court.

(2) Any fish seized pursuant to this Act may be sold, subject to the approval and direction of the appropriate court, for not less than the fair market value thereof. The proceeds of any such sale shall be deposited with such court pending the disposition of the matter involved.

(e) Rebuttable Presumption.--For purposes of this section, it shall be a rebuttable presumption that all fish found on board a fishing vessel which is seized in connection with an act prohibited by section 307 were taken or retained in violation of this Act.

16 USC 1861.

SEC. 311. ENFORCEMENT.

(a) Responsibility.--The provisions of this Act shall be enforced by the Secretary and the Secretary of the department in which the Coast Guard is operating. Such Secretaries may, by agreement, on a reimbursable basis or otherwise, utilize the personnel, services, equipment (including aircraft and vessels), and facilities of any other Federal agency, including all elements of the Department of Defense and of any State agency, in the performance of such duties. Such Secretaries shall report semiannually, to each committee of the Congress listed in section 203 (b) and to the Councils, on the degree and extent of known and estimated compliance with the provisions of this Act.

Reports to congressional committees.

(b) Powers Of Authorized Officers.--Any officer who is authorized (by the Secretary, the Secretary of the department in which the Coast Guard is operating, or the head of any Federal or State agency which has entered into an agreement with such Secretaries under subsection (a) to enforce the provisions of this Act may---

(1) with or without a warrant or other process--

(A) arrest any person, if he has reasonable cause to believe that such person has committed an act prohibited by section 307;

(B) board, and search or inspect, any fishing vessel which is subject to the provisions of this Act;

(C) seize any fishing vessel (together with its fishing gear, furniture, appurtenances, stores, and cargo) used or employed in, or with respect to which it reasonably appears that such vessel was used or employed in, the violation of any provision of this Act;

(D) seize any fish (wherever found) taken or retained in violation of any provision of this Act; and

(E) seize any other evidence related to any violation of any provision of this Act;

(2) execute any warrant or other process issued by any court of competent jurisdiction and

(3) exercise any other lawful authority.

(c) Issuance Of Citations.--If any officer authorized to enforce the provisions of this Act (as provided for in this section) finds that a fishing vessel is operating or has been operated in violation of any provision of this Act, such officer may, in accordance with regulations issued jointly by the Secretary and the Secretary of the department in which the Coast Guard is operating, issue a citation to the owner or operator of such vessel in lieu of proceeding under subsection (b). If a permit has been issued pursuant to this Act for such vessel, such officer shall note the issuance of any citation under this subsection, including the date thereof and the reason therefor, on the permit. The Secretary shall maintain a record of all citations issued pursuant to this subsection.

(d) Jurisdiction Of Courts.--The district courts of the United States shall have exclusive jurisdiction over any case or controversy arising under the provisions of this Act. In the case of Guam, and any Commonwealth, territory, or possession of the United States in the Pacific Ocean, the appropriate court is the United States District Court for the District of Guam, except that in the case of American Samoa, the appropriate court is the United States District Court for the District of Hawaii. Any such court may, at any time--

(1) enter restraining orders or prohibitions;

(2) issue warrants, process in rem, or other process;

(3) prescribe and accept satisfactory bonds or other security; and

(4) take such other actions as are in the interest of justice.

(e) Definition.--For purposes of this section--

(1) The term "provisions of this Act" includes (a) any regulation or permit issued pursuant to this Act, and (B) any provision of, or regulation iissued pursuant to, any international fishery agreement under which foreign fishing is authorized by section 201 (b) or (c), with respect to fishing subject to the exclusive fishery management authority of the United States.

(2) The term "violation of any provision of this Act" includes (A) the commission of any act prohibited by section 307, and (B) the violation of any regulation, permit, or agreement referred to in paragraph (1).

16 USC 1857 note.

SEC. 312. EFFECTIVE DATE OF CERTAIN PROVISIONS.

Sections 307, 308, 309, 310, and 311 shall take effect March 1, 1977.

TITLE IV--MISCELLANEOUS PROVISIONS

16 USC 1881.

SEC. 401. EFFECT ON LAW OF THE SEA TREATY.

If the United States ratifies a comprehensive treaty, which includes provisions with respect to fishery conservation and management jurisdiction, resulting from any United Nations Conference on the Law of the Sea, the Secretary, after consultation with the Secretary of State, may promulgate any amendment to the regulations promulgated under this Act if such amendment is necessary and appropriate to conform such regulations to the provisions of such treaty, in anticipation of the date when such treaty shall come into force and effect for, or otherwise be applicable to, the United States.

SEC. 402. REPEALS.

(a) The Act of October 14, 1966 (16 U.S.C. 1091-1094), is repealed as of March 1, 1977.

(b) The Act of May 20, 1964 (16 U.S.C. 1801-1086), is repealed as of March 1, 1977.

SEC. 403. FISHERMEN'S PROTECTIVE ACT AMENDMENTS.

(a) AMENDMENTS.--The Act of August 27, 1954 (22 U.S.C. 1972), is amended--

(1) by amending section 2 thereof to read as follows:

"SEC. 2. If--

"(1) any vessel of the United States is seized by a foreign country on the basis of claims in territorial waters or the high seas which are not recognized by the United States; or

"(2) any general claim of any foreign country to exclusive fishery management authority is recognized by the United States,

and any vessel of the United States is seized by such foreign country on the basis of conditions and restrictions under such claim, if such conditions and restrictions--

"(A) are unrelated to fishery conservation and management,

"(B) fail to consider and take into account traditional fishing practices of vessels of the United States,

"(C) are greater or more onerous than the conditions and restrictions which the United States applies to foreign fishing vessels subject to the exclusive fishery management authority of the United States (as established in title I of the Fishery Conservation and Management Act of 1976), or

"(D) fail to allow fishing vessels of the United States equitable access to fish subject to such country's exclusive fishery management authority;

and there is no dispute as to the material facts with respect to the location or activity of such vessel at the time of such seizure, the Secretary of State shall immediately take such steps as are necessary--

"(i) for the protection of such vessel and for the health and welfare of its crew;

"(ii) to secure the release of such vessel and its crew; and

"(iii) to determine the amount of any fine, license, fee, registration fee, or other direct charge reimbursable under section 3(a) of this Act." and

Infra.

22 USC 1973

(2) by amending section 3(a) thereof by inserting immediately before the last sentence thereof the following new sentence: "For purposes of this section, the term 'other direct charge' means any levy, however characterized or computed (including, but not limited to, any computation based on the value of a vessel or the value of fish or other property on board a vessel), which is imposed in addition to any fine, license fee, or registration fee."

(b) EFFECTIVE DATE.-- The amendment made by subsection (a) (1) shall take effect March 1, 1977. The amendment made by subsection (a) (2) shall apply with respect to seizures of vessels of the United States occurring on or after December 31, 1974.

SEC. 404. MARINE MAMMAL PROTECTION ACT AMENDMENT.

(a) AMENDMENT.--Section 3 (15) (B) of the Marine Mammal Protection Act of 1972 (16 U.S.C. 1362 (15) (B) is amended by striking out "the fisheries zone established pursuant to the Act of October 14, 1966." and inserting in lieu thereof "the waters included within a zone, contiguous to the territorial sea of the United States, of which the inner boundary is a line coterminous with the seaward boundary of each coastal State, and the outer boundary is a line drawn in such a manner that each point on it is 200 nautical miles from the baseline from which the territorial sea is measured.".

16 USC 1362 note.

(b) EFFECTIVE DATE.--The amendment made by subsection (a) shall take effect March 1, 1977.

SEC. 405. ATLANTIC TUNAS CONVENTION ACT AMENDMENT.

(a) AMENDMENT.--Section 2(4) of the Atlantic Tunas Convention Act of 1975 (16 U.S.C. 971 (4) is amended by striking out "the fisheries zone established pursuant to the Act of October 14, 1966 (80 Stat. 908; 16 U.S.C. 1091-1094)," and inserting in lieu thereof "the waters included within a zone, contiguous to the territorial sea of the United States, of which the inner boundary is a line coterminous with the seaward boundary of each coastal State, and the outer boundary is a line drawn in such a manner that each point on it is 200 nautical miles from the baseline from which the territorial sea is measured."

16 USC 971 note

(b) EFFECTIVE DATE.--The amendment made by subsection (a) shall take effect March 1, 1977.

16 USC 1882.

SEC. 406. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated to the Secretary, for purposes of carrying out the provisions of this Act, not to exceed the following sums:

(1) $5,000,000 for the fiscal year ending June 30, 1976.
(2) $5,000,000 for the transitional fiscal quarter ending September 30, 1976.
(3) $25,000,000 for the fiscal year ending September 30, 1977.
(4) $30,000,000 for the fiscal year ending September 20, 1978.

APPROVED APRIL 13, 1976.

LEGISLATIVE HISTORY:

HOUSE REPORTS: No. 94-445 (Comm. on Merchant Marine and Fisheries) and No. 94-948 (Comm. of Conference).

SENATE REPORTS: No. 94-416 (Comm. on Commerce), No. 94-459 (Comm. on Foreign Relations), and No. 94-515 (Comm. on Armed Services) all accompanying S. 961, and No. 94-711 (Comm. of Conference).

LEGISLATIVE HISTORY (Con'd):

CONGRESSIONAL RECORD:

Vol. 121 (1975): Oct 9, considered and passed House.
Dec. 19, S. 961 considered in Senate.

Vol. 122 (1976): Jan. 19-22, 27, S. 961 considered in Senate.
Jan. 28, considered and passed Senate, amended, in lieu of S. 961.
Mar. 29, Senate agreed to conference report.
Mar. 30, House agreed to conference report.

WEEKLY COMPILATION OF PRESIDENTIAL DOCUMENTS:

Vol. 12, No. 16 (1976): Apr. 13, Presidential statement.

U.S. GOVERNMENT PRINTING OFFICE:
1976 O - 69-716

The Fishing Work Ethic and Experiential Training

In order for the observer trainee to gain first hand insight into what commercial fishermen are like, it is necessary to participate with him in his work environment. Toward that end, a list of domestic fishing captains and their vessels has been provided. These people have all indicated a willingness to take observer trainees on an actual trip. The rational for such experiential training is two-fold. You as a potential observer gain immediate understanding of the intensity of the fishing life-style, while the domestic fisherman is able to convey his point of view. Both parties will benefit from the trip experience.

The fishing work ethic can be defined as a set of values and attitudes that commercial fishermen the world over hold true about their work and place in society. This section is intended to discuss the fishing work ethic so that the trainee has some understanding of what it means to be a contemporary fisherman.

While most fishermen realize that they are members of a minority occupation or microcosm, most feel that they work harder than terrestrial based occupations. This attitude can be understood if it is placed in the context of the number of variables that any given occupation must contend with. If we were to examine the different variables connected with a commercial finfishing operation and a retail shoe store for

example, it would become apparent that the terrestrial business would have a number of "fixed" or expected variables. Six days per week the retailer may expect a certain number of shoe sales (gross income) based on his experience in the business to date. His overhead expenditure would have known parameters with periodic inflation which would be passed on to the consumer directly. Various options exist for the retailer to increase sales volume such as advertising, management education, and business finance. The stability of his business activity is increased by the number of "expected" variables. The commercial fishermen of the domestic fleets expect few fixed variables. With small privately owned vessels, these fishermen must seek a scarce resource under the relatively unstable conditions of weather, market, seasonal fisheries and the constant liability of loss of vessel and crew. The working hours are specified by the demand of the activity itself. With the advent of FCMA regulations and the resultant quotas, both foreign and domestic, the list of variables gets larger.

The fishing work has an aesthetic aspect. The adventure and challenge of the sea so often written about does exist for fishermen. In some way this sustains fishermen during difficult times and innumerable variables.

Our purpose here has been to convey a concept of the type of people that fish for a living and their motivation. Certainly this is only an overview. The rest will be learned from your experience with the people listed on the following page.

The foreign, far ranging fleets are not subject to the same number and types of variables encountered domestically. The larger vessel sizes, government subsidization and non-incentive wages offer a different set of variables to foreign fishermen. The observer trainee must be familiar with both groups of professionals.

Captain/Owner

1.	Capt. Richard B. Allen 1735 Drift Road Westport, MA (617) 636-3276	Jennie and Jackie 55' - steel
2.	Capt. William I. Bomster 16 Lockwood Drive Clinton, CT (203) 669-2038	Zebu 95' - steel
3.	Capt. Joseph Dolan New Bedford, MA (203) 453-3880	Two fishing vessels
4.	Capt. Bill Hallsen Scituate, MA (617) 337-1989	Barbara Christine 65' - steel
5.	Capt. T. Jordan Portland, ME (207) 781-2247	dragger 70' - wood
6.	Capt. Peter M. Mahoney 26 Newport Road Hull, MA (617) 925-3100	42' - wood
7.	Capt. Jim McCauley PeaceDale, RI	Alliance 86' - steel
8.	Capt. Alphonse Santo Gloucester, MA (617) 283-2158	Antonina
9.	Capt. Steve Thivobeau Five Island, ME (207) 371-2166	Teresha 54' - wood

10. Capt. Sherman Thompson
P.O. Box 867
Kennebunkport, ME
(207) 967-3064

Annie Jay
55' -

FISHERIES OBSERVER TRAINING PROGRAM

Glossary of Basic Seamanship Terminology

The following list of words and word phrases is provided to give the observer trainee a basic working knowledge of seamanship terminology used by men and women on ships the world over. The elements of this list are selected by specific criteria and are by no means exhaustive in the subject area. The observer trainee should internalize these definitions with the knowledge that working at sea demands an intimate understanding of vessels as stable working platforms.

After appropriate time to review these definitions you will be tested on the material. Word-for-word rote learning is not necessary or desirable. Internalize the meaning of these terms so that you understand them in any way that is most meaningful to you.

GLOSSARY OF BASIC SEAMANSHIP TERMINOLOGY

ABAFT: "Farther aft than."

ABEAM: Bearing 90° or 270° relative from own ship.

ABOARD: In a ship.

ACCOMODATION LADDER: Portable steps leading down a ship's side, by which small boats may be entered or the ship boarded.

ADRIFT: Loose from morrings and unable to make headway. Applied in a general sense to anything not in its proper place.

AFLOAT: Resting buoyantly upon the water.

AGROUND: When any part of a ship is resting on the bottom. A ship runs aground or goes aground.

AHOY: The customary hail to a boat or ship.

ALOFT: Above the decks, on the mast, or in the rigging.

ALONGSIDE: By the side of the pier or ship.

AMIDSHIPS: In or toward the middle of a ship.

ANCHOR: A metal device so shaped as to grip the bottom and hold a ship by means of the cable attached.

ASHORE: On the beach or shore.

ASTERN: Behind the ship.

ATHWARTSHIPS: The direction at right angles to the centering of a ship.

AWASH: So low that water washes over.

BACK STAY: Piece of standing rigging leading aft.

BATTEN DOWN: The act of making a hatch watertight by wedging the battens against the tarpaulins.

BEAM: The greatest width of a ship.

DECK BEAM: A transverse member supporting a deck.

BELOW: Downward. Below decks.

BERTH: (1) An anchorage or mooring space. (2) Sleeping place assigned a man on board ship.

BIGHT: A loop of line or chain.

BITTS: A pair of heavy metal posts securely fastened in a vertical position on deck, to which mooring lines and hawsers are belayed.

BLOCK: A device made of a wheel (sheave), inside a shell, over which a line or wire rope can run freely.

BOAT FALLS: The lines used in hoisting or lowering a boat.

BOAT HOOK: Wooden staff with a metal hook and prod at one end, used to fend off or hold on.

BOATSWAIN'S CHAIR: A short wooden seat sent aloft or over the side on a line to hold a man engaged in painting or repairs.

BOLLARD: Strong cylindrical upright on a pier, around which the eye or bight of a ship's mooring line is thrown.

BOW: The forward end of the ship or boat.

BRIDGE: Elevated athwartships structure extending across the forward end of the superstructure. It is the station of the deck watch officer underway.

BRIDLE: A span of rope, chain, or wire with both ends secured and the strain taken on the mid-part.

BULWARK: Solid fence-like barrier along the edges of weather decks.

BUOY: A floating marker, anchored to the bottom, to indicate a position on the water.

CAMEL: A floating spar or other timber used as a fender between two ships or a ship and a pier.

CAPSTAN: That part of a vertical shaft windlass around which a working line is passed; used for heaving in anchors and hawsers.

CARGO NET: A square net of line used to transfer case goods or small package freight.

CAST OFF: Order given to let go or throw off a mooring line from a bollard or cleat.

CENTERLINE: An imaginary line down the middle of the ship from bow to stern.

CHAFING GEAR: Canvas, line, or other material placed around rigging and mooring lines to prevent wear, also at cod end of net.

CHAIN OF COMMAND: The succession from superior to subordinate through which command is exercised. The succession from subordinate to superior through which requests should go.

CHECK: To keep a strain on a line but to ease out only enough to prevent its parting.

COMPARTMENTS: An interior shipboard space enclosed by bulkheads and in which personnel work and live. Peak tanks and cofferdams are not compartments.

DAVIT: One of a pair of strong arms by means of which a boat is hoisted in or out; the pair is called a set of davits. Any similar hoisting device.

DECK: Horizontal planking or plating which divides a ship into layers of compartments; never called a floor.

DISPLACEMENT: The weight of the water displaced by the ship, equal to the weight of the ship.

DRAFT: Vertical distance from the keel to the waterline.

DRAFT MARKS: The figures fastened on the stem and stern which indicate the drafts of the ship.

FANTAIL: The after end of the main deck.

FATHOM: A measure of length or depth: 6 feet.

FENDER: A device to take the shock of contact between ship and pier or between ships.

FORE AND AFT: Lengthwise of a ship, from stem to stern.

FORECASTLE: Forward section of weather deck. (Pronounced Foksol.)

FORWARD: Toward the bow.

FOUL WEATHER: Rainy or stormy weather.

FRAMES: The athwartships strength members of a ship's hull. Numbered from bow aft, and used as reference points to locate fittings, compartments, etc.

FREEBOARD: The vertical distance from weather deck to waterline.

GANGWAY: An opening in the rail or bulwarks, giving access to the ship.

GUNWALE: The upper edge of a ship's or boat's side. (pronounced gunnel.)

HALYARD: A light line used to hoist a flag or pennant.

HAND: A member of the crew.

HATCH: An access or opening in a deck.

HAUL: To pull.

HAWSER: A heavy line over 5 inches in circumference used for towing or mooring.

HOLD: A compartment aboard ship used for stowing cargo.

INBOARD: Toward the center of a ship.

KEEL: The lowermost, central strength member of a ship which runs fore and aft and from which the frames and the plating rise.

KINK: A twist which disturbs the lay of line and wire.

KNOT: (1) A unit of speed equal to 1 nautical mile (6080) per hour.

LANYARD: A small line made fast to an object to secure it, as a lanyard.

LASH: To secure by turns of wire, line or chain.

LAY: The direction of the twist of strands of a rope.

LEE: The opposite direction from which the wind is blowing. Sheltered area to leeward of a ship or other windbreaker.

LEFT-HANDED: Counterclockwise.

LOCKER: A metal cabinet, fitted with a lock, in which men keep their gear. Any small compartment or cabinet.

LOOKOUT: A man stationed as a visual watch. May be air lookout, horizon lookout, surface lookout, fog lookout, etc.

MAIN DECK: The highest complete deck extending from stem to stern and from side to side.

NAVIGATOR: The officer responsible to the commanding officer for the position of the ship and the condition of her navigating equipment.

OVERHEAD: The underside of a deck forms the OVERHEAD of the compartments on the next deck below. Never referred to as the ceiling.

PASSAGEWAY: Corridor or hall aboard ship.

PAY OUT: To slack off or ease out a line.

PILOTHOUSE: Enclosure on the bridge centerline, housing the main steering control. Also called the WHEELHOUSE.

PORT: Direction to the left of centerline of the ship as one faces forward.

PURCHASE: A combination of one or more blocks reeved with a line or wire. Also called TACKLE, BLOCK AND TACKLE, or when.

ROLL: Movement of a ship from side to side.

RUNNING LIGHT: Any one of the lights required by law to be shown by a vessel underway. Not restricted to the side lights, as many sailors believe.

SAMSON POST: A vertical timber on the forward deck of a boat used in towing and securing.

SCUPPER: The waterway along the gunwales. Opening in the side through which waste water from a head or galley is discharged. Extended to cover any type of drain opening.

SECURE: To make fast. To quit or knock-off.

SHEAVE: The pulley in a block. (Pronounced "shive".)

SHIP'S COMPANY: All hands permanently attached to ship or station.

SHROUD: Piece of standing rigging that provides athwartships support for a mast.

SIDELIGHT: One of the colored lights required by law to be shown by a vessel underway. The starboard side light is green and the port side light is red.

SNATCH BLOCK: A single-sheaved block with a hinged strap which can be opened and the bight of a rope inserted, making it unnecessary to reeve the end of the rope through the block.

SNUB: To stop running line suddenly by taking a turn and holding.

SPRING: Any mooring line which does not lead at right angles to the keel.

SQUALL: A sudden gust of wind, often violent, and often accompanied by rain or snow.

STARBOARD: Direction to the right of centerline of the ship as one faces forward.

STATEROOM: An officer's living space aboard ship.

STAY: A fore-and-aft support for a mast.

STERN: The aftermost part of a ship.

STOW: The act of packing articles into a storage space, or cargo into a cargo space.

TACKLE: Any arrangement of line and blocks to gain a mechanical advantage. (Pronounced taykel.)

TIDE: The vertical rise and fall of the ocean level.

TWO-BLOCK: Round in a tackle all the way so that the blocks come together. Extended to mean hoist an article to the highest position possible. In relation to signal flags, this term has been replaced by CLOSE UP.

UNLAY: Untwist and separate the strands of a rope.

WEATHER DECK: Any deck or portion of a deck exposed to the elements.

WHARF: A structure parallel to the shoreline to which ships moor for loading or unloading.

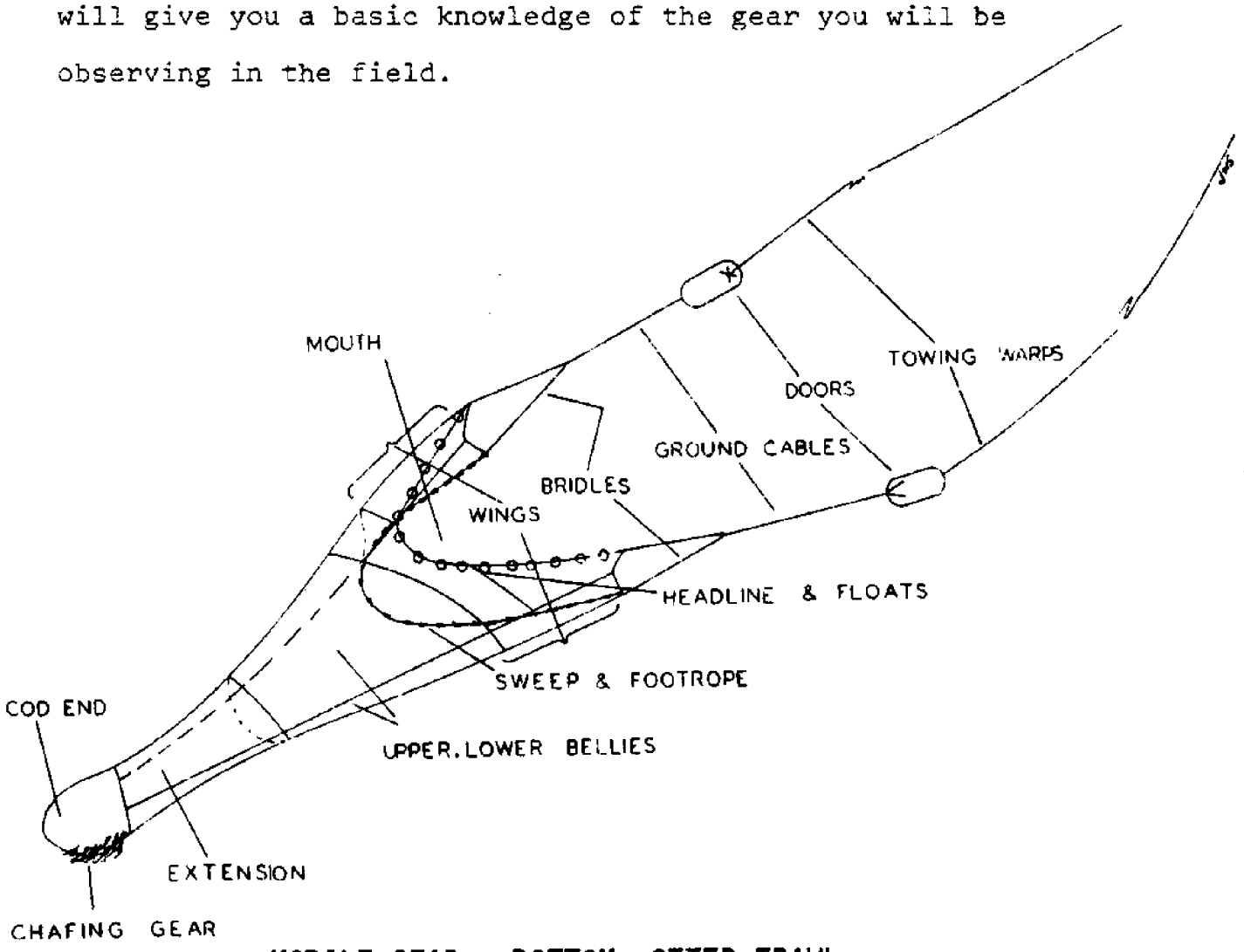
WINCH: A power driven machine for heaving in lines aboard ship.

WINDWARD: Toward the wind.

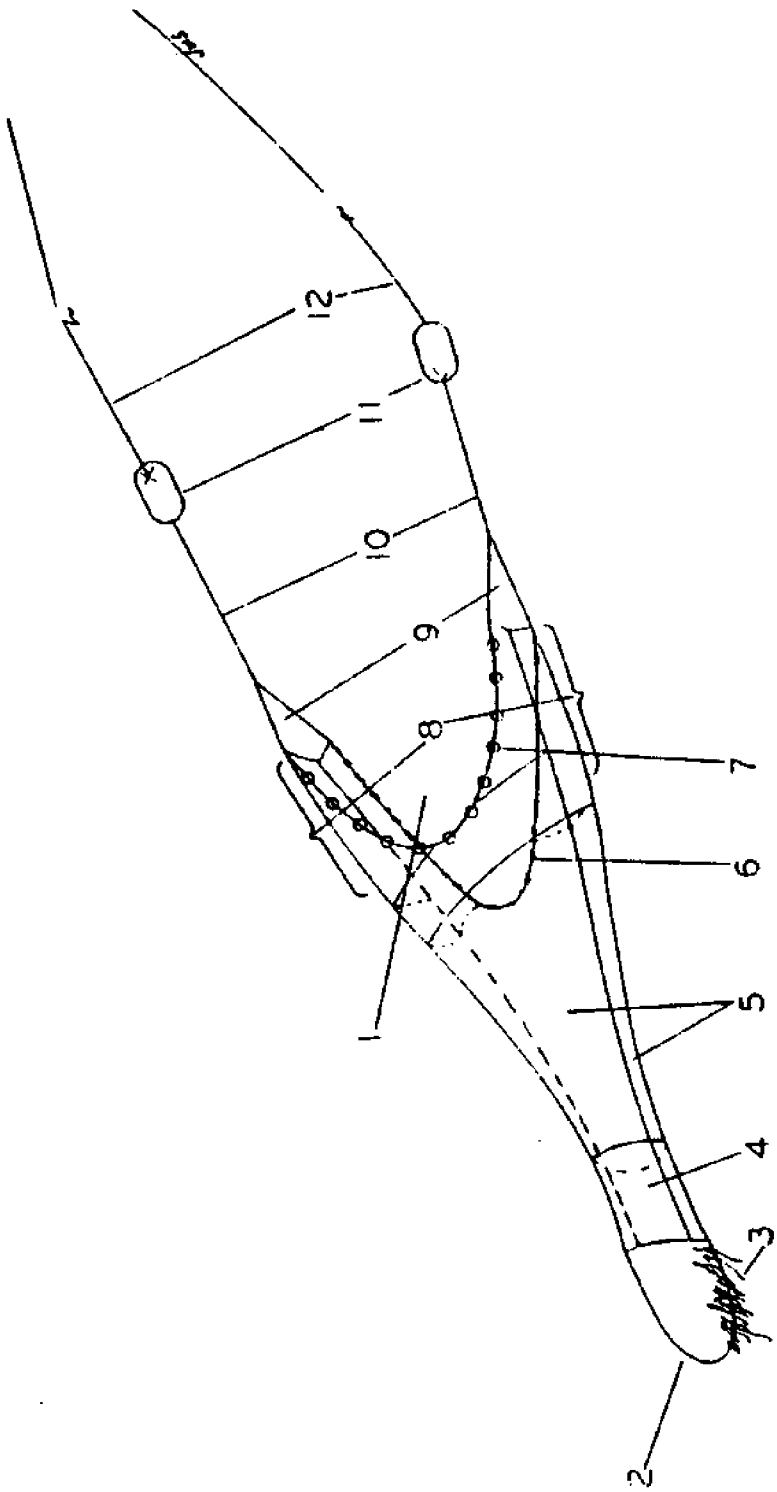
Fishing Gear

The Observer must realize the methods and gears used by commercial fisherman to acquire marketable marine protein. While the purpose of this chapter is to facilitate an understanding of common gears used, it must be stated that this is only an overview but is sufficient for fisheries observers.

Using the diagram below, find each item listed in the operational definitions that follow. This information will give you a basic knowledge of the gear you will be observing in the field.



MOBILE GEAR - BOTTOM, OTTER TRAWL



MOBILE GEAR - BOTTOM, OTTER TRAWL

Mobile Gear - Bottom, Otter Trawl

GEAR: Any configuration of apparatus used to acquire a marketable product (self-explanatory).

TRAWL: Any configuration of gear used in conjunction with a vessel to produce a marketable product.

TOWING WARPS: Usually wire or wire rope used to connect the source of propulsion (boat) with the gear used to catch specific species.

DOORS: Plainer surfaces which serve as water foils and provide spread to the mouth of the net; various shapes and sizes.

GROUND CABLES: Wire, chain or a combination of both which provide attachment between doors and wings of the net; maintains herding characteristic.

WINGS: Lateral extensions of the net first to encounter product itself.

BRIDLES: Warp or wire rope affair which allows for the distribution of force at two points; usually a continuance of the headline and footrope.

MOUTH: Ellipsoidal opening of the net as seen during its performance on the bottom.

HEADLINE: Upper warp at the mouth of the net which provides points of attachment and strength for net and net floats.

NET FLOATS: Provide a buoyant force holding upper mouth of net open.

FOOTROPE: Lower warp or wire at mouth of net which provides point of attachment and strength for net and sweep; maintains net at or near the sea-bed.

SWEEP: Any of a number of configurations of chain, rollers, cookies, bobbins, wrapped wire, etc., which is attached to footrope and provides a ballast force and contact with the sea-bed.

UPPER, LOWER BELLIES: Areas of netting following the mouth of the net.

EXTENSIONS: Area of netting aft of the bellies which allow the net to become more restrictive by virtue of tappers and the run of the twine.

COD END: Area of netting which holds the product acquired during the fishing operation. Usually larger gauge twine or double knit twine for strength quality.

CHAFFING GEAR: Any substance purposely attached to contact the side of the cod end which restricts deterioration due to friction; optional, used for certain type of bottom topography; may consist of old bellies, polypropylene, rawhide, etc.

The method of otter trawling requires the towing of the gear (or net, ground cables and doors) along the bottom of the sea-bed. As in any fishing activity the selection of the proper method requires first that a directed fishery be chosen. As operationally defined before, a directed fishery is a designated species of marine animal which the vessel is authorized to catch. The by-catch is that part of the catch not covered by the "directed" categorization.

While the composition and quantity of the by-catch must be documented, only certain percentages of non-directed species may be taken. Usually these percentages are assessed as part of the directed catch total. The catch or haul back may also contain species designated as PROHIBITED. These animals are usually referred to as "Creatures of the Shelf" such as lobster and crab. Their populations are protected by the Federal Government and are not to remain part of the haul back.

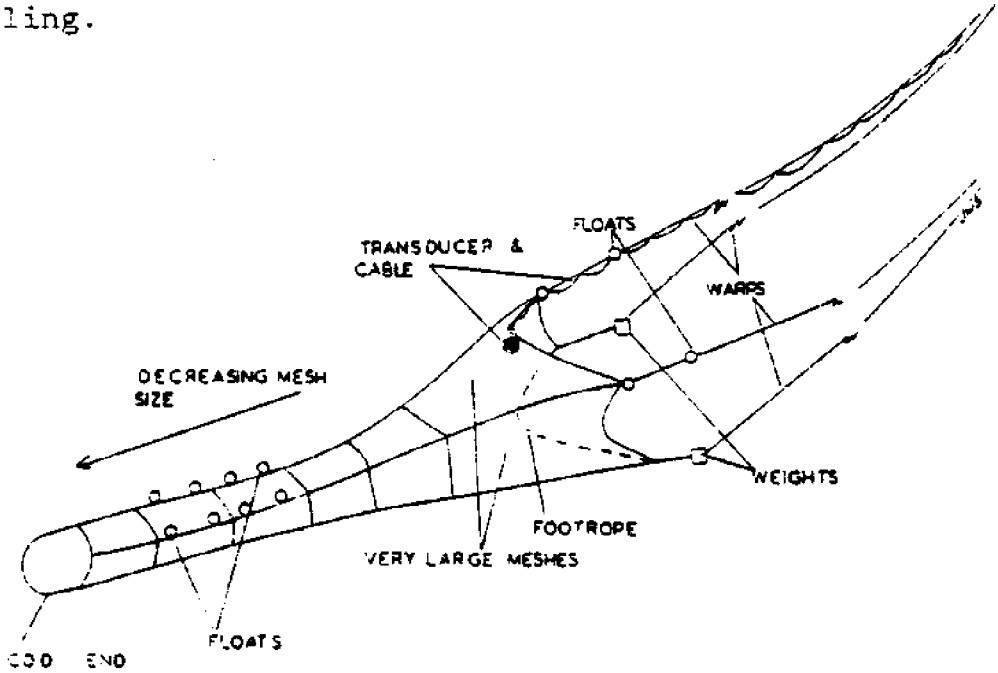
As certain fishing methods are more species specific than others, the observer must be aware of the suitability of gear methods with the stated, or directed fisheries. With respect to otter trawling, demersal or finfish that live at, or near, the bottom and benthic (organisms that live at, or just below, the bottom) are acquired.

While it is not necessary to go into specifics, the observer must be aware that fisherman can make numerous modifications to the net, headline, sweep, wings, doors, etc., that will change the fishing behavior of the original equipment considerably. It must be noted that foreign fishing interests are responsible for a majority of present gear technology and are to be respected for their efforts.

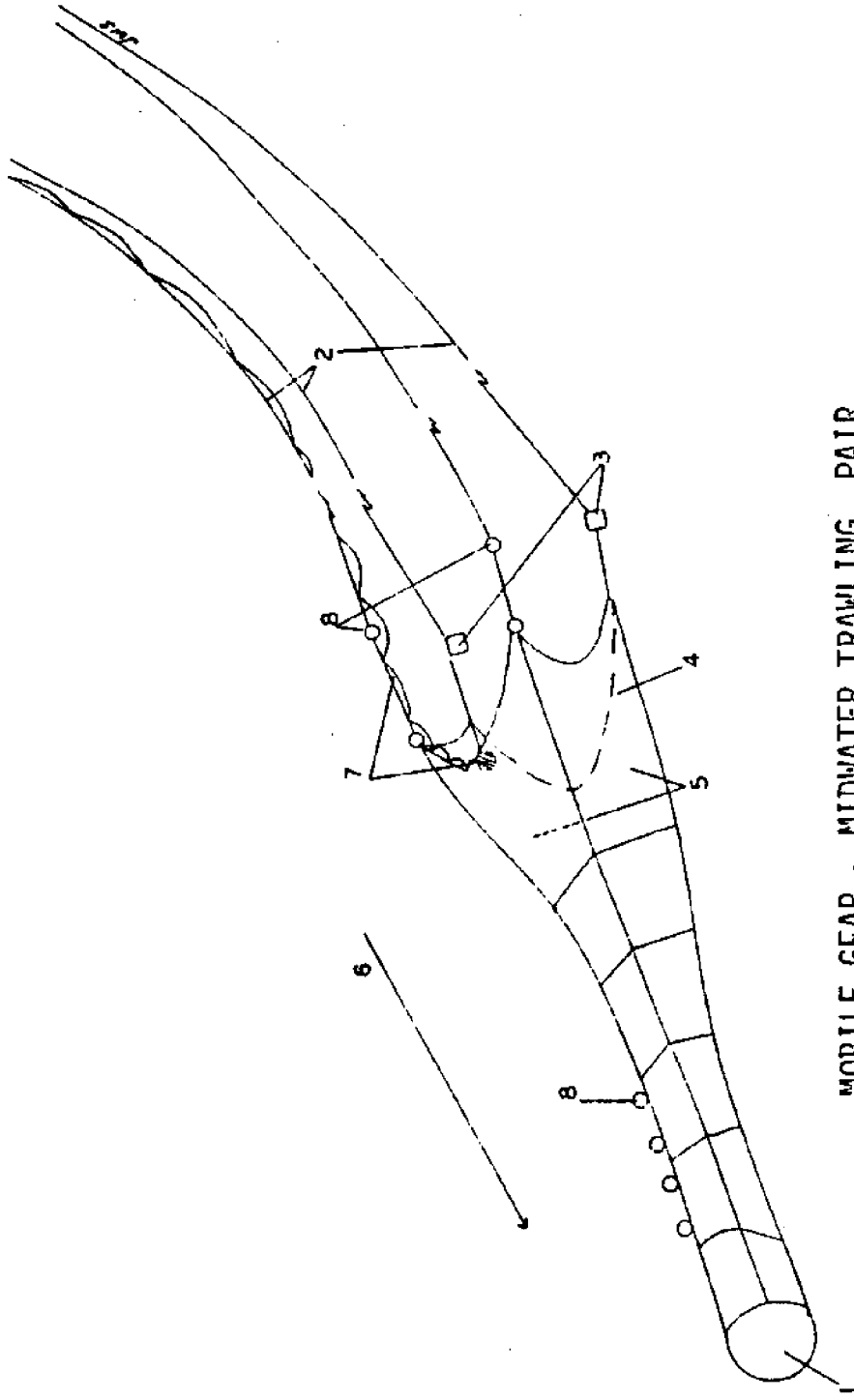
Mobile Gear - Midwater Trawl

The method of mid-water trawling is species specific to pelagic or schooling marine animals such as herring and squid. The main distinction between otter trawling and mid-water trawling is obviously the depth at which the gear is deployed in the hydrosphere. The bottom gear requires heavier gauge parameters such as twine size, sweep ballast, and chaffing gear. The mid-water trawl is noted by its light twine, increased net size and cod end capacity, larger mesh size in a squared mouth, and the possible absence of trawl doors entirely.

The diagram below depicts the two-boat or "pair" mid-water trawl method. Find each concept operationally defined below and note the differences between otter and mid-water trawling.



MOBILE GEAR - MIDWATER TRAWLING, PAIR



MOBILE GEAR - MIDWATER TRAWLING, PAIR

TOWING WARPS: One per corner of the mouth of the net; may have weights deployed on lower warps to ballast the trawl.

DOORS (lack of): Pair mid-water method utilizes the separation power of twin vessel steerage. Therefore, doors are not needed and would only waste horsepower. Single boat mid-water trawling requires the use of SUPERKRUB type doors in which the height dimension is greater than the length. These doors are not intended to make contact with the bottom and provide lateral force to the mouth of the net with no downward coefficient.

TRANSDUCER CABLE: Relays telemetry from headrope mounted transducer as to height of net from the bottom. Optional, many foreign operations use either the utilization of a second vessel with variable pitched (sonar) transducer or use no extra vessel transducer and regulate the height of the net in the water using known weight characteristics of the gear and varying the vessel's speed through the water. The height of the gear varies directly with the speed of the vessel.

SWEEP (Lack of): A leaded or ballasted footrope called a leadline is used to hold the lower mouth down.

HEADLINE: The warp hung with varying amounts of net floats. Near neutral buoyancy is sought between the headrope and leadline.

LARGE MESHES: In face of wings larger meshes of twine are utilized. This quality of the net makes it lighter due to less twine mass and water resistant surface area. All these

considerations allow the mid-water trawl to move faster through the water. In that, pelagic (schooling fish) swim much faster over a prolonged period, the mid-water gear must compensate for this aspect of species specificity.

LONGITUDINAL FLOATATION (optional): Net floats placed down the extensions and cod end of a mid-water net will hold the net relatively horizontal at any depth in the hydrosphere; also used to aid in the stability of the net as it acquires product.

The rectangular shape of the net is acquired by the use of four (4) panels of netting in its construction. This arrangement of panels and seams helps the net to remain open to the cod end while the decreasing mesh size prevents lateral escapement of the product, and increased strength where the biomass becomes concentrated.

It is noted that the single vessel mid-water trawl method is used extensively by foreign fleets because of their wide range in horsepower and holding capacity. While this particular method provides large quantities of the same species/ same year class fish, the product itself is not always handled on-board the catching vessel. For example, a documented mid-water technique used by the Japanese fleet employs the use of a detachable cod end which may be removed at haul back and towed to a processing vessel. This method is of concern to the observer in that sampling and species identification are made more difficult.

As we have seen, mid-water differs greatly from the otter trawling method. While the gear differs in its anatomy, the economic factors of species specificity, behavior and anticipated quantity make mid-water trawling very efficient. However, the risks are heightened as well. The schools must be found first.

The observation of past foreign fishing activities has generated instances where foreign vessels have been committed to a mid-water directed fishery and violations have been suspected. Because of the oxidation qualities of steel, the appearance of bright (ferrous) surfaces on cables, doors and weights indicate that the gear is indeed making contact with the bottom in the vicinity of non-directed or prohibited species.

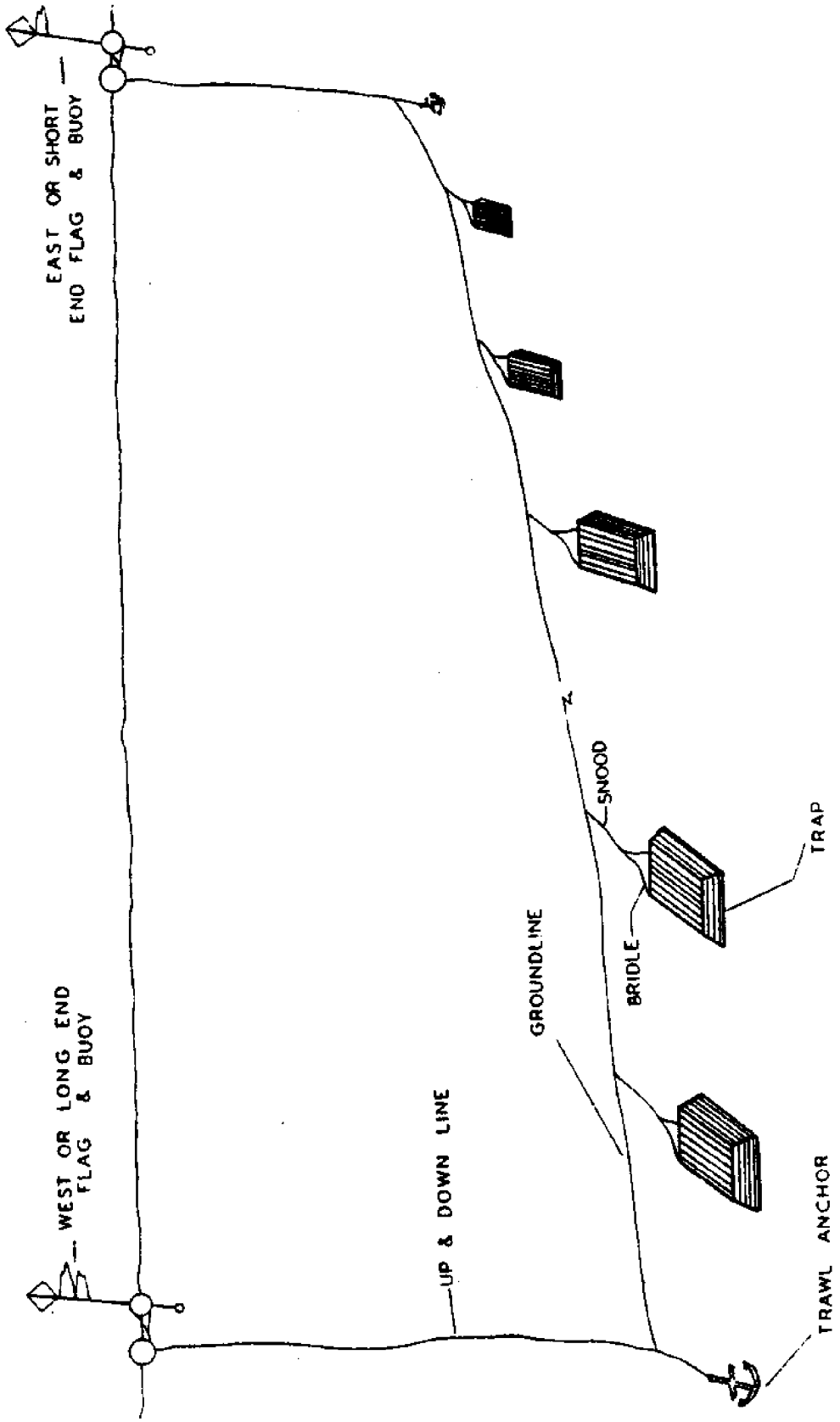
Otter trawling and mid-water trawling constitute the two most popular commercial fishing methods presently used by far ranging fleets. While other methods are used, the significant biomasses with relation to FCMA regulations are produced using these two examples of mobile gear.

Fixed Gear and Conflicts

While most foreign vessels use few fixed gear methods with the exception of long lines, the observer must be aware that gears such as trawls of lobster traps may be destroyed by vessels engaged in otter trawling. The responsibilities of the observer are contained in the chapter on regulations. Our purpose here is to understand the method of fixed gear deployment.

The fixed gear fishery for Homarus americanus (American lobster) is noted for the rather extended distribution of the population along the continental shelf of the Northwestern Atlantic. From Maine to South Carolina, the American lobster, with its predominant first pair of modified walking legs, is fished most heavily by domestic lobstermen using either single or multi-trap trawls of fixed gear. Various domestic finfishermen using otter trawls with modified sweeps are also engaged in fishing for lobster periodically. It is noted that the use of mobile gear methods to acquire lobster is considered a poor choice ecologically. This is cited because otter trawls are not species specific to lobster and because of the high potential for mutilation of the animal or destruction of its habitat.

The use of fixed gear traps is highly species specific for lobster and does little or no damage to the bottom topography. In the diagram on the following page, find each item which is operationally defined. Understand that you as an observer may be required to document these items as evidence of infractions of FCMA regulations.



FIXED GEAR ON THE CONTINENTAL SHELF

Aspects of Net Twine

While the observer is not required to possess net mending capabilities, it is necessary that he be cognizant of various aspects of twine for regulatory purposes. Toward this end the following discussion will aid in the establishment of suitable background information.

Having previously identified the various segments of the basic fishing net, it is important to realize why a net can support the retention and hoisting of many metric tons of marine product. From the legal aspect of fisheries regulations, as determined by regional councils, the size of the openings (meshes) in the net are specified and are to be documented by observers. We can address both aspects of strength and size by an examination of the basic unit of the net called MESH. In the diagram on the following page, we find the anatomy of the mesh to consist of two types of knots called pickups and siders and four equal lengths of twine called bars. Each mesh has two pickups which are operationally defined as a continuous loop of twine onto which another piece of twine is tied. Therefore, a pickup when cut can leave the original mesh intact. A sider, however, consists of a single knot which when cut destroys the integrity of the entire mesh.

The size of a mesh is determined by the combined length of any two bars meeting at a knot. Therefore, if the mesh in

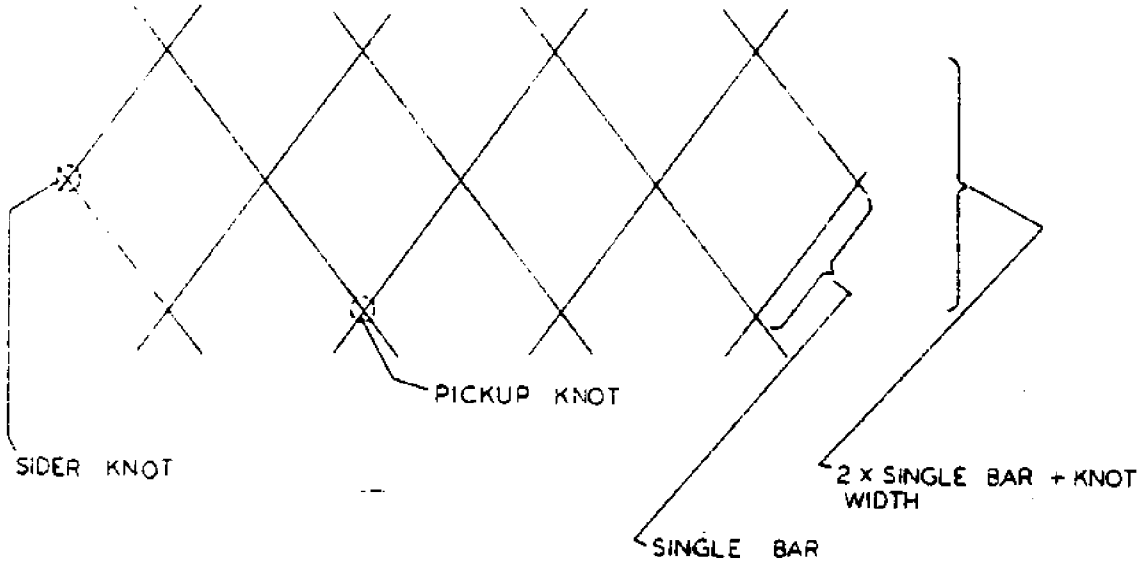
the diagram has two inch bars, then the mesh size would be represented as:

2 x length of one bar + width of one knot or

2 x 2" bar length + .25" knot width = 4.25 mesh

With this method of determining mesh size the actual shape of the mesh, be it in a full cod end or an empty one, is not critical.

Note is made that most European netting is prestretched and treated by the manufacturers so as to eliminate excessive change in mesh size once used. Some change is inevitable, therefore, the field observer should periodically check mesh sizes for vessels engaged in directed fisheries which include such specifications.



MESH SIZE

FISHERIES OBSERVER TRAINING PROGRAM

Foreign Language Training

Responding to requests from the New England Regional Fishing Management Council, members of the original observer corps and others, the curriculum development staff has established a unique foreign language training program for observer candidates. The Berlitz Schools of Languages of America Inc. in Providence, Rhode Island is actively working with the program staff to develop a short term, high intensity program where candidates will acquire working fisheries facility in any two of the principle foreign languages used in the Atlantic Region.

A cursory description of this comprehensive program includes the following elements:

1. Exposure to basic skills in each language to be part of each observers repertoire.
2. Acquisition of verbal, visual and silent understanding usage of specific fisheries terminology and word phrases in each language to be part of each observers repertoire.
3. Program adaptability to changing observer needs in the field.
4. Potential for periodic retraining sessions and/or the acquisition of additional language group(s) during observers' career.

In addition to the formal program, observer candidates will become acquainted with hand-held language translators currently marketed by Lexicon Inc. and Craig Inc. These instruments will be stressed as being useful only as reinforcement/refresher devices. The colloquial nature of fishing terms and idioms relegate each respective language module to a secondary learning system, not a primary one.

Further details about the contents of the program can be obtained by the instructor group directly from Berlitz's Providence office.

BIOLOGY

Introduction

The biological portion of the observer curriculum has been divided into four sections; anatomy, species identification, biological sampling - data recording, and laboratory exercises. In each case, the text material has been designed to consider the most important information, pertinent to the effective and efficient training of observers for the purpose of biological sampling and data recording. The material is, therefore, selective, by no means approaching a complete course in fishery and invertebrate biology. Where appropriate, parts of the National Marine Fisheries Service Observer Manual have been included. A continuity between the existing observer program and NMFS requirements and this training curriculum was a primary consideration. A duplication in effort of the excellent work accomplished by the personnel at the Woods Hole Oceanographic Institute would be counter-productive to the purpose of the curriculum. All NMFS regulations concerning procedures in field sampling have been adhered to and incorporated in the training material. We are grateful for their contributions.

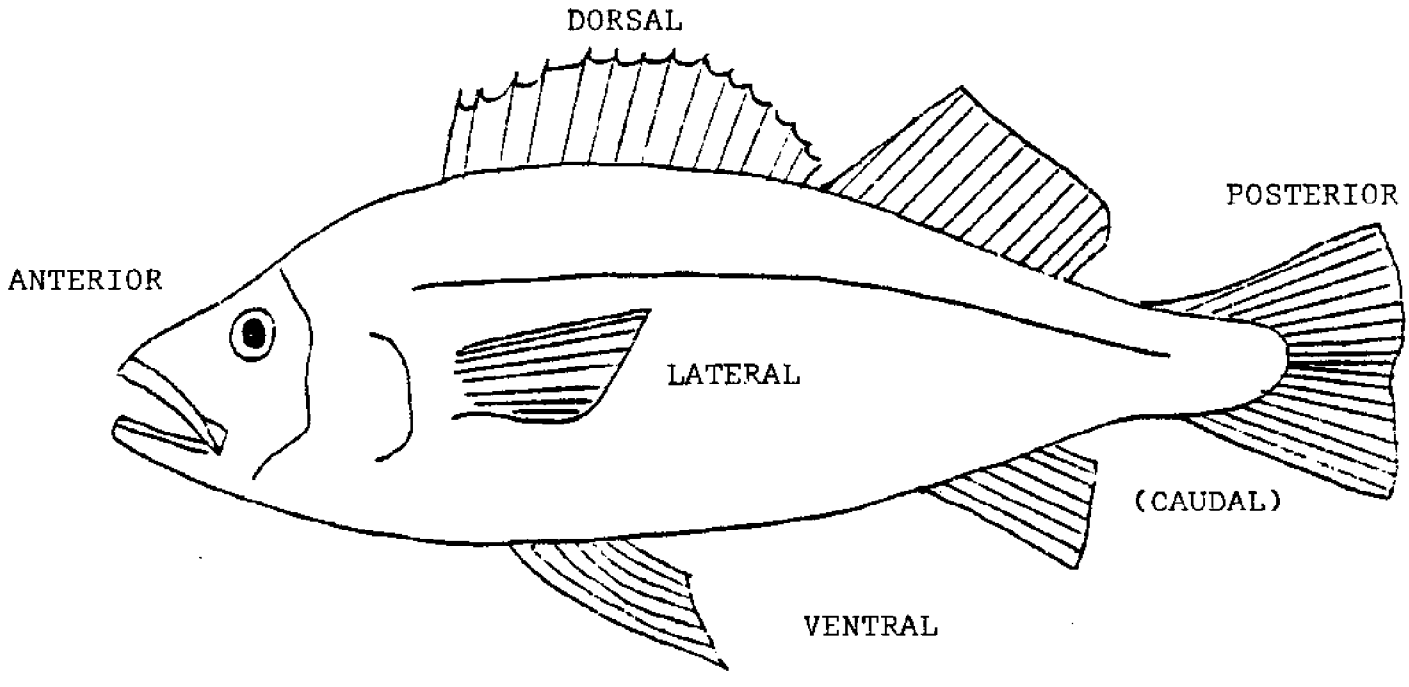
The text material has been reinforced by laboratory exercises to give the student a "hands on" experience with marine fish and invertebrates; and practice in performing skills that are primary in the duties of a fisheries observer.

At the conclusion of each section, a laboratory practicum is scheduled to assess the students' grasp of the material and skills. At the end of the training period, an observer trip situation has been scheduled aboard a domestic fishing vessel and all aspects of a field sampling are performed.

FISH EXTERNAL ANATOMY

External body form and anatomical features are important for descriptive purposes in the identification of species. When we refer to a particular section of an organism, we use these common biological terms denoting position. These descriptive terms are applicable to fish, many invertebrates, and mammals.

Using the fish as an example, we see that the ANTERIOR part is situated at the front; the POSTERIOR refers to the after-section or CAUDAL area; the DORSAL refers to the back of the fish; the VENTRAL denotes the belly or lower surface; and the LATERAL section refers to the sides. These terms are concise, accurate means of reference to position on an organism.



We may progress to a more descriptive designation of fish external morphology. The important structures are outlined below. Please refer to the diagrams on the following page.

ADIPOSE FIN - small fin located anterior to the caudal fin, on the caudal peduncle.

ANAL FIN - located posterior to the pelvic fins on the ventral portion of the fish.

CAUDAL FIN - tail fin.

CAUDAL PEDUNCLE - shaft of the tail fin.

CHIN BARBEL - found beneath the lower jaw, contains sensory cells.

DORSAL FIN - fin located on the dorsal part of the body; it may consist of one, two, or three fins, designated first, second, or third.

FINLETS - small fins located anterior to the caudal fin, on the dorsal and ventral portion of the caudal peduncle.

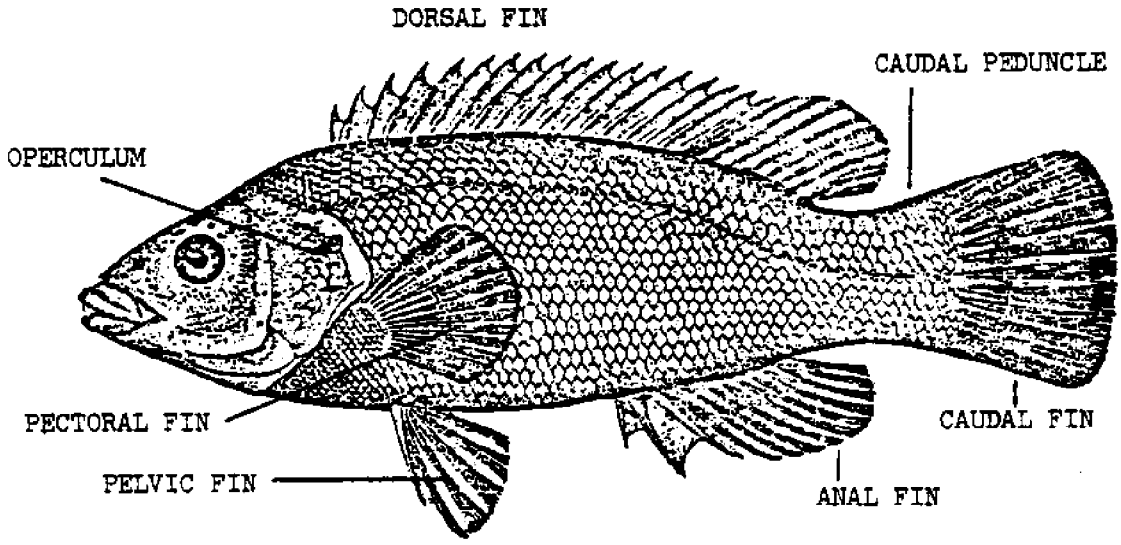
KEELS - bony protuberances located on the lateral planes of caudal peduncle.

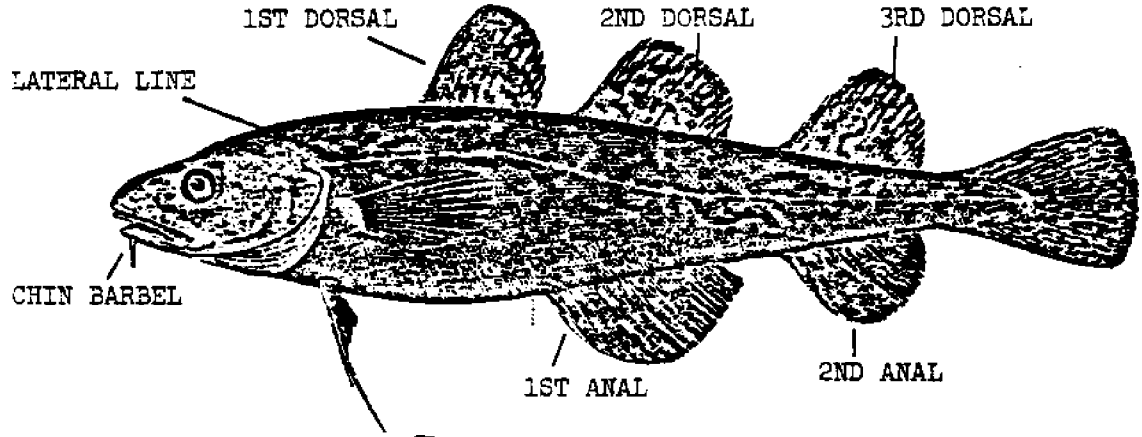
LATERAL LINE - sensory organ, a series of pores located in a line from the operculum to the caudal peduncle.

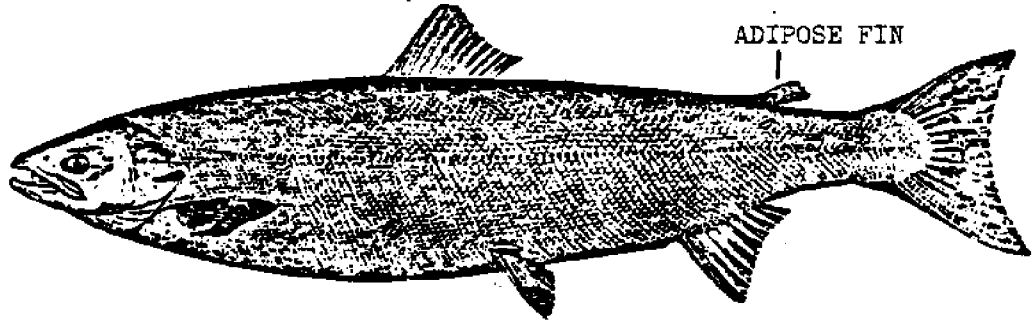
PECTORAL FINS - paired, located laterally on both sides of the fish, posterior to the operculum

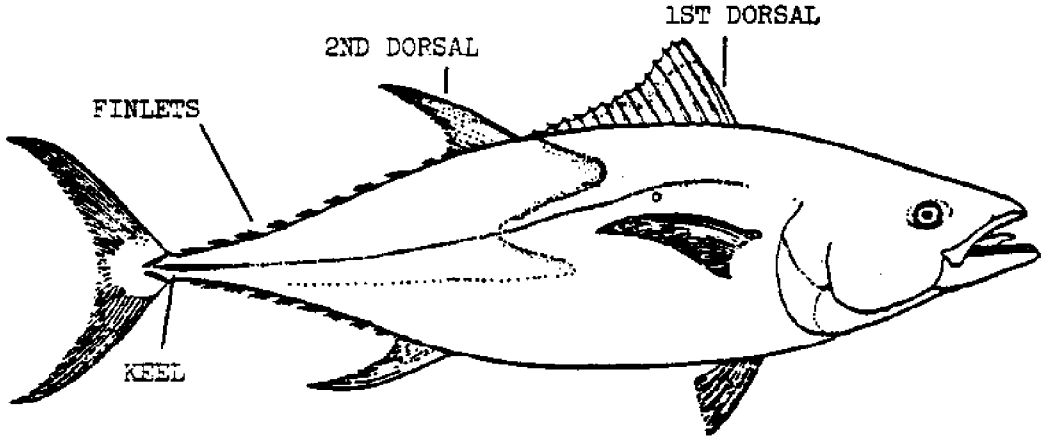
PELVIC FINS - (ventral fins), paired, located on the ventrum of the fish.

OPERCULUM - gill cover.


DORSAL FIN
CAUDAL PEDUNCLE
OPERCULUM
PECTORAL FIN
CAUDAL FIN
PELVIC FIN
ANAL FIN


1ST DORSAL
2ND DORSAL
3RD DORSAL
LATERAL LINE
CHIN BARBEL
1ST ANAL
2ND ANAL


ADIPOSE FIN


1ST DORSAL
2ND DORSAL
FINLETS
KEEL

FISH INTERNAL ANATOMY

The following is a list of internal anatomical structures of fish with which the observer-trainee should become familiar.

Please refer to the diagram below.

GILLS

HEART

STOMACH

PYLORIC CAECA - fingerlike projections of the digestive tract.

INTESTINE

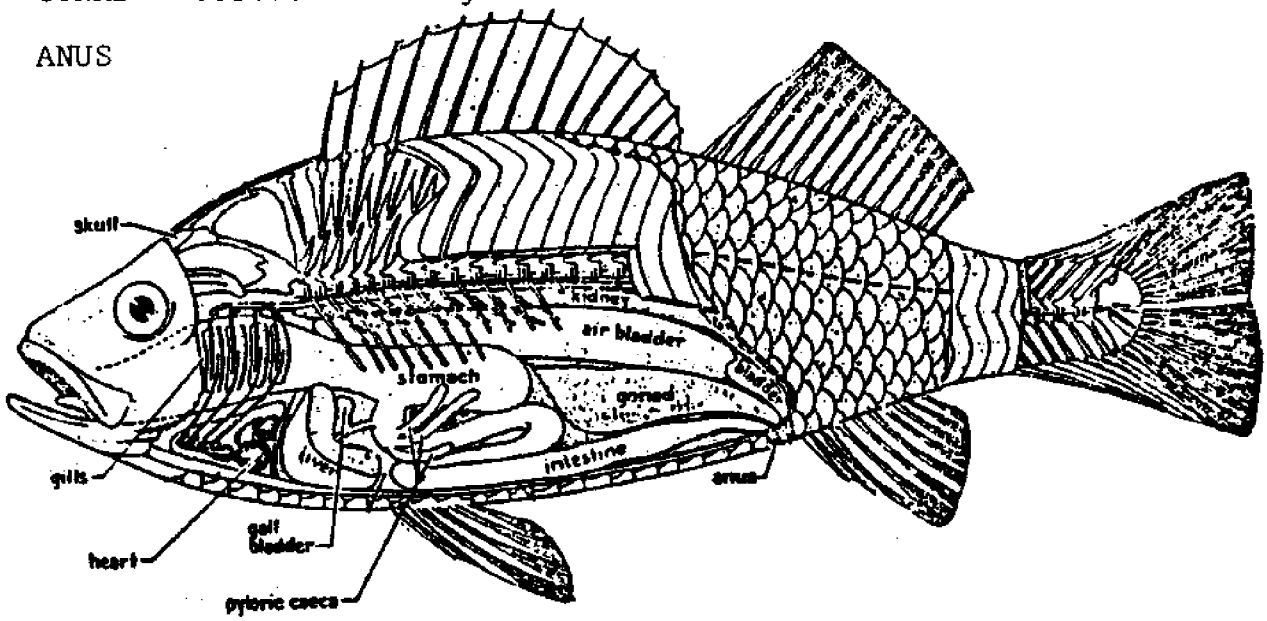
SWIM BLADDER - (air bladder); hydrostatic organ.

KIDNEY

LIVER

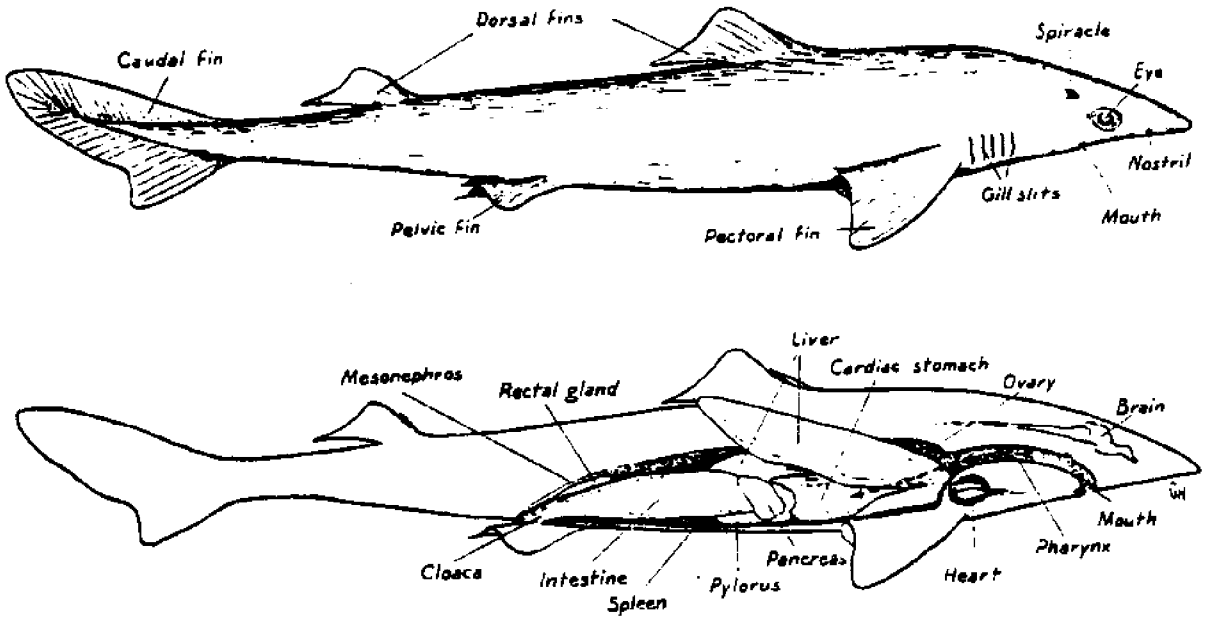
GONAD - testis or ovary

ANUS



SHARK EXTERNAL AND INTERNAL ANATOMY

Shark morphology differs slightly from that of most teleosts. Please refer to the following diagram to familiarize yourself with major external and internal structures.



Alexander, Gordon 1967. General Zoology

RESPIRATION

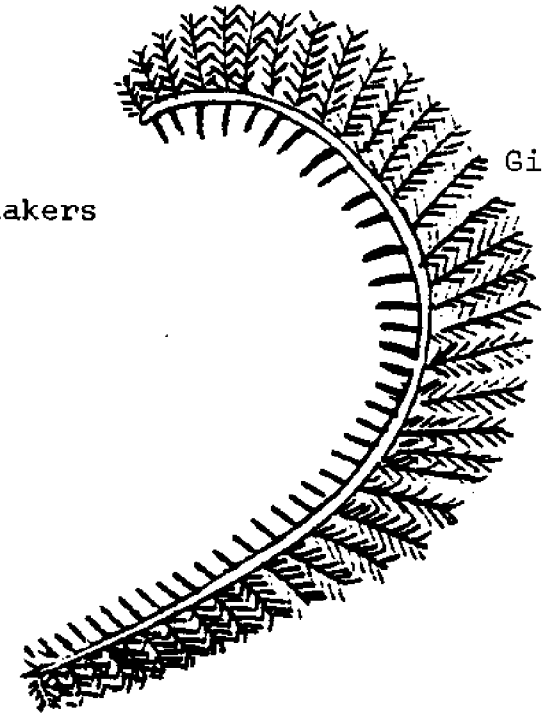
Fish obtain oxygen for respiration by moving water, 800 times as dense as air, over their gill surfaces. Oxygen diffuses from the water into the bloodstream through a capillary network in the GILL FILAMENTS. There it is picked up by haemoglobin in the red blood cells and circulated throughout the body. Concurrently, carbon dioxide is given off into the environment at the gill surface. The vascular parts of each filament are tightly-packed, thin, small plates called gill lamellae. They represent an enormous surface area which serves to maximize the amount of oxygen taken up.

The water enters the mouth, then flows over the quills and is expelled outward through the operculum. The mouth is contracted, acting as a pump to force water through the gills. A second type of suction pump is caused through the expansion of the opercular cavity itself. In sharks and rays, each gill slit is separate and possesses its own suction arrangement.

Oxygen consumption will vary according to the species, size, activity, season, and temperature. Faster moving fish use more oxygen because of their lifestyle in contrast to more sedentary species. Therefore, their gill surfaces would be more expansive. For example, we would expect that mackerel have a larger gill surface than most other fish because of their active swimming behavior; which in fact, they do.

Another characteristic of gill construction is the GILL RAKER, or that portion of the gill that lies in the throat cavity. The design of the gill raker gives us vital information on the individual. For example, if the gill rakers are long, thin, and spaced close together, we could deduce that they are utilized to sieve plankton. However, if the gill rakers are spaced far apart and/or stubby and short, they are not likely to be used for "trapping" anything and the specimen is a carnivore. Stomach contents examinations can confirm our suppositions based on gill raker morphology.

Note the parts of a fish gill in the diagram below:



SWIM BLADDER

The swim bladder originated as a lung to assist fish in breathing when in water of low oxygen content. Then it evolved as a buoyancy chamber or hydrostatic organ. It is located near the center of gravity of the fish. By inflating or deflating the fish can achieve the correct amount of buoyancy to offset gravitational forces with a minimum of fin action. In this way the fish can hold its position in the water column.

The swim bladder functions as a hydrostatic organ by replacing part of the fishes body, which is heavier than water with a gas. The specific weight of the fish is brought toward that of the ambient water and the fish becomes neutrally buoyant.

There are two types of swim bladders; open and closed. Fishes with open swim bladders recharge them by swallowing air at the surface. As the fish ascends, gas is expelled as bubbles through the mouth or gill cavities. In a closed swim bladder, the gas is secreted by gland cells and reabsorbed into the bloodstream. With this type of swim bladder, there is no means of rapid deflation. The swim bladder wall houses a dense network of capillaries.

Fishes with open swim bladders are the herring family and eel order. Those with closed swim bladders include the salmonids, cod-like fishes, perch-like fishes, and toadfish.

Those without the swim bladder include the Atlantic mackerel, tunas, sharks, swordfish. These species are constantly in motion after prey. A swim bladder would restrict their movements. Buoyancy in these species is achieved through the high oil content of their bodies.

If a fish moves quickly from the depths, the air in the swim bladder expands adding to the fish's buoyancy and thus to upward force. Half of the pressure is removed for each 30 ft. rise. If the air sac were fully expanded, it would double in size when brought to the surface from 30 ft. and quadruple in size from 60 ft. In reality it does not expand this much, but enough to prevent the fish from easily returning to the original depth. If a fish rises too far, too fast, the critical point is passed and the fish loses control and is carried helpless to the surface. Organs may rupture due to the tremendous increase in size of the swim bladder. Some fish can burp out the air quickly and regain control and thus avoid this ballooning effect. Can you understand what a disadvantage a closed swim bladder would be in this case?

This is an important concept in the fishing industry because when a haul of fish is brought up from the depths, the swim bladders of the fish expand and facilitate floating the net up with ease. A detachable cod-end can be very useful in this case. A problem could arise if the net comes up in an unexpected place.

REPRODUCTION

Reproduction in marine fishes involves a large expenditure of energy. All physiological processes in the body are geared to spawning and in addition, spawning may be preceded by extensive migrations and/or nest building. Often, feeding is curtailed or abandoned completely and as a result, the digestive organs wither. For example, the pacific salmon perform long migrations to their parent stream to spawn and subsequently die. The physiological changes in their bodies result in all energy channeled to migration and the production of eggs and sperm. The digestive system atrophies, never to be used again. Most teleosts survive to spawn many more times, but because of the changes they undergo prior to and during spawning, their bodies and flesh will be in the poorest condition of the year. This is an important consideration to a fisherman in regard to weight and quality of the flesh.

Teleost fish have ovaries opening directly into oviducts; the testis also has its own duct, leading to the genital opening. In juvenile fish, the gonads are slender, paired strands in the dorsum of the abdomen. As the fish matures, the gonads increase in size. At their peak of development, they will completely fill the body cavity. In a female fish in the ripe stage of development, the ovaries with eggs will constitute 10-25% of the body weight. In ripe males, the testis will make up 5-10% of the total body weight.

At this ripe stage, eggs and milt can be expressed from the body by light pressure on the abdomen.

It might be mentioned here that fishes are not invariably designated male and female. Some species of sea-bream and sea-perch are functional hermaphrodites, that is to say, that one fish will produce both ripe sperm and eggs.

Most marine teleosts produce unfertilized eggs. The female lays the eggs and the male is usually hovering nearby to release milt for fertilization.

In nature, the pituitary of a fish will not produce the necessary sexual triggers until the fish has been exposed to certain changes of light and heat. The gonads produce sex hormones in response to the pituitary gland. Products of the pituitary regulate the final stages of egg-ripening and stimulate the release of eggs from the ovaries. The release of ripe eggs in response to the pituitary trigger, indicates that fish spawn at certain times and seasons of the year. It is believed that spawning is temperature dependent, and varies from one species to another. There is a certain temperature range for each species of fish. North Atlantic fishes spawn at the following termperatures: cod, 0.4-7° C.; pilchard, 9-16.5° C.; mackerel, 10-15° C.; herring spring spawners, 3.7-9.3° C.; autumn spawners, 9.1-13.3° C. (Please refer to the spawning chart from the National Marine Fisheries Service Observer Manual included in this section). A main spawning in the spring and summer is to be expected because these are the seasons when the plankton can flourish and provide food for the young larvae.

The majority of marine teleosts lay planktonic, floating eggs. Grounded non-buoyant eggs are produced by only a few species. Buoyant eggs are produced with a moderate amount of yolk and a thin membrane and oil droplet aids in buoyancy. They are small, usually no more than .5-1 mm. in diameter. Buoyant eggs are numerous, produced in the millions and have no attendant pre-natal care. The free floating stage of the larvae may last several weeks. After hatching, the larvae spends up to 10 days living off the yolk reserves. After these reserves have been exhausted, the tiny fish feed upon planktonic organisms. Since planktonic animals occur most abundantly in the upper euphotic zone of the ocean, the best strategy for ensuring a high probability of food supply for the fish larvae is to have them float on the surface layers. A great number of eggs are spawned because survival is more precarious due to predation, or because they are at the mercy of the currents, unfavorable conditions of temperature, or food supply. The greatest overall cause of mortality is due to drifting into unfavorable environments. As few as 1/1 million may survive. Buoyant eggs are produced by fish living in the ocean over continental shelves, for instance, eels, codfish, hake, sea-perch, mackerel, tuna, flatfish; as well as fish living in the open ocean surface waters. Deep sea species in mid-water and bathypelagic fishes spawn in the depths, their eggs float up to the surface, developing as they rise. As with other planktonic young, the larval nursery ground in the surface layers contain an abundance of food organisms.

In contrast to the buoyant eggs and larvae mentioned above, a few marine fishes have non-buoyant grounded eggs. This usually occurs in inshore estuarine areas where the adults migrate. The eggs are deposited and sink to the bottom in adhesive clusters. Most of the larvae are also non-buoyant, only swimming upwards to feed and then sinking to the bottom again. Staying for the most part close to the substratum, the young are less likely to be carried away from the nursery areas by tidal currents. These coastal estuarine areas are abundant with food and the production of non-buoyant eggs and larvae insure that the young will remain near the nursery grounds. The winter flounder migrates inshore during the winter months and spawns from January to May. The female will deposit from 1/2 to 1-1/2 million eggs which sink to the bottom. Some other examples of marine species which breed in inshore locales and produce non-buoyant offspring are the toadfish and sand eels.

With cartilagenous fish, internal fertilization is most prevalent. There are four methods of reproduction in marine elasmobranchs.

OVIPAROUS - the production of eggs in egg cases. The largest has been 12 inches with a 14-1/2 inch young inside. Example: whale shark.

VIVIPAROUS - the young is born alive, developing in the oviduct with a placental connection. There can be 20-80 pups produced

by the female with separate placentas. Development takes from 6-12 months and the young are 6-12 inches in length when born. Example: Mustelus, hammerheads.

OVOVIVIPAROUS - egg hatches in the oviduct and develops there. There is no placental attachment. The young have large yolk sacs; when these are absorbed the young live on secretions. The young are fewer in number than viviparous, usually no more than 20-60. Example: the majority of sharks, chimaeras, and rays.

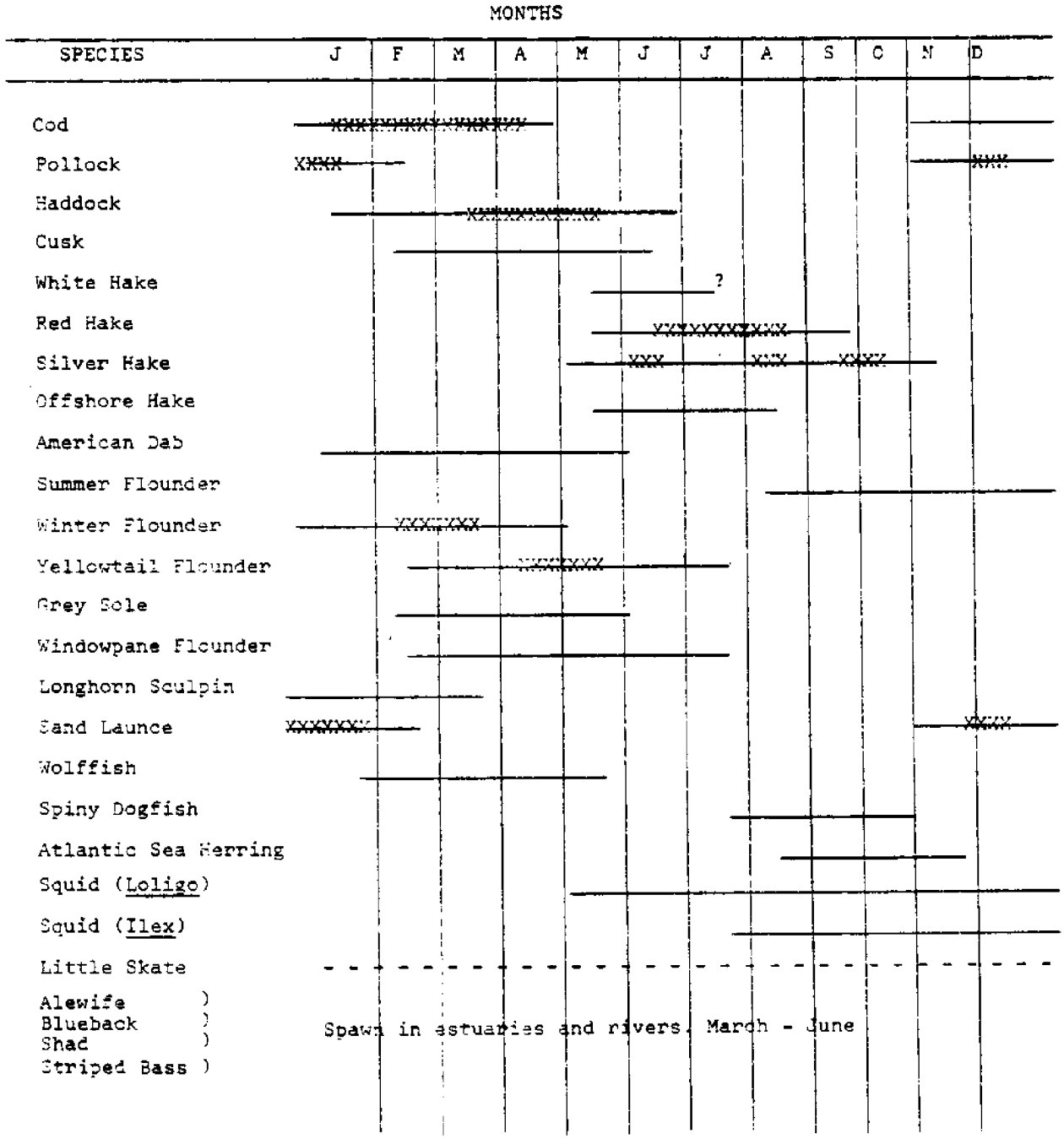
OVOPHAGY - Ovoviviparous but only the right ovary functions. Only one young will hatch at each oviduct. The young live off the yolk sacs and other eggs. The female continues to produce eggs which the young ingest. Twenty to fifty eggs are produced in one batch. Example: sand shark(sand tiger), mackerel shark.

The mortality is low in the young because of internal fertilization, the development in the mother, or egg case, and being born fully formed. In addition there are distinct, separate nursery grounds where males and bigger sharks are kept away. The females stop feeding at pupping. For these reasons, canabalism at the nursery grounds is reduced and growth is enhanced.

Regardless of the methods or means of reproduction, marine fishes have adapted to insure maximum survival of the young.

The spawning area is important so that the young are carried to favorable nursery grounds. The evolutionary implications are obvious, those individuals which wisely choose their spawning areas will be left with more offspring.

Spawning Seasons (———) and Principle Spawning Time (XXXXX) for Selected Species



EXTERNAL ANATOMY OF THE SQUID

We now focus our attention on the squid; an invertebrate and member of the phylum mollusca, class cephalopoda. It is an active carnivore and scavenger which feeds upon fish, crustaceans, and molluscs. Most recent cephalopods have only a remnant of the mollusc shell, found in the dorsal mantle cavity and known as the "pen". The squid has a well-developed head region, surrounded by ten appendages used for the capture of prey. The mouth is equipped with a horny beak or "radula". A characteristic defense mechanism is the release of an ink cloud along with a jet of water. This behavior is often accompanied by a rapid color change. In this way, the predator is confused and this allows the squid to escape. The surface of the squid is covered by a thin, transparent cuticle. The spotted configuration of the body is due to pigment cells (chromatophores) which control the color of the animal. Squid are noted for their ability to change color.

In the Northwest Atlantic Region, there are two main species of economic importance:

Loligo pealei - the long-finned or winter squid; usually 8 inches in length and having no eyelids.

Ilex illacebrosus - the short-finned or summer squid; up to 18 inches in length and having eyelids.

The TENTACLES and ARMS of the squid are located at the VENTRAL END which also corresponds to the "foot" region. The squid appendages consist of eight ARMS and two, club-shaped TENTACLES. Both are equipped with sucker disks. Directly opposite, is the DORSAL END. The POSTERIOR SURFACE is that which contains the SIPHON and the ANTERIOR SURFACE, is that which is opposite and comprises the flat plane of the FIN. LATERAL refers to the sides of the animal.

The outer tubular structure is the MANTLE. Water is drawn into the mantle cavity and restricted in the cavity by a specialized valve in the COLLAR. Contraction of the mantle forces water through the siphon and serves to "jet" propel the animal. By positioning the siphon, the squid can direct its movement.

The important external anatomical features of the squid are listed below:

ANTERIOR SURFACE

ARMS (POSTERIOR AND ANTERIOR)

COLLAR

DORSAL END

EYE

FIN

LATERAL

MANTLE

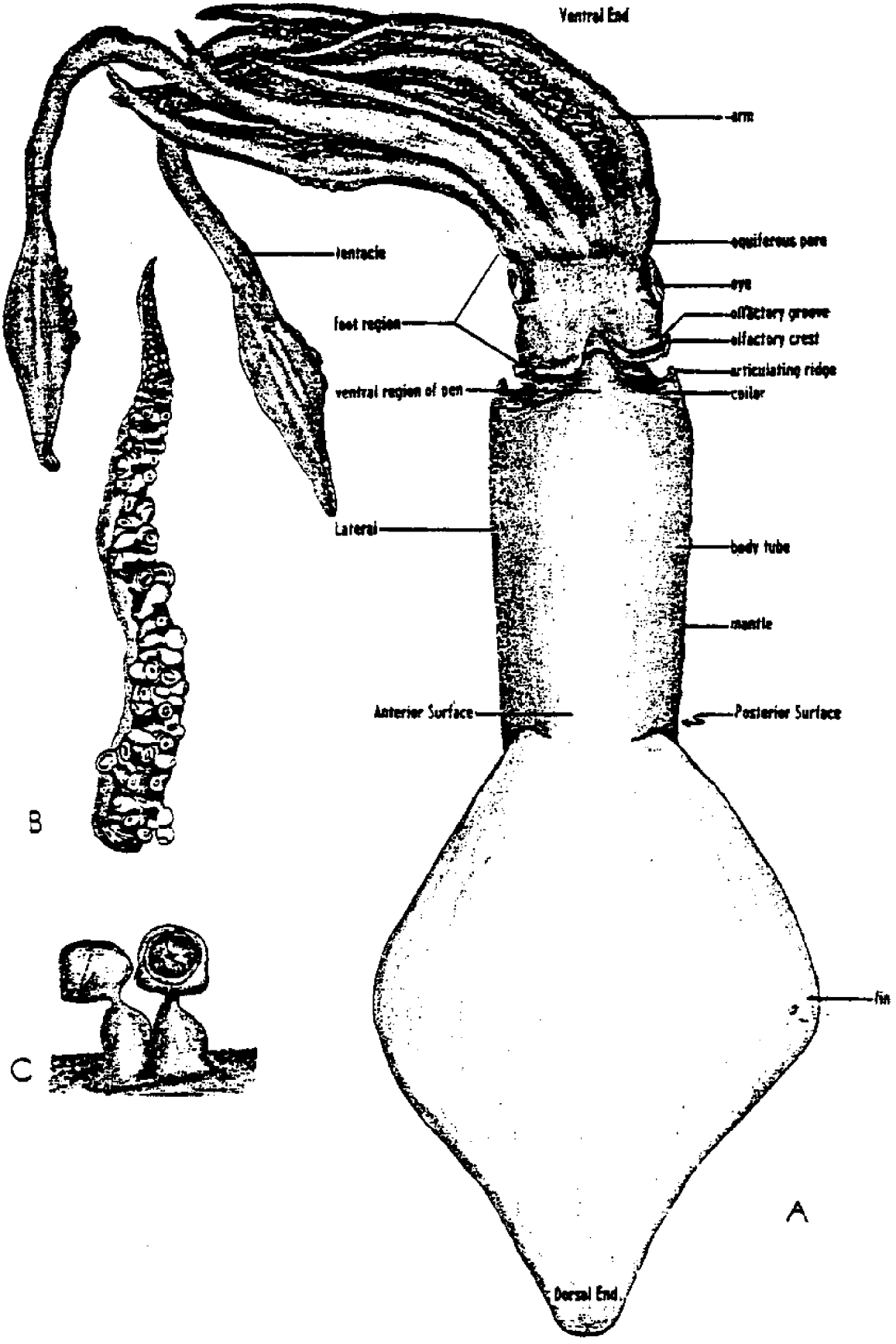
POSTERIOR SURFACE

SIPHON

TENTACLES

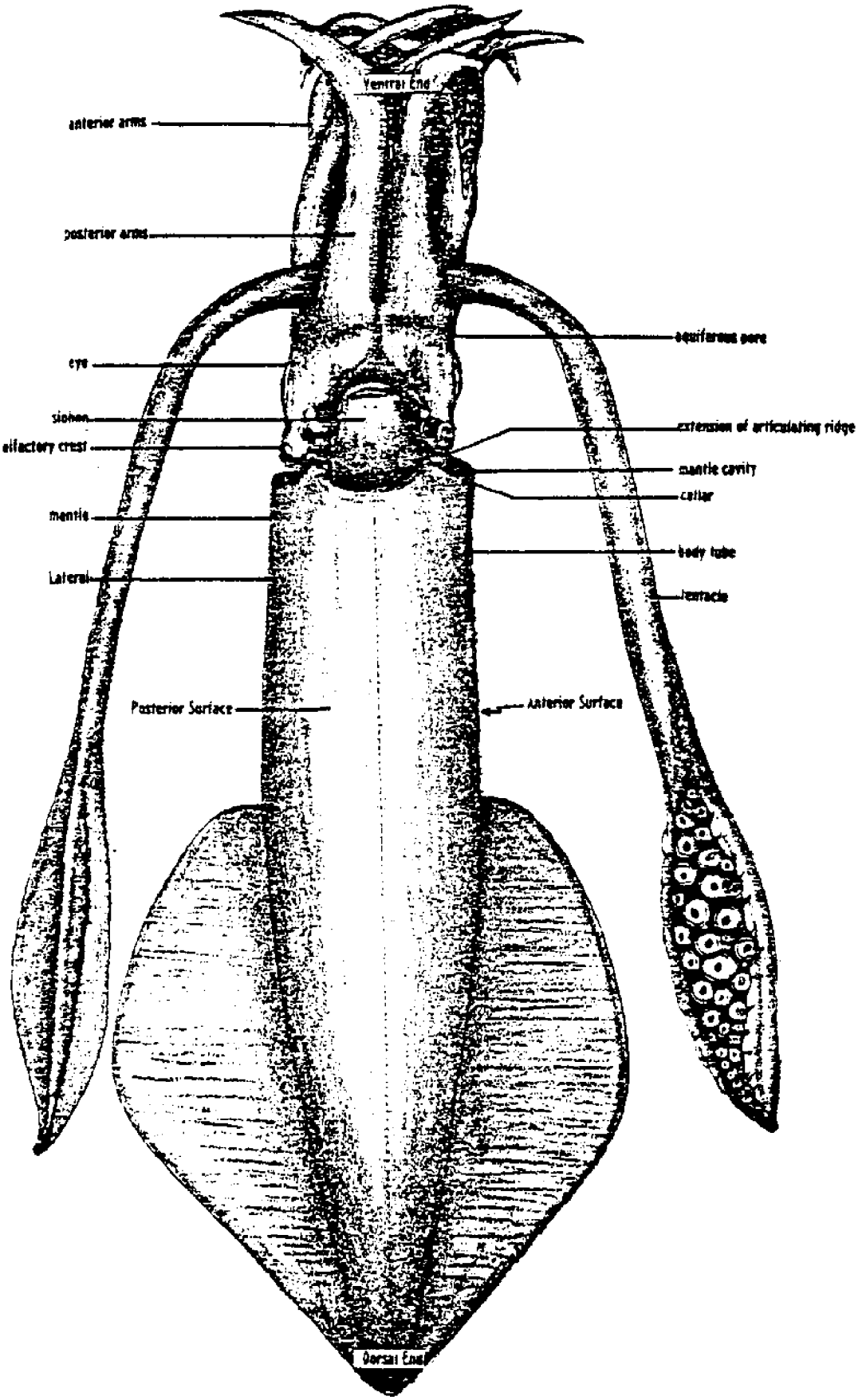
VENTRAL

Please refer to the diagram on the following page.



A. Anterior view of squid *Loligo pealeii*. B. Inside view of arm (enlarged) showing sucker cups. C. Two sucker cups.

Invertebrate Zoology - Laboratory Notebook - D. Wilden Beck and Lee F. Braithwaite 3rd. edition. 1968.



Posterior view of squid *Loligo pealeii*.
Invertebrate Zoology - Laboratory Notebook - D. Elden Beck and Lee F. Braithwaite 3rd edition. 1968.

You will be responsible for learning the internal anatomical structures listed below. Please refer to the diagram on the following page.

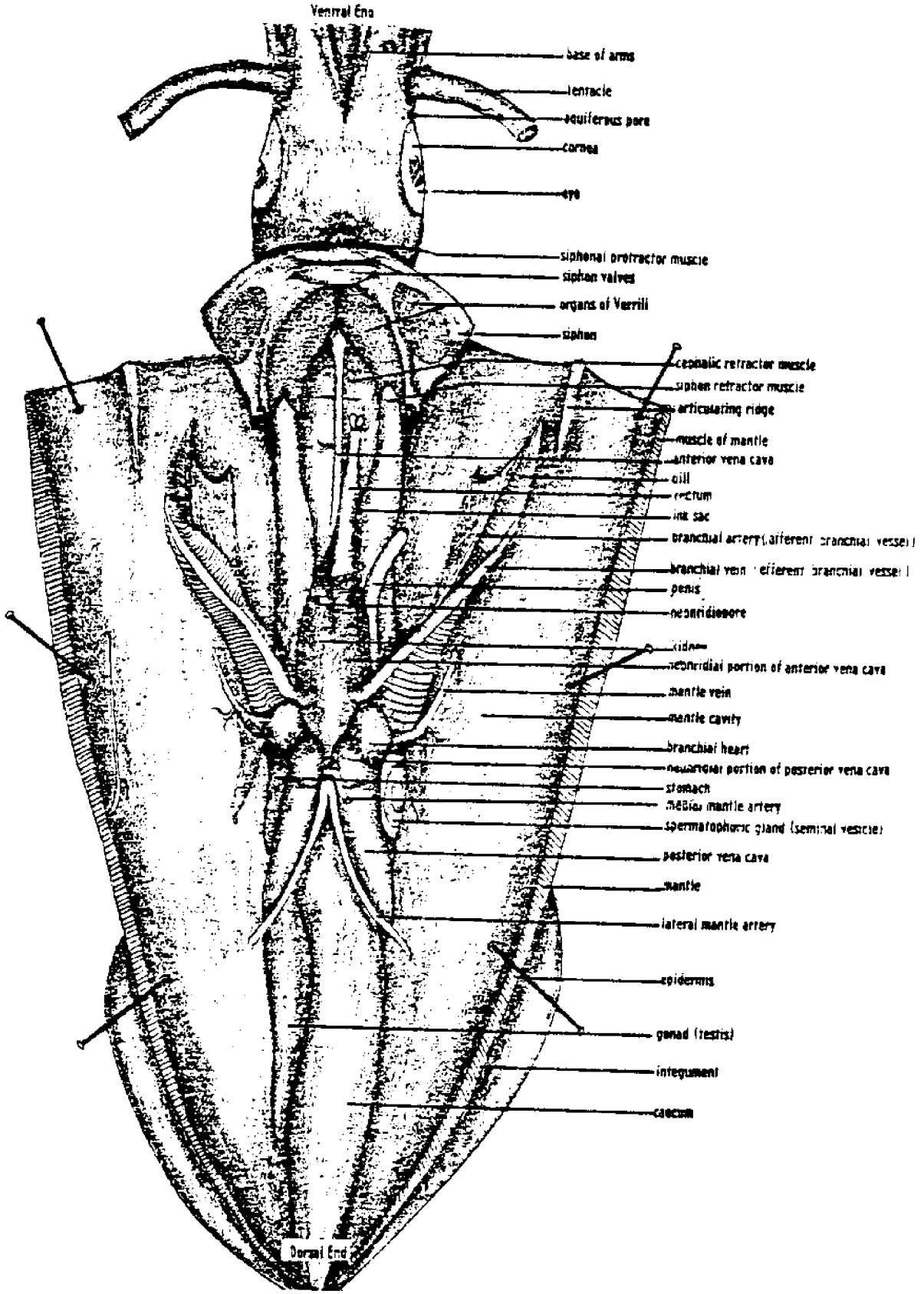
CAECUM

INK SAC

KIDNEY

MANTLE

SIPHON



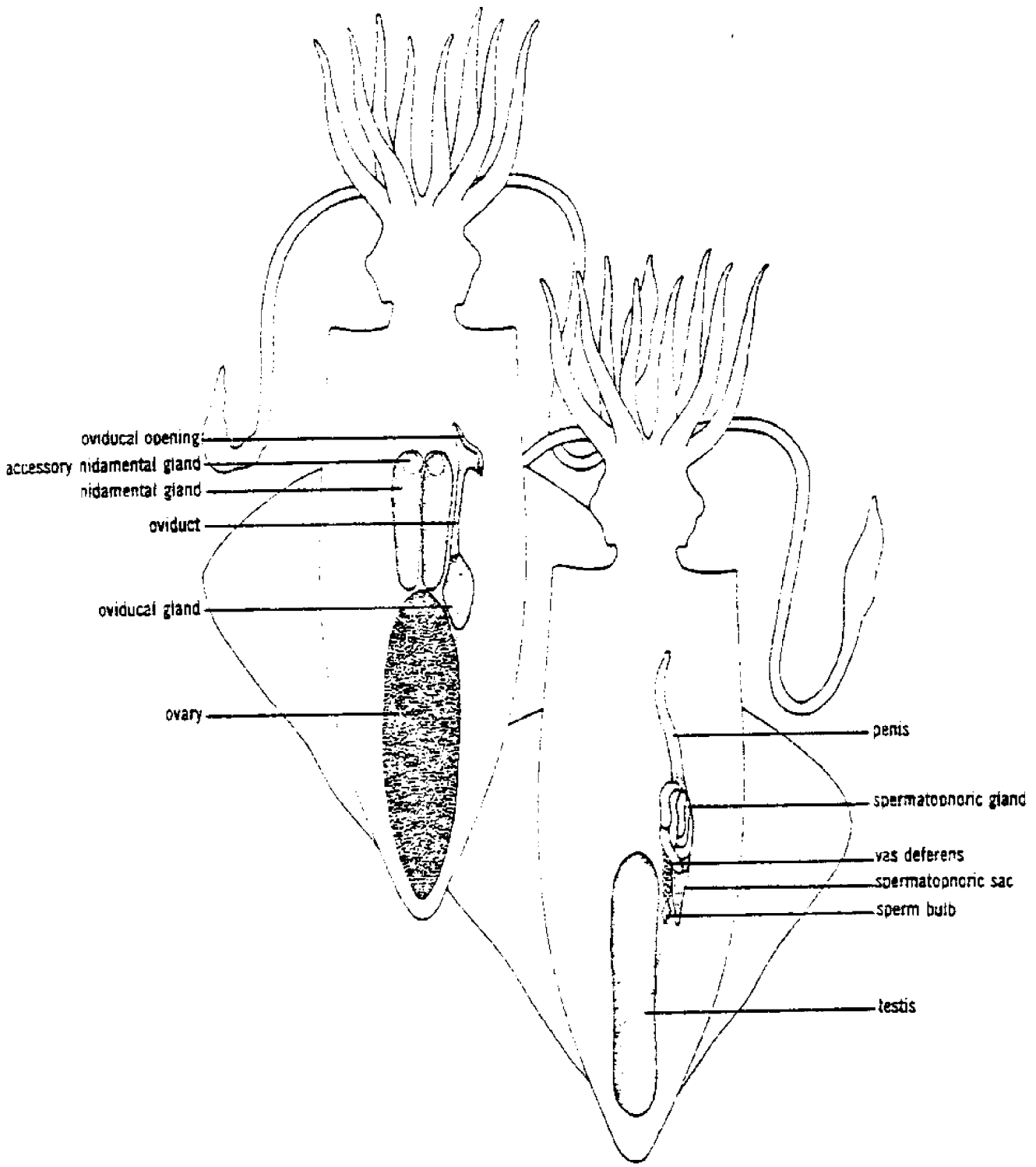
Loligo pealeii. Posterior view of the anatomy in the mantle cavity. Invertebrate Zoology - Laboratory Notebook - D. Elden Beck and Lee F. Braithwaite. 3rd edition. 1968.

REPRODUCTION - SQUID

Squid spawn from September to May in inshore areas. The sperm of the male is contained in large spermatophore packets. The male transfers the sperm packet to the mantle of the female with a special modified arm. The eggs hatch within one month.

Below is a list of the male and female reproductive organs of the squid of which you should become familiar. Please refer to the diagram on the next page.

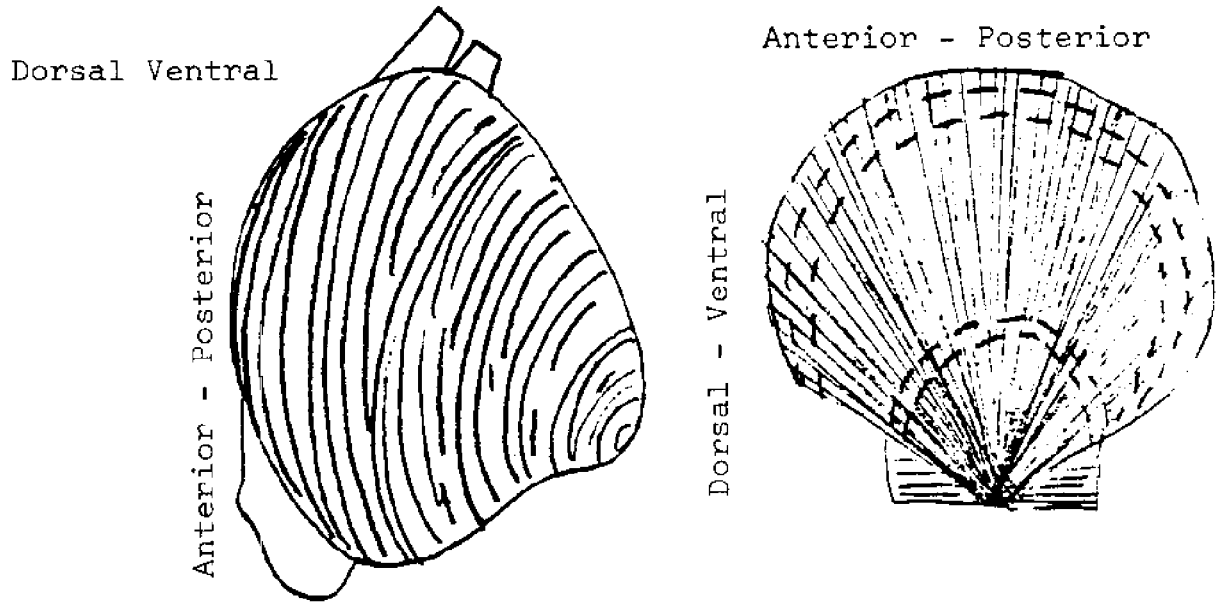
MALE	FEMALE
Testis	Ovary
Spermatophoric sac	Oviductal gland
Spermatophoric gland	Oviduct
Sperm bulb	Nidamental gland
Penis	Accessory nidamental gland
Vas deferens	



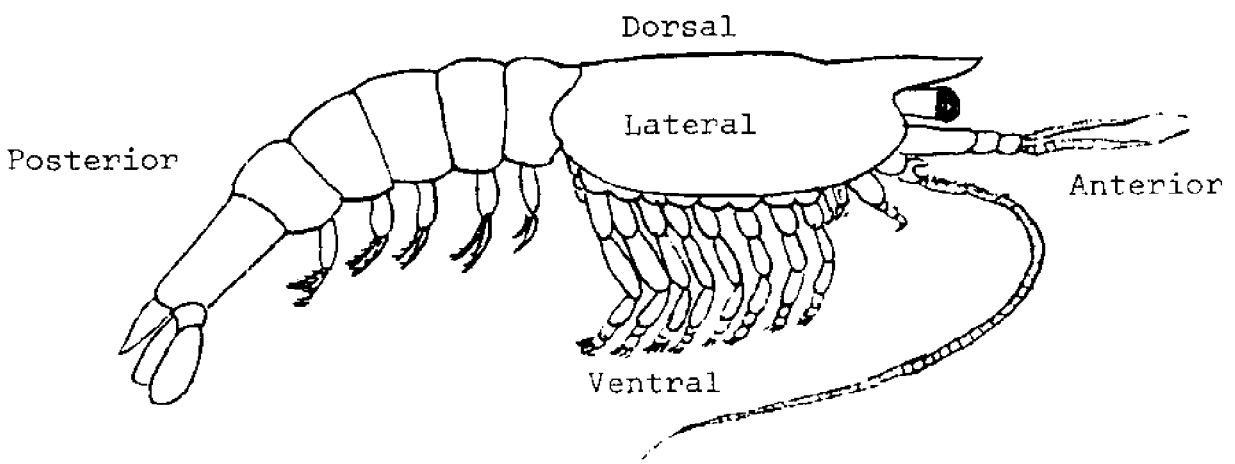
Loligo pealeii. A. Female reproductive system. B. Male reproductive system.
Invertebrate Zoology - Laboratory Notebook - D. Elden Beck and Lee F. Braithwaite 3rd edition. 1968.

EXTERNAL ANATOMY OF INVERTEBRATES

In the bivalve mollusc, we measure the ANTERIOR - POSTERIOR plane parallel to the hinge of the valves. The DORSAL-VENTRAL plane is designated that which is perpendicular to the hinge. LATERAL would refer to the greatest flat plane of the valves.



In crustaceans, ANTERIOR refers to the frontal region, POSTERIOR is designated as the tail region; DORSAL refers to the back and VENTRAL refers to the underside area. The LATERAL region of the animal denotes the sides.



CLASSIFICATION OF MARINE FISH

Fish belong to the phylum of the animal kingdom known as Chordata, which denotes the possession of a notochord at some time in the life cycle. They are also classified as Vertebrates having a jointed backbone.

Fish can be further differentiated into three classes:

1. Agnatha - jawless, with sucking mouths, no paired fins and no bony skeleton. (lampreys, hagfish)
2. Chondrichthyes - possess jaws, paired fins and cartilagenous skeletons. (Sharks, rays, skates, chimaeras)
3. Osteichthyes - (Teleosts), possess jaws, paired fins, and bony skeletons. (The remainder of the fish species)

There are many diverse forms of fish, in all encompassing over 21,000 species. Of the three classes mentioned above, we will concern ourselves with the latter two. These two groups of fish, the cartilagenous and teleosts are considered important in the commercial fishing enterprises. The teleosts or bony fish will by far occupy most of our concern in this curriculum.

Bony fish can be further subdivided into groups according to habitat and lifestyle. Each species represents the product of evolution through natural selection - an integrated genetic pattern that through generations has conformed to a particular lifestyle or "niche" in the marine environment.

As a result, marine fish have developed to be four times as diverse as fresh water species.

The following terms can be used to classify marine fish according to habitat and lifestyle:

PELAGIC - organisms that live in the open sea, above the benthos such as mackerel and tuna.

DEMERSAL - swimming organisms that prefer to spend most of their time at or near the bottom, such as flatfish and shrimp.

BENTHIC - organisms that live on or in the bottom, such as the quahog and lobster.

We can also classify marine fish and other organisms according to their mode of feeding:

HERBIVORE - consumes plant material such as phytoplankton, algae, and seaweeds; has small gullet, gill rakers used for filtering food, digestive enzymes for the breakdown of carbohydrates, a large intestinal surface, i.e. pyloric caeca.

CARNIVORE - consumes animal material such as fish invertebrates and mammals; has a large gullet, gill rakers are small and ineffectual, large acid stomach for digestion of protein, small intestinal surface.

OMNIVORE - consumes both plant and animal material.

PLANKTON-FEEDER - consumes zooplankton and phytoplankton; gill rakers used for filtering plankton.

Fish and invertebrates belong to more than one of the groups mentioned above during various stages in their life-cycles.

NOMENCLATURE

Whereas common or colloquial names of a species may vary from one geographical or cultural place to another, the scientific names of fish and invertebrates for the most part remain constant. The scientific name of an organism serves to differentiate it as a unique entity.

The scientific name is of little use to a fisherman, however, biologists and scientists must be able to properly classify an organism for referencing and reporting procedures. For example,

Atlantic Herring - Clupea harengus
Hickory Shad - Alosa mediocris
Alewife - Alosa pseudoharengus
Blueback Herring - Pomolobus aestivalis
Round Herring - Etrumeus sadina
Thread Herring - Opisthonema oglinum
Shad - Alosa sapidissima

are all called Herring!

The scientific name is useful when the many regional names of a species is not known and for communicating with a foreign person. In this latter respect, it is truly a universal language.

The scientific name is composed of two parts, the generic and specific names. Sometimes a subspecies name is also included, as well as the name of the first descriptor in parenthesis. The words are latinized, and are often descriptive of a significant feature, or honor a persons surname.

The names and rules for designation of a species name are governed by the International Code of Zoological Nomenclature.

A scientific species name is always underlined in typescript and italicized in print. The generic name is always capitalized; the specific is never capitalized.
Example: Genus species

Organisms are most often identified from their structure on the basis of their external characteristics. Keys, descriptions, diagrams, photos and pictures are all useful in the identification process. We will make use of all these methods in our training.

We will endeavor to focus upon the common names of species. Although rote memorization of scientific names will not be required, it is hoped that through practice most will be learned. The student will soon realize the benefits of a familiarity with the scientific, common and colloquial, especially in communication with colleagues and foreign and domestic fishermen.

NORTHWEST ATLANTIC SPECIES - FISH

The following is a list of selected common species of the Northwest Atlantic Region. It includes the common, colloquial and scientific names.

I. SHARKS

Chain Dogfish - Scyliorhinus retifer
Spiny Dogfish - (dogfish, piked dogfish, grayfish) - Squalus acanthias
Smooth Dogfish - (smooth dog, smooth hound, grayfish) - Mustelus canis
Brown Shark - (sand bar shark) - Carcharhinus milberti
Hammerhead - Sphyrna zygaena
Mackerel - (porbeagle, blue dog) - Lamna nasus
Mako - Isurus oxyrinchus
White Shark - (maneater) - Carcharodon carchias
Sand Shark - (dogfish, shark, ground shark) - Carcharias tauru
Blue Shark - (blue dog) Prionace glauca
Dusky Shark - Carcharhinus obscurus

II. SKATES

Barndoor Skate - Raja laevis
Thorny Skate - (starry skate) - Raja radiata
Winter Skate - (big skate, spotted skate, eyed skate) - Raja ocellata
Little Skate - (common skate, summer skate, hedgehog skate, tobacco box) - Raja erinacea
Smooth Skate - (smooth tailed, prickly skate) - Raja senta

III. EEL AND EEL SHAPED FISHES

Cusk - (tusk, torsk) - Brosme brosme
Atlantic Wolffish- (catfish, ocean whitefish) Anarhichas lupus
Ocean Pout - (eelpout, congo eel, muttonfish) Macrozoarces americanus
Sand Launce - (sand eel, launce, lant) - Ammodytes americanus
Fawn Cusk Eel - Lepophidium cervinum

American Eel - (silver eel, fresh-water eel, elver (young) - Anguilla rostrata
Conger Eel - (American conger, sea eel) - Conger oceanica
Rock Eel - Pholis gunnellus
Wrymouth - (congo eel, bastard cusk, ghostfish) - Cryptocanthodes masculatus
Spotted Wolffish- (spotted catfish) - Anarhichas minor

IV. HERRING FAMILY

Atlantic Herring - (sea herring, labradore herring, sardine, sperling, brit) - Clupea harengus
Round Herring - Etrumeus teres
Atlantic Menhaden - (pogy, bunker, mossbunker, fat back) - Brevoortia tyrannus
Hickory Shad - (fall herring, shad herring) - Alosa mediocris
American Shad - Alosa sapidissima
Blueback Herring - (glut herring, summer herring, blackbelly, kyack) - Alosa aestivalis
Alewife - (gaspereau, sawbelly, kyack, branch herring, fresh-water herring, grayback, bucky) - Alosa pseudoharengus

V. SMELT AND ANCHOVY-SHAPED FISHES

Anchovy - (whitebait) - Anchoa mitchilli
Striped Anchovy - Anchoa hepsetus
Atlantic Silverside - (green smelt, sand smelt, whitebait, capelin, sperling, shiner) - Menidia menidia
Waxen Silverside - Menidia beryllina
Smelt - (salt-water smelt) - Osmerus mordax
Argentine - (herring smelt) - Argentina silus
Capelin - Mallotus villosus

VI. COD FAMILY

Atlantic Cod - (rock cod) Gadus morhua
Haddock - Melanogrammus aeglefinus
Atlantic Tomcod - (frostfish) - Microgadus tomcod
Pollock - (boston bluefish, coalfish(G. Britain) green cod (G. Britain) - Pollachias virens

Cusk - (tusk, torsk) - Brosme brosme
Silver Hake - (whiting, New England hake) - Merluccius bilinearis
Offshore Hake - Merluccius albidus
Spotted Hake - Urophycis regius
Longfin Hake - Urophycis chesteri
White Hake - (Boston hake, black hake, mud hake, hake, ling) - Urophycis tenuis
Red Hake - (squirrel hake) - Urophycis chuss
Blue Hake - Antimora rostrata
Four-Bearded Rockling - (rockling) - Enchelyopus cimbrius

VII. PERCH-LIKE FISHES

Tilefish - Lophalatilus chamaeleonticeps
Redfish - (ocean perch, rosefish, red sea perch, red bream, Norway haddock) - Sebastes marinus
Blackbelly Rosefish - (red bream, blue mouth) - Helicolenus dactylopterus
Scup - (porgy) - Stenotomus versicolor
Cunner - (perch, sea perch, blue perch, bergall, chogset, choggie) - Tautogolabrus adspersus
Tautog - (blackfish, white chin) - Tautoga onitis
Black Sea Bass - (sea bass, blackfish) - Centropristes striatus
Striped Bass - (striper, rockfish, rock, linesides) - Morone saxatilus
Bluefish - (snapper, skipjack, baby blues) - Pomatomus saltatrix
Weakfish - (squeteague, sea trout, gray trout) - Cynoscion regalis
White Perch - (sea perch) - Morone americana
Northern Kingfish - (king whiting, minkfish, whiting) - Menticirrhus saxatilus
Spot - (lafayette) - Leiostomus xanthurrus

VIII. SCULPINS AND SEA ROBINS

Sea Raven - (red sculpin, sea sculpin, raven, king o' Norway) - Hemitripterus americanus
Longhorn Sculpin - (gray sculpin, hacklehead, toadfish) - Myoxocephalus octodecimspinosus
Northern Searobin - (common searobin, sea robin, robin, green-eye) - Prionotus carolinus
Striped Searobin - Prionotus evolans

Little Sculpin - (grubby) - Myoxocephalus aeneus
Shorthorn Sculpin - (daddy sculpin, black sculpin, greenland sculpin) - Myoxocephalus scorpius
Armored sea robin - Peristedion miniatum

IX. FLATFISH

Atlantic Halibut - Hippoglossus hippoglossus
Canadian Dab - (Canadian plaice, long rough dab, american plaice) - Hippoglossus platessoides
Witch Flounder - (gray sole, craig fluke, pole flounder) - Glyptocephalus cynoglossus
Winter Flounder - (blackblack, Georges Bank Flounder, sole, flatfish, rough flounder, lemon sole, flounder, mud dab, black flounder) - Pseudopleuronectes americanus
Yellowtail Flounder - (rusty flounder) - Limanda ferruginea
Windowpane Flounder - (sand flounder, spotted flounder, New York plaice, sand dab, spotted turbot) - Scopthalmus aquosus
Fourspot Flounder - (stinkfish) - Paralichthys oblongus
Gulf Stream Flounder - Citharichthys artifrons
Summer Flounder - (flounder, fluke, plaicefish) - Paralichthys dentatus
Hogchoker - (American sole) - Trinectes maculatus

X. MACKEREL FAMILY

Atlantic Mackerel - Scomber scombrus
Chub Mackerel - (hardhead, bullseye) - Scomber japonicus
Spanish Mackerel - Scomberomorus maculatus
King Mackerel - (kingfish) - Scomberomorus regalis
Bonito - (bonito, skipjack, horse mackerel) - Sarda sarda
Blue Fin Tuna - (tuna, horse mackerel, great albacore, tunny, albacore) - Thunnus thynnus

XI. BILLFISHES

Swordfish - (broadbill) - Xiphias gladius
Blue Marlin - (skilligalee) - Makaira ampla

White Marlin - Makaira albida
Silver Gar - (billfish, salt-water gar, sea pike) - Tylosurus marinus
Garfish - Ablennes hians
Atlantic Saury - (needlefish, billfish, skipper, saury) - Scomberesox saurus
Halfbeak - (skipjack) - Hyporhamphus unifasciatus

XII. MISCELLANEOUS

Butterfish - (dollarfish, shiner, skipjack, sheepshead, harvestfish) - Peprilus triacanthus
American Goosefish - (monkfish, angler, allmouth, molligut, fishing frog, mollikike) - Lophius americanus

NORTHWEST ATLANTIC SPECIES - INVERTEBRATES

I. CEPHALOPODS

Long-finned Squid - (common squid) - *Loligo pealei*
Short-finned Squid - (northern, summer squid) - *Ilex illacebrosus*

II. BIVALVE MOLLUSCS

Quahog - (little-neck clam, hard-shelled clam) - *Mercenaria mercenaria*
Black Quahog - (deep-sea quahog) - *Arctica islandica*
Surf Clam - (hen clam) - *Spisula solidissima*
Deep-Sea Scallop - *Placopecten magellanicus*
Iceland Scallop - *Chlamys islandica*
Bay Scallop - *Aequipecten irradians*
Eastern Oyster - *Crassostrea virginica*
Blue Mussel - (common mussel) - *Mytilus edulis*

III. CRUSTACEANS

Atlantic Lobster - (northern lobster) - *Homarus americanus*
Jonah Crab - (northern rock crab) - *Cancer borealis*
Rock Crab - *Cancer irroratus*
Blue Crab - *Callinectes sapidus*
Red Crab - *Geryon quinquedens*
Northern Shrimp - *Pandalus borealis*

GEOGRAPHIC RANGE, SIZE AND ABUNDANCE

The following information is from the National Marine Fisheries Service Observer Manual. It should be kept in mind that the length and weight given for each species is the maximum recorded. Most individuals will be smaller; therefore, mature specimens will be between 1/2 and 3/4 the length given.

SHARKS AND SKATES

Chain dogfish
Southern New England to North Carolina
17 inches (a small shark)
Scarce and in deeper water (40-125 fathoms)

Spiny dogfish
Canada to Carribean Sea
4 feet (a medium size shark)
Very abundant, often get 1,000 lbs. or more/tow

Sandbar shark
Southern New England to South America
8 feet (a fairly large shark)
Occasionally caught in a trawl off New Jersey and New York

Smooth dogfish
Southern New England to South America
5 feet (a medium size shark)
Second most abundant shark, after spiny dogfish, in southern New England

Barndoor skate
Canada to North Carolina
5 feet (largest skate in our area)
Least numerous skate on Georges Bank and in the Gulf of Maine

Smooth skate
Canada to South Carolina
2 feet (medium size skate)
Common on Georges Bank and in the Gulf of Maine

Thorny skate
Canada to New York
3 feet (medium size skate)
Common on Georges Bank and in the Gulf of Maine

Winter skate
Canada to North Carolina
3 1/2 feet (medium large skate)
Second most abundant skate, after little skate, on Georges Bank and in the Gulf of Maine, much less numerous in southern New England and farther south

Little skate
Canada to Virginia
1 3/4 feet (medium size skate)
Most abundant skate on Georges Bank, Gulf of Maine, and southern New England

EELS AND EEL-SHAPED FISH

Cusk
Canada to southern New England
3 1/2 feet, 27 lbs.
Moderately common on Georges Bank and in the Gulf of Maine

Sand lance
Canada to North Carolina
7 inches
Common on Georges Bank and southern New England
(sand eel is another common name)

Atlantic wolffish
Canada to Delaware
5 feet, 40 lbs.
Has large teeth like a dog or wolf (Ocean catfish is market name)

Ocean pout
Canada to Delaware
3 1/2 feet, 12 lbs.
Has two rows of blunt teeth and big fleshy lips

Fawn cusk-eel
Southern New England to Florida
11 inches
Found in deeper water (38-102 fathoms)

Conger eel
Southern New England to South America
7 feet
From near shore out to deep water

American eel
Canada to Gulf of Mexico
3 1/2 feet
Found in fresh water, estuaries and in salt water close to land. Not found in water more than a few feet deep

HERRING FAMILY

Round herring
Southern New England to the Gulf of Mexico
10 inches

Atlantic menhaden
Canada to Florida
20 inches
In the Gulf of Maine menhaden are very abundant some summers, while in other summers it is rare. Not in the Gulf of Maine during colder half of year. Very abundant all year long from southern New England to North Carolina

Atlantic herring
Canada to North Carolina
17 inches
Abundant in the Gulf of Maine, Georges Bank and in southern New England. A few occur as far south as North Carolina in winter

Hickory shad
Southern New England to Florida
24 inches
Hickory shad is most easily confused with American shad - both species have a row of approximately 6 spots coming back from the gill cover, whereas blueback herring and alewife have only one black spot. American shad is common on Georges Bank and the Gulf of Maine while hickory shad is rare in these areas. Both species are common in the area from southern New England to Florida

American shad
Canada to Florida
30 inches, 8-9 lbs.
Common all the way from the Gulf of Maine to Florida

Blueback herring
Canada to Florida
14 inches

Alewife
Canada to North Carolina
14 inches
Alewife is difficult to distinguish from blueback herring. In the Gulf of Maine and on Georges Bank the alewife is more abundant than the blueback. The blueback herring is about equal to alewife in numbers from southern New England to North Carolina

SMELT AND ANCHOVY-SHAPED FISHES

Atlantic argentine
Canada to Georges Bank
18 inches
Deep water, 30 fathoms or more

Rainbow smelt
Canada to Virginia
12 inches
Close to shore, never caught deeper than 10 fathoms

Bay anchovy
Southern New England to Texas
3 1/2 inches
Close to shore

Atlantic silverside
Canada to Delaware
5 1/2 inches
Close to shore, usually in a fathom or less during summer

COD FAMILY

Cusk
Canada to New Jersey, but rare in southern New England and south of there
3 1/2 feet and about 27 lbs.

Haddock
Canada to North Carolina
44 inches, 37 lbs.
Abundant
Color is whitish-gray

Pollock
Canada to New Jersey
42 inches, 35 lbs.
Common
Color is dark blue on the back and sides

Atlantic cod
Canada to North Carolina
Over 6 feet, over 200 lbs.
Abundant
Body is covered with numerous brown spots

Atlantic tomcod
Canada to Virginia
15 inches
Only near shore

Silver hake
Canada to North Carolina
30 inches, 5 lbs.
Abundant from shoreline to 500 fathoms

Offshore hake
Georges Bank to at least North Carolina
30 inches, 5 lbs.
Common in 100 fathoms or more
Very difficult to distinguish from silver hake without looking at gill rakers

Spotted hake
Southern New England to Florida
16 inches, 1 1/2 lbs.

Longfin hake
Canada to North Carolina
15 inches
Deep water, abundant between 100 and 500 fathoms

White hake
Canada to North Carolina
4 feet, 40 lbs.

Red hake
Canada to Virginia
30 inches, 7 lbs.
Difficult to distinguish red from white hake, without counting scales or gill rakers but with practice you can separate them by relative scale size

PERCH-LIKE FISH

Tilefish
Canada to Virginia
42 inches, 35 lbs.
45 fathoms and deeper; common in southern New England at appropriate depths
Brilliant color: yellow spots on body, yellow strips on fins. Blues and reds on various parts of body

Redfish
Canada to Georges Bank
32 inches, 20 lbs. Most are less than 16 inches.
Usually in deep gullies and at the edge of banks in 60 to 350 fathoms. Very abundant

Blackbelly rosefish
Georges Bank to Virginia
13 inches. Most are less than 8 inches
Deeper water (over about 70 fathoms)

Scup
Canada to North Carolina, rare in the Gulf of Maine and Georges Bank
18 inches, 4 lbs.
Common from southern New England to North Carolina

Black seabass
Canada to Florida, rare in the Gulf of Maine and never on Georges Bank
2 feet, 7 1/2 lbs.
Common from southern New England to North Carolina
Spend winter offshore between 30-70 fathoms.
Spend summer inshore in less than 20 fathoms.

Cunner
Canada to Virginia
17 inches, 3 1/4 lbs.
Common nearshore, and a few strays get offshore, to depths as great as 70 fathoms

Tautog
Canada to North Carolina
3 feet, 22 lbs.
Dark fish with mottled sides; white chin in large fish.
Northward from Cape Cod - common inshore 30-60 ft.
Southward - 10-13 fathoms on Cholera Bank, 10-12 miles off Long Island, Seventeen Fathom Bank, 8 miles off northern New Jersey

Bluefish
Canada to South America
3 1/2 feet, 27 lbs.
Abundant from southern New England to North Carolina. In some summers it is common in the Gulf of Maine. Found near shore, not found on Georges Bank

Striped bass
Canada to Florida
6 feet, 125 lbs.
Only near shore, Abundant from southern New England to North Carolina

White perch
Canada to South Carolina
15 inches, 2 lbs.
Only near shore, usually in less than 2 fathoms

Northern kingfish
Gulf of Maine to Florida
17 inches, 3 lbs.
Near shore. Common from southern New England to Virginia, rare in the Gulf of Maine

Weakfish
Canada to Florida
Over 3 feet, over 12 lbs.
Common inshore from southern New England to North Carolina. Absent from Gulf of Maine in recent years. Not found on Georges Bank

Spot
Southern New England to Texas
14 inches, less than 1 1/2 lbs.
Abundant between Virginia and North Carolina

SCULPINS AND SEAROBINS

Sea raven
Canada to Chesapeake Bay
About 2 feet, 7 lbs.
From shore out to about 50 fathoms. Less common than longhorn sculpin on Georges Bank and the Gulf of Maine. Belly usually bulging with water when trawled.

Longhorn sculpin
Canada to Virginia
18 inches
Common out to 50 fathoms in the Gulf of Maine and on Georges Bank. When caught it spreads its gill cover spines and dorsal fin spines making it painful to pick up

Northern searobin
Canada to North Carolina
16 inches, 1 3/4 lbs.
Common in southern New England, rare on Georges Bank and in the Gulf of Maine

Striped searobin
Gulf of Maine to South Carolina
18 inches
Common in shallow water from New York south. Rare in the Gulf of Maine, not on Georges Bank

FLATFISH

American plaice
Canada to southern New England
About 2 2/3 feet, 14 lbs.
One of the two most numerous flatfish (with witch flounder) in the moderately deep water of the Gulf of Maine. Abundant in water deeper than about 40 fathoms. Not many are found in water shallower than about 15 fathoms

Atlantic halibut
Canada to Virginia
Over 8 feet, 400 lbs.
Thick body (looks wellfed) and very white blind side are two characteristics shared with summer flounder. Therefore, these two species may be confused with each other. Shape of tail's margin readily separates the two species (concave margin for halibut, convex margin with a midline peak for summer flounder)

Yellowtail flounder
Canada to Virginia
25 inches
Medium weight body. Most likely to be confused with winter flounder. However, the yellowtail body is not as thick. Base of tail on blind side is yellow

Witch flounder
Canada to North Carolina
25 inches
Thin body (looks underfed). One of the two most numerous flatfish (with American plaice) in the moderately deep water of the Gulf of Maine. Abundant from about 60 to 150 fathoms. Not many are found in water shallower than 10 fathoms

Winter flounder
Canada to North Carolina
25 inches, 8 lbs.
Thick body (looks wellfed). Most likely to be confused with yellowtail flounder. However, winter flounder's body is thicker. Base of the caudal peduncle on blind side may be yellowish or pure white.

Gulfstream flounder
Georges Bank to South Carolina
7 inches
Usually in water deeper than about 40 fathoms, Rare on Georges Bank

Windowpane
Canada to North Carolina
17 inches
Shallow water fish, from nearshore out to about 40 fathoms. Very thin body (looks underfed)

Fourspot flounder
Georges Bank to North Carolina
16 inches
Medium weight body. Abundant from southern New England to Delaware Bay

Summer flounder
Gulf of Maine to South Carolina
37 inches, 26 lbs.
Common from southern New England to North Carolina. Thick body (looks wellfed) and very white blind side are two characteristics shared with Atlantic halibut. Therefore, these two species may be confused with each other. Shape of the tail's margin readily separates the two species (convex margin with a midline peak for summer flounder, concave margin for halibut)

MISCELLANEOUS SPECIES

Butterfish
Canada to South Carolina
12 inches, 1 1/4 lbs.

Atlantic mackerel
Canada to North Carolina
22 inches, 4 lbs.

Atlantic saury
Canada to West Indies
17 inches
Abundant south of Cape Cod

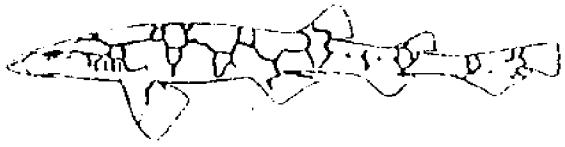
Goosefish
Canada to South America
4 feet, 60 lbs.

Identification Keys

As observer-trainees, you will be required to develop a knowledge and use of keys for identification of marine fish and invertebrates. Generally, identification keys are based on a dichotomous scheme; that of a yes-no or true-false method. Usually two descriptive choices of a particular anatomical structure are given. The appropriate one is chosen, and the investigator is directed by a number at the end of the line to the next question. At the conclusion of the questions, a species name is given. It is a good idea to then confirm the answer with the use of diagrams or pictures. We will make use of the keys from Fishes of the Gulf of Maine and Keys to Marine Invertebrates of the Woods Hole Region as well as the excellent key developed by the personnel at the Woods Hole Oceanographic Institute for the NMFS Observer Manual. The latter key has been included in this manual and may be found on the following pages.

SHARKS

A chain-like pattern of black stripes on back and sides

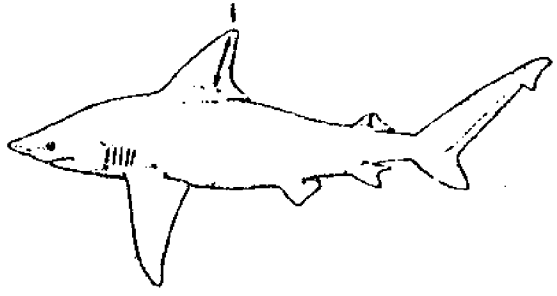


CHAIN DOGFISH *Scyliorhinus retifer* (Garman)

No chain-like pattern of black stripes

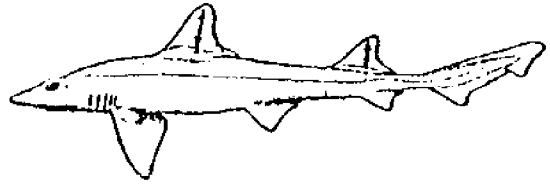
An anal fin. No spine in front of each dorsal fin

Second dorsal fin less than half as high as first dorsal fin. Occurs in vicinity of land.



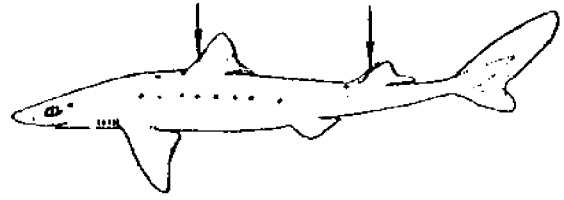
SANDBAR SHARK *Carcharhinus milberti* (Valenciennes)

Second dorsal fin nearly as high as first dorsal fin. Occurs in vicinity of land to offshore.



SMOOTH DOGFISH *Mustelus canis* (Mitchill)

No anal fin. A spine in front of each dorsal fin



SPINY DOGFISH *Squalus acanthias* Linnaeus

SKATES

No conspicuous thorns in middle of back, in area A. Lower surface has black dots or dashes

One or more rows of conspicuous thorns in middle of back. No black dots or dashes on lower surface

One or more rows of large thorns on top of rear 1/3 of tail

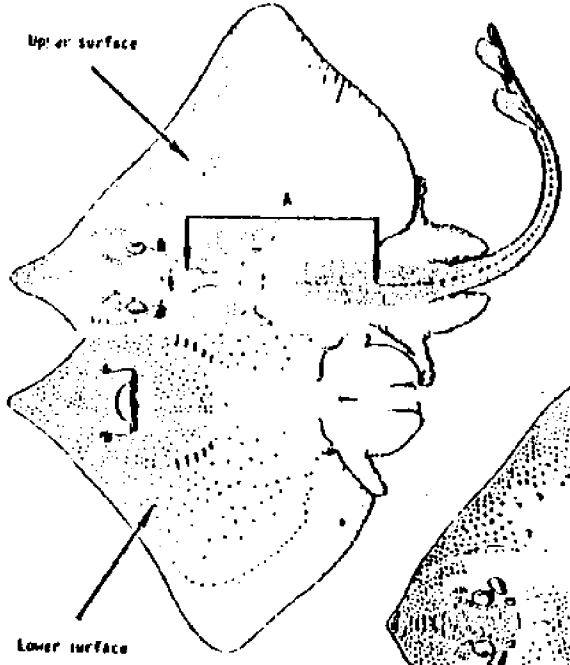
No large thorns on top of rear 1/3 of tail

A single row of thorns down the back and tail. These thorns are very large

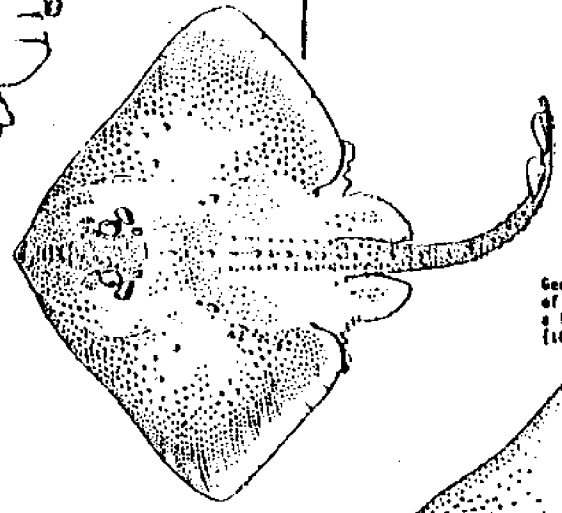
More than one row of thorns down the back and tail. These thorns are moderate size

Generally more than 80 rows of teeth in upper jaw. Grows to a length of about 43 inches (109 centimeters).

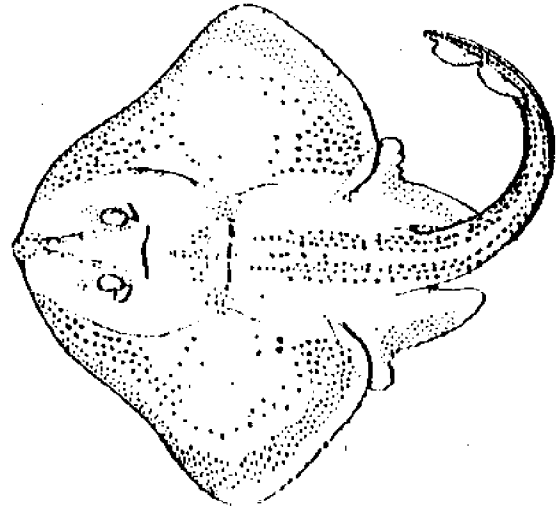
Generally less than 54 rows of teeth in upper jaw. Rarely exceeds length of about 21 inches (54 centimeters) or weight of 2 pounds.



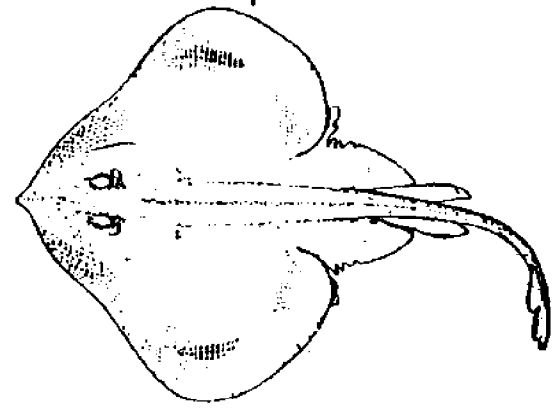
BARNDOOR SKATE *Raja laevis* Mitchill



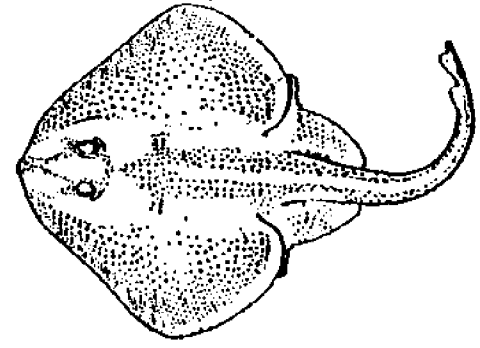
THORNY SKATE *Raja radiata* Donovan



WINTER SKATE *Raja ocellata* Mitchill



SMOOTH SKATE *Raja senta* Garman



LITTLE SKATE *Raja erinacea* Mitchill

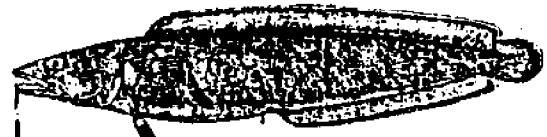
EELS AND EEL-SHAPED FISHES

Anal fin and caudal fin not separated by deep notch or gap

Anal fin and caudal fin separated by deep notch or gap

No ventral fins or chin barbel

Ventral fins and chin barbel present



CUSK *Brosme brosme* (Müller)

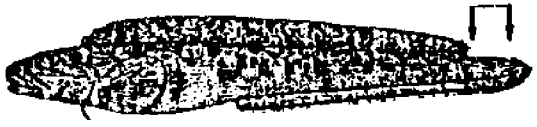
Snout pointed and no large canine teeth

SAND LANCE *Ammodytes* species

Snout rounded and large canine teeth present

ATLANTIC WOLFFISH *Anarhichas lupus* Linnaeus

Dorsal fin seems separated from caudal fin by a considerable gap



OCEAN POUT *Macrozoarces americanus* (Bloch and Schneider)

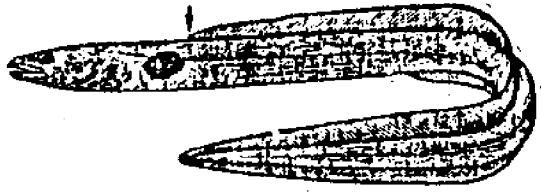
Dorsal, caudal, and anal fins form one continuous fin

No barbel-like fins on the throat, back is a solid color

Barbel-like fins on the throat; back covered with light spots

FAUN CUSK-EEL *Lepophidium cervinum* (Goode and Bean)

Dorsal fin begins above tips of pectoral fins. Adults found in vicinity of land to offshore



CONGER EEL *Conger oceanicus* (Mitchill)

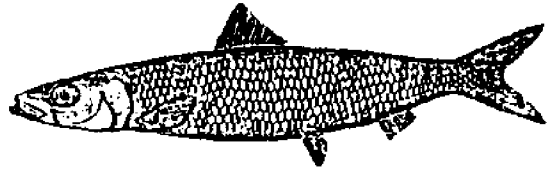
Dorsal fin begins far behind tips of pectoral fins. Adults almost always found in vicinity of land

AMERICAN EEL *Anguilla rostrata* (Lesueur)

HERRING FAMILY

Belly sharp edged

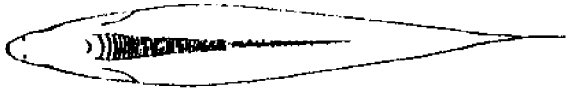
Belly rounded



ROUND HERRING *Etrumeus teres* (DeKay)

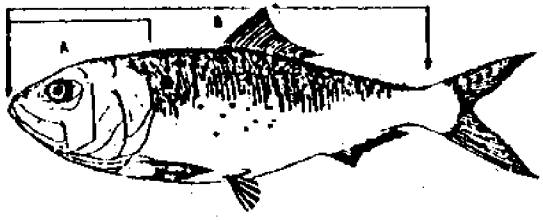
Two rows of distinctive scales along middle of back between head and dorsal fin. Head large, about 1/3 of body length to narrowest part of tail.

No rows of distinctive scales along middle of back between head and dorsal fin. Head smaller, about 1/4 or less of body length to narrowest part of tail.



Top view of fish to show scales

A = 1/3 B

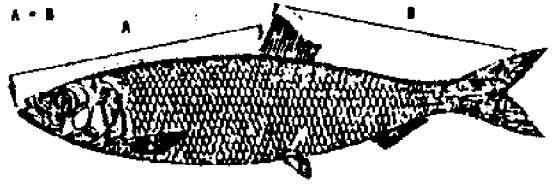


ATLANTIC MENHADEN *Brevoortia tyrannus* (Latrobe)

(A) much less than (B). Belly sawtoothed.

Distance from tip of lower jaw to start of dorsal fin (A) equals distance from start of dorsal fin to base of tail (B). Belly slightly sawtoothed.

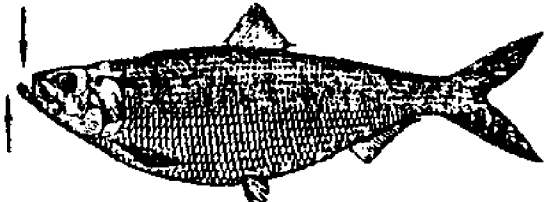
A = B



ATLANTIC HERRING *Clupea harengus* Linnaeus

Tip of lower jaw does not extend much beyond upper jaw when mouth closed

Tip of lower jaw extends beyond upper jaw when mouth is closed

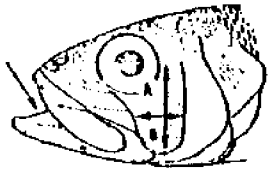


HICKORY SHAD *Alosa mediocris* (Mitchill)
(Hickory shad, p. 100)

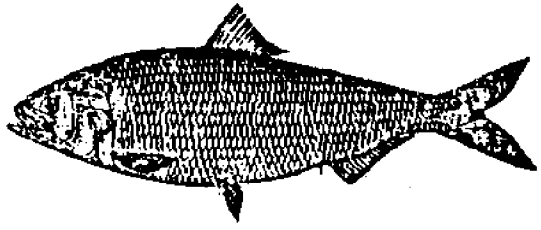
(continued on next page)

(continued from preceding page)

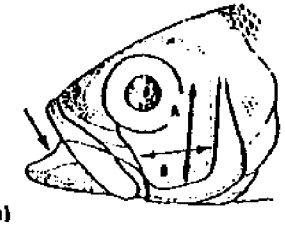
HERRING FAMILY (CONTINUED)



Upper outline of forward part of lower jaw nearly straight. Cheek bone much higher (A) than long (B)



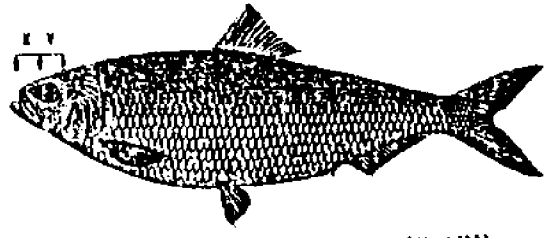
AMERICAN SHAD *Alosa sapidissima* (Wilson)



Upper outline of forward part of lower jaw with pronounced angle. Cheek bone only slightly higher (A) than long (B)

Eye width equal to distance from front of eye to tip of snout. Lining of belly cavity black or sooty. Back is blue-green

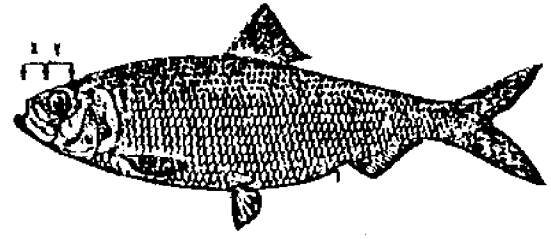
X = Y



BLUEBACK HERRING *Alosa aestivalis* (Mitchill)

Eye width greater than distance from front of eye to tip of snout. Lining of belly cavity pale gray. Back is gray-green

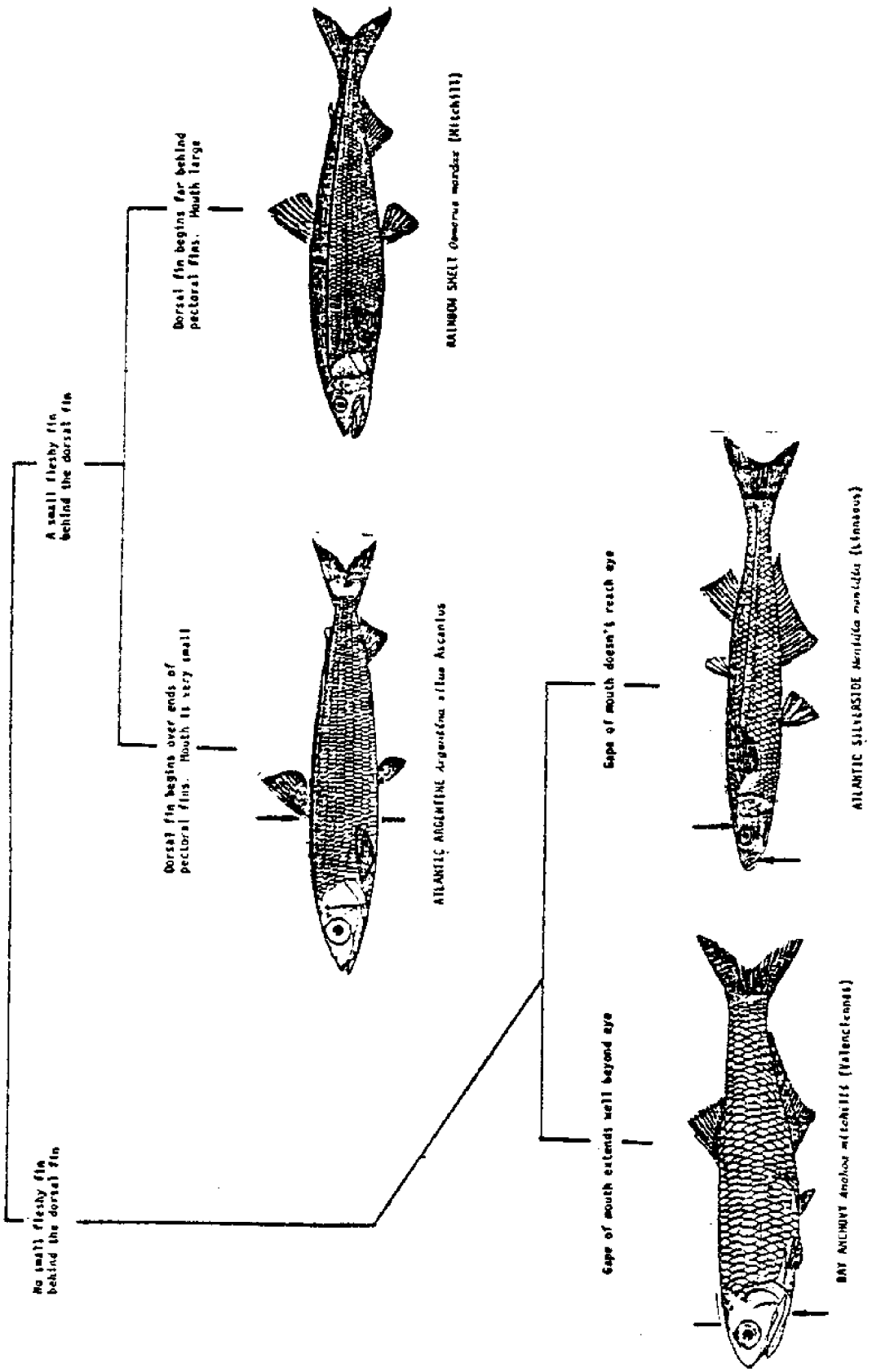
X < Y



ALEWIFE *Alosa pseudoharengus* (Wilson)

Note: One authority on herrings believes the amount of black in the lining of the belly cavity is an unreliable character for separating the blueback herring and alewife (S. F. Hildebrand, "Fishes of the Western North Atlantic, Part 3", p. 330). The usefulness of this character is therefore uncertain.

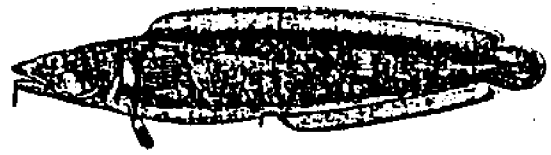
SMELT AND ANCHOVY-SHAPED FISHES



COD FAMILY I. ONE OR THREE DORSAL FINS

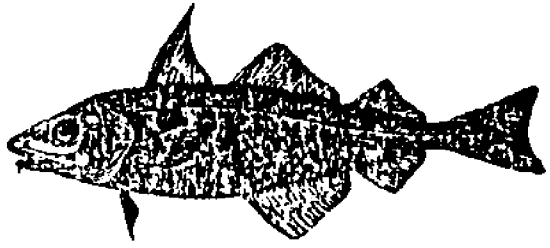
Three separate dorsal fins

One dorsal fin and one anal fin



COUSK *Brosme brosme* (Müller)

The lateral line is black; a black blotch on each shoulder

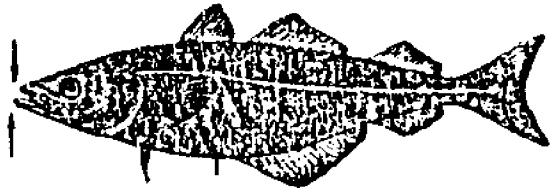


HADDOCK *Melanogrammus aeglefinus* (Linnaeus)

The lateral line is pale; there is no shoulder blotch

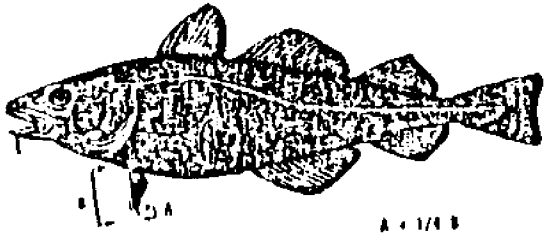
The upper jaw projects beyond the lower; the chin barbel is large

The lower jaw projects beyond the upper; the chin barbel is very small, if there is one



POLLOCK *Pollachius virens* (Linnaeus)

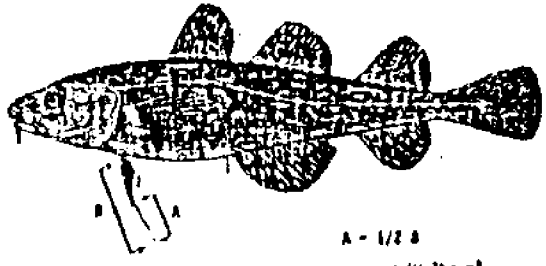
Filament of ventral fin less than one-fourth the total length of the fin. Tail square or concave



A = 1/4 B

ATLANTIC COD *Gadus morhua* Linnaeus

Filament of ventral fin about half the total length of the fin. Tail rounded. An inshore fish, seldom in water deeper than about 3 fathoms.



A = 1/2 B

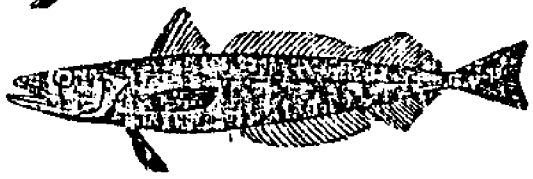
ATLANTIC TOMCOD *Microgadus tomcod* (Walbaum)

COD FAMILY II. TWO DORSAL FINS

The ventral fins are short and of ordinary form

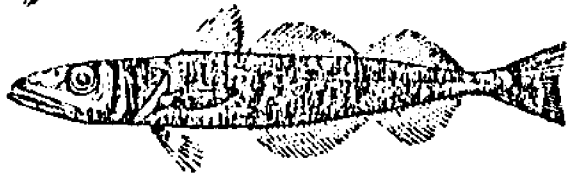
The ventral fins are very long and feeler-like

18-22 gill rakers on first gill arch (A).



SILVER HAKE *Merluccius bilinearis* (Mitchill)

9-11 gill rakers on first gill arch (A).



OFFSHORE HAKE *Merluccius albidus* (Mitchill)

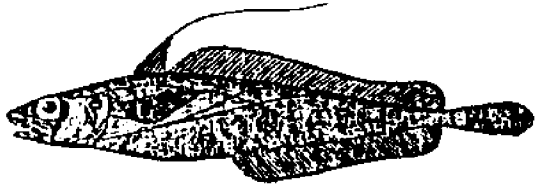
Lateral line is unbroken; front of first dorsal fin projects as a thread

Lateral line is broken up by white spots; first dorsal fin doesn't project as a thread

SPOTTED HAKE *Urophycis regius* (Walbaum)

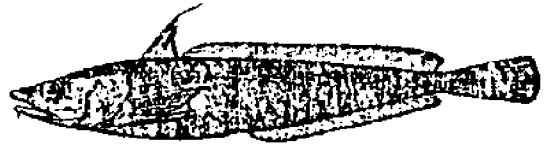
The ventral fins reach nearly or as far back as the rear end of the anal fin

The ventral fins do not reach back to the middle of the anal fin



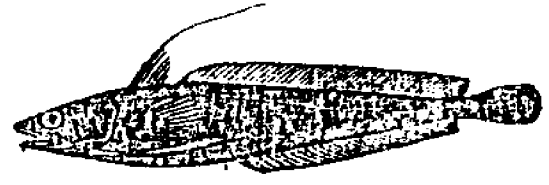
LONGFIN HAKE *Phycis chesteri* Goode and Bean

Two gill rakers on the upper segment of the first gill arch. Scales smaller (120 to 145 scales along the lateral line). Greyish or purplish in color. Often heavier than 4 pounds



WHITE HAKE *Urophycis tenuis* (Mitchill)

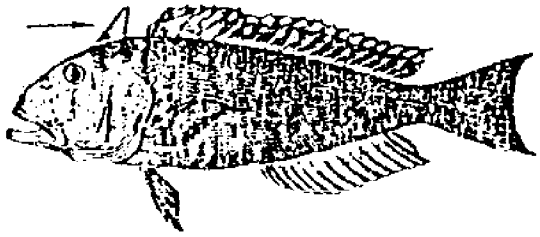
Three gill rakers on the upper segment of the first gill arch. Scales larger (95 to 117 scales along the lateral line). Brownish to bronze in color. Very rarely heavier than 4 pounds



RED HAKE *Urophycis chuss* (Walbaum)

PERCH-LIKE FISHES I. ONE DORSAL FIN

A large fleshy flap on top of head



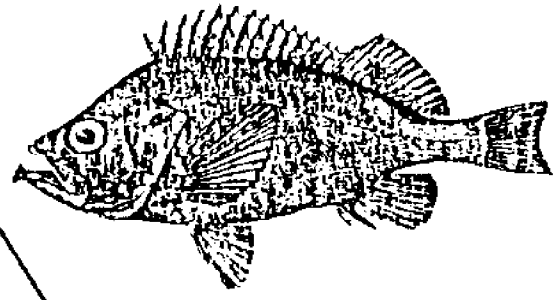
TILEFISH *Lopholatilus chamaeleonticeps* Goode and Bean

No large fleshy flap on top of head

Body neither red nor orange. No spines on cheeks. Eyes smaller

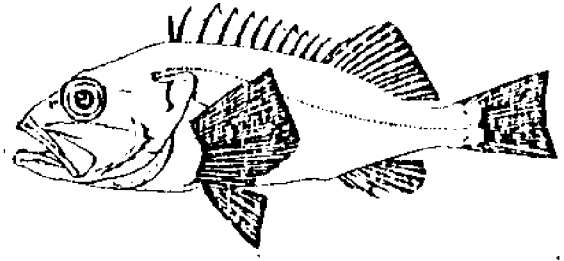
Body red; spines on cheeks; eyes larger

No black spot on dorsal fin. Color is scarlet vermilion red



REDFISH *Sebastes marinus* (Linnaeus)

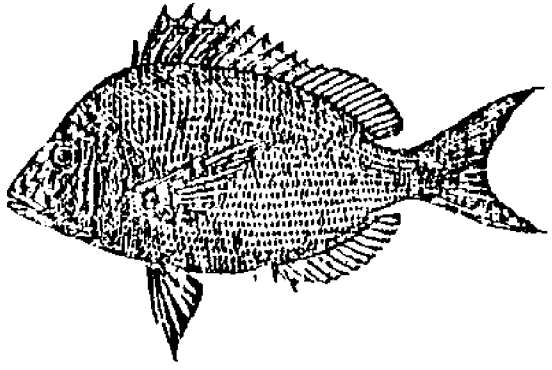
Black spot on dorsal fin. Color is golden orange



BLACKBELLY ROSEFISH *Helicolenus dactylopterus* (De la Roche)

Tail forked

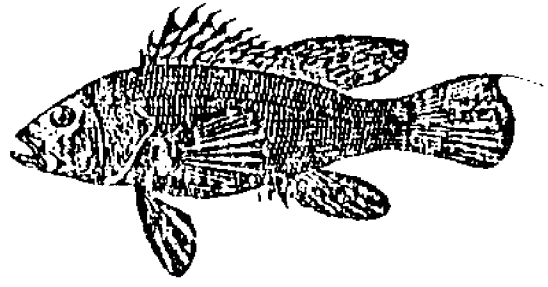
Tail rounded



SCUP *Stenotomus chrysops* (Linnaeus)

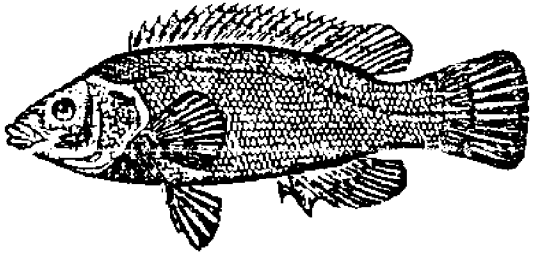
Start of pectoral fin is in front of start of ventral fin. Pectoral fin shorter, end of pectoral fin far in front of start of anal fin.

Start of pectoral fin is behind the start of ventral fin. Pectoral fin long, end of pectoral fin often reaches to start of anal fin



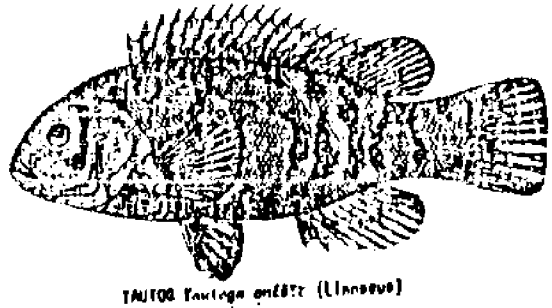
BLACK SEA BASS *Centropristis striata* (Linnaeus)

Scales on rear part of gill cover. Snout somewhat pointed. Profile of head rather flat



TAUTOG *Tautoga onitis* (Linnaeus)

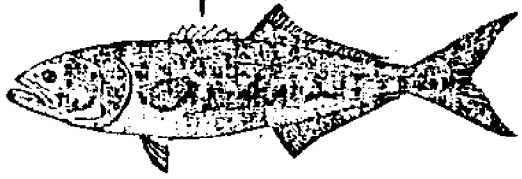
No scales on rear part of gill cover. Snout rounded. Profile of head rounded.



CUNNER *Tautogolabrus adspersus* (Walbaum)

PERCH-LIKE FISHES II. TWO DORSAL FINS

First dorsal fin is much lower than second dorsal



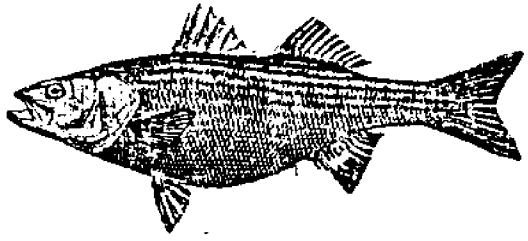
BLUEFISH *Pomatomus saltatrix* (Linnaeus)

First dorsal fin is as high or higher than second dorsal

Second dorsal fin about twice as long as anal

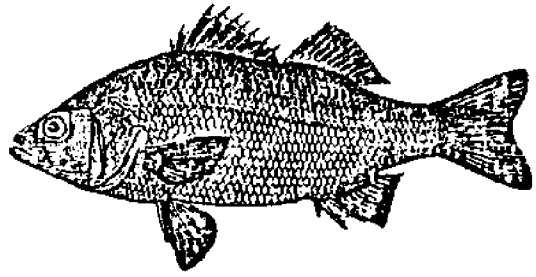
Second dorsal fin not much longer than anal fin

Sides have dusky longitudinal stripes



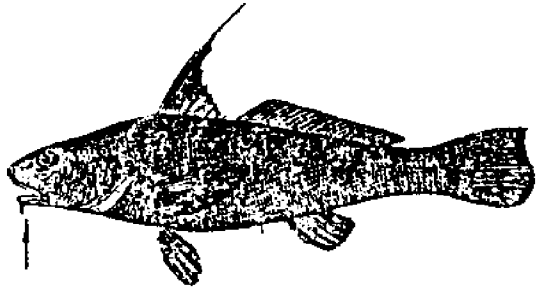
STRIPED BASS *Morone saxatilis* (Walbaum)

Sides have no stripes



WHITE PERCH *Morone americana* (Gmelin)

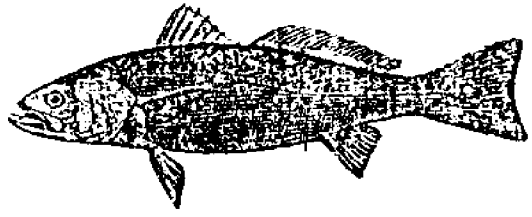
Chin has a barbel



NORTHERN KINGFISH *Menticirrhus saxatilis* (Bloch and Schneider)

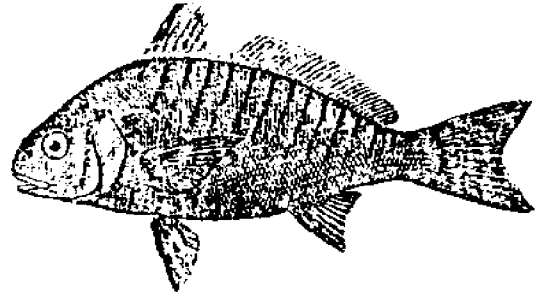
Chin has no barbel

No dark spot on body just behind upper edge of gill cover



WEAKFISH *Cynoscion regalis* (Bloch and Schneider)

Dark spot on body just behind upper edge of gill cover



SPOT *Leiostomus xanthurus* Lacépède

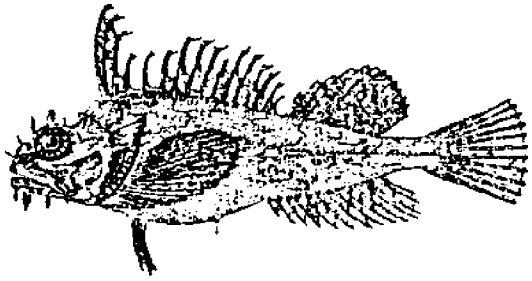
SCULPINS AND SEA ROBINS

Lower few rays of pectoral fins not in the form of feelers and not separate from remainder of fin

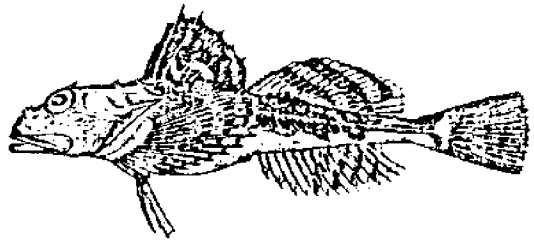
Lower few rays of pectoral fins in the form of feelers and separate from remainder of fin

No large sharp spines on the gill cover. Lower jaw and top of head has fleshy flaps

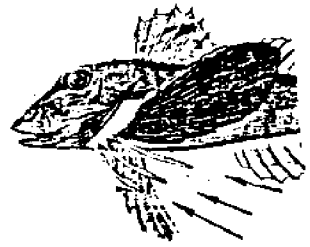
Several large sharp spines on the gill cover. No fleshy flaps on head.



SEA RAVEN *Hemitripterus americanus* (Gmelin)

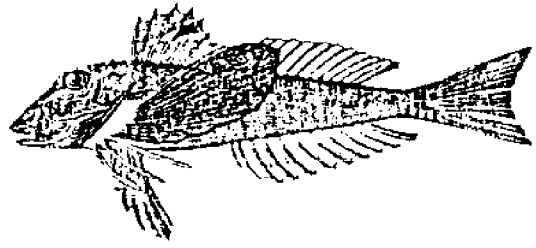


LONGHORN SCULPIN *Myoxocephalus octodecimspinosus* (Mitchill)

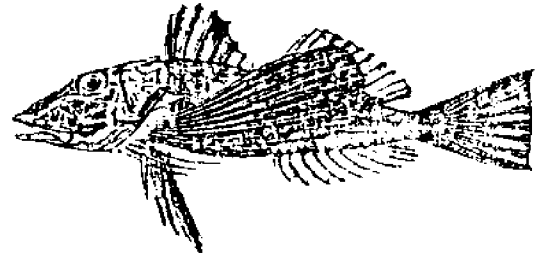


No stripe down side of body. Pectoral fin shorter, reaching only about 1/2 the way to end of bottom of second dorsal fin

A prominent dark-brown stripe down side of body. Pectoral fin longer, reaching about 3/4 the way to end of bottom of second dorsal fin



NORTHERN SEAROBIN *Prionotus carolinus* (Linnaeus)



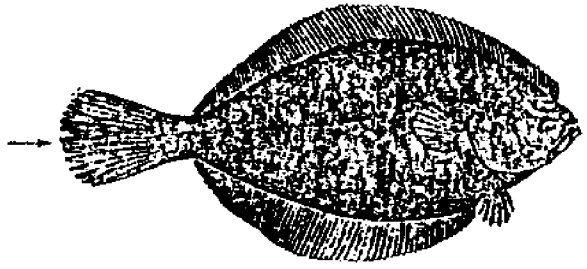
STRIPED SEAROBIN *Prionotus evolans* (Linnaeus)

FLATFISHES I. RIGHT-EYED FLATFISHES

Large mouth, gaping back as far as the eye

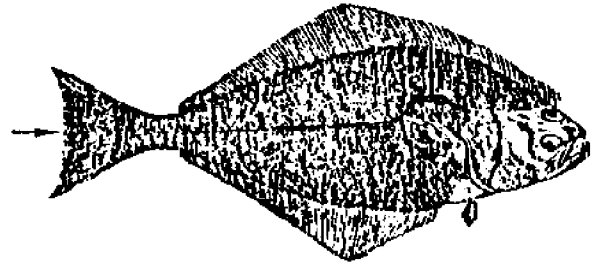
Small mouth, not gaping back as far as the eye

Margin of tail rounded; lateral line nearly straight just behind gill opening



AMERICAN PLAICE *Hippoglossoides platessoides* (Fabricius)

Margin of tail concave with angular corners; lateral line arched just behind gill opening



ATLANTIC HALIBUT *Hippoglossus hippoglossus* (Linnaeus)

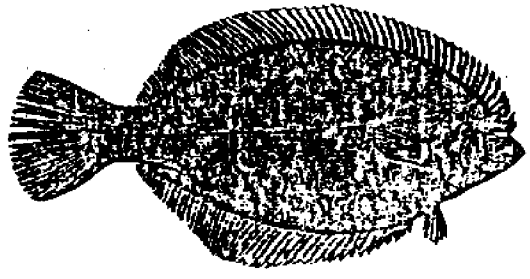
Lateral line nearly straight

Lateral line arched behind gill opening

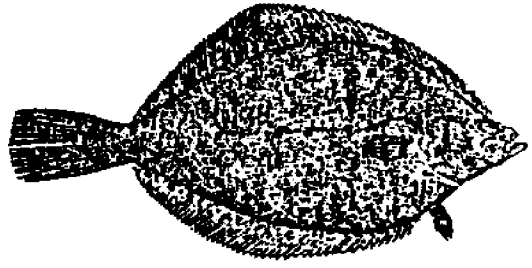
Depth of base of tail about equal to distance between outer margins of eyes

WITCH FLOUNDER *Glyptocephalus cynoglossus* (Linnaeus)

Depth of base of tail much more than distance between outer margins of eyes



WINTER FLOUNDER *Pseudopleuronectes americanus* (Walbaum)

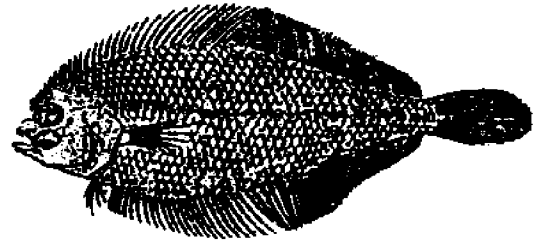


YELLOWTAIL FLOUNDER *Limanda ferruginea* (Storer)

FLATFISHES II. LEFT-EYED FLATFISHES

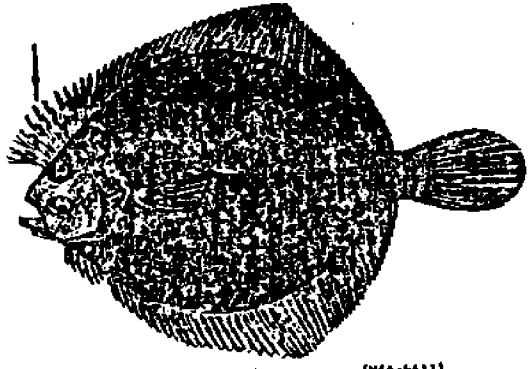
Lateral line arched over pectoral fin. Often much longer than 7 inches.

Lateral line nearly straight. Maximum length is 7 inches



GULF STREAM FLOUNDER *Citharichthys arctifrons* Goode

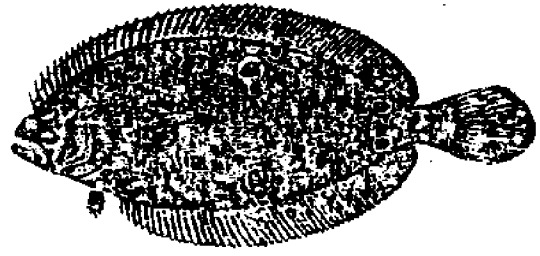
Body more round in outline, body about 1½ times as long as broad. Front part of dorsal fin is enlarged and fringe-like



WINDOWPANE *Scophthalmus aquosus* (Mitchill)

Body more elongate in outline, body about 2 times as long as broad. Front part of dorsal fin is about like the rest of dorsal fin

Four large eyespots on upper side

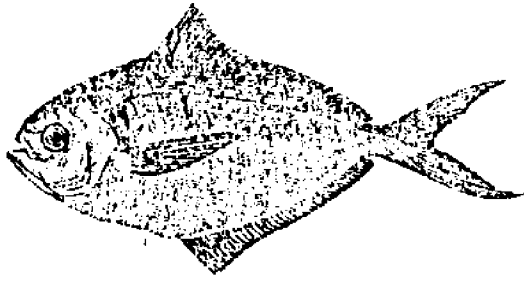


FOURSPOT FLOUNDER *Paralichthys oblongus* (Mitchill)

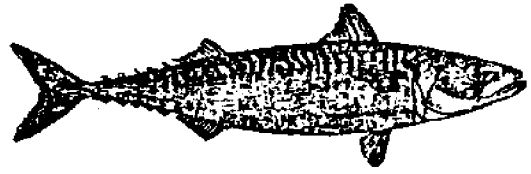
Many small spots on upper side

SUMMER FLOUNDER *Paralichthys dentatus* (Linnaeus)

FISHES UNLIKE OTHERS

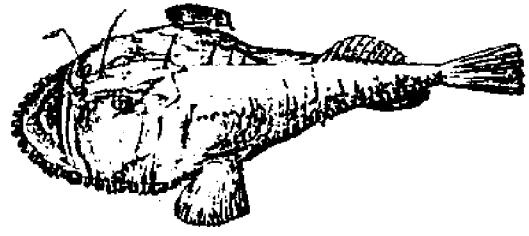


BUTTERFISH *Peprilus triacanthus* (Peck)



ATLANTIC MACKEREL *Scomber scombrus* Linnaeus

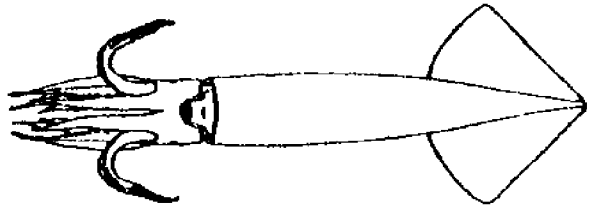
ATLANTIC SAURY *Scomberesox saurus* (Walbaum)



GOOSEFISH *Lophius americanus* Valenciennes

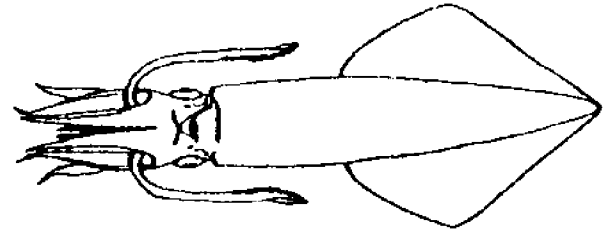
SQUIDS

Fins about 1/3 as long as mantle (body) length



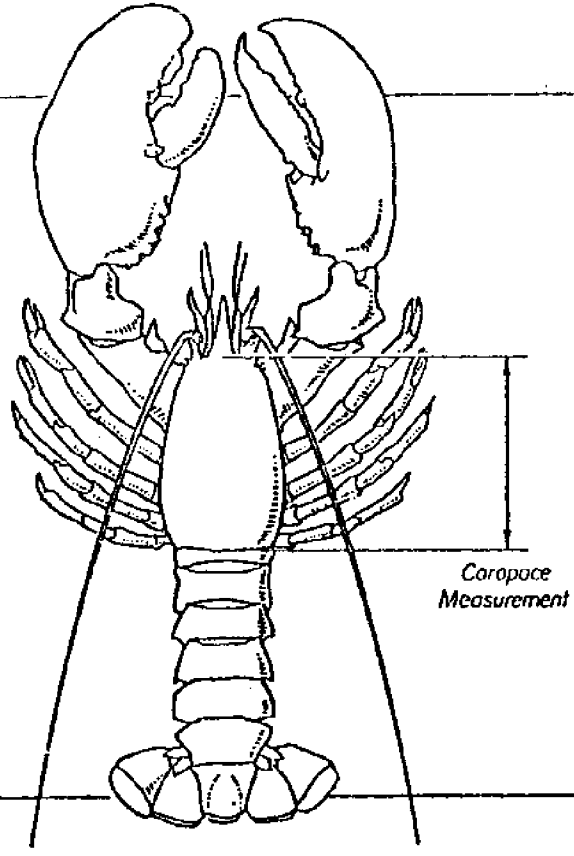
SHORTFIN SQUID *Illex illecebrosus*

Fins longer than 1/2 the mantle (body) length



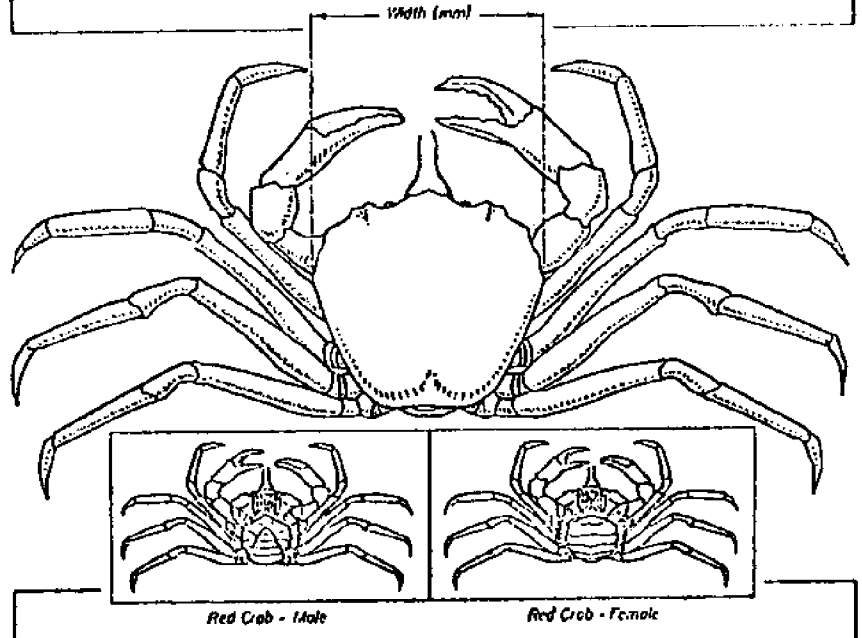
LONGFIN SQUID *Loligo pealei*

American Lobster



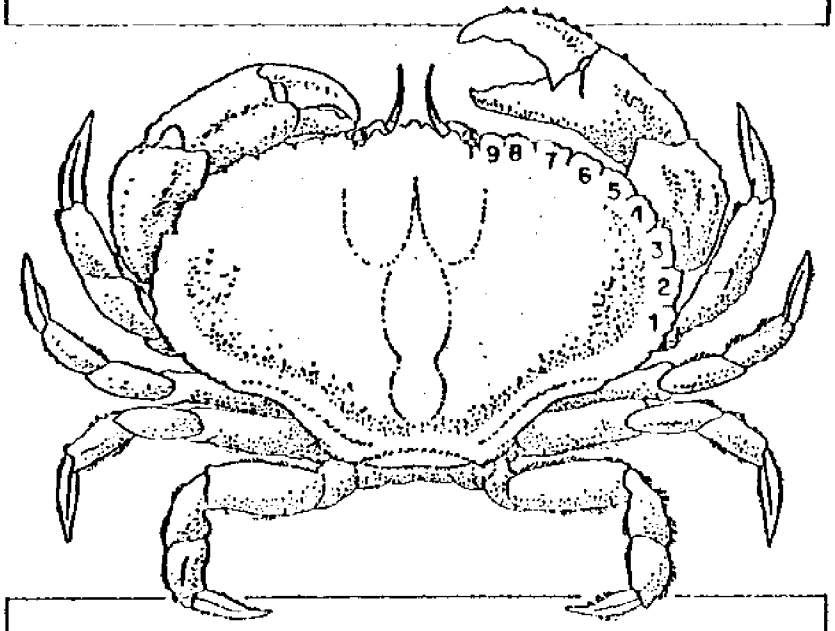
AMERICAN LOBSTER (HOMARUS AMERICANUS)

Deep Sea Red Crab



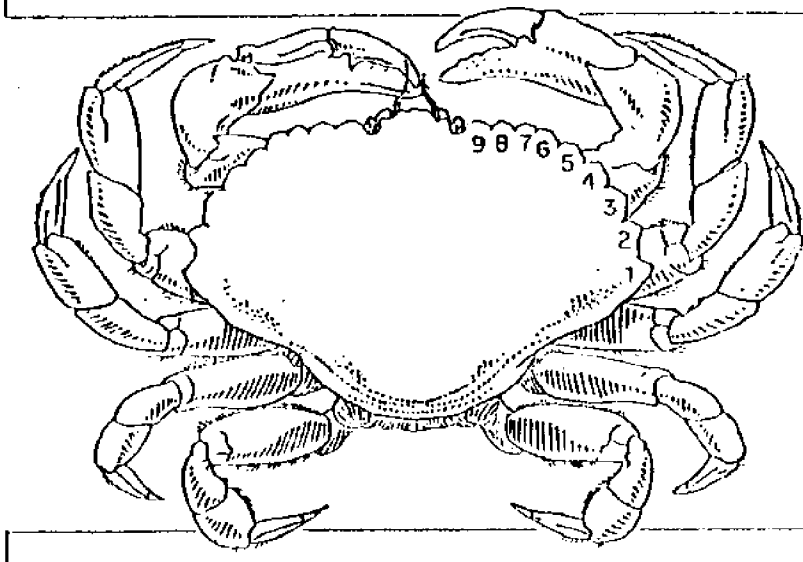
DEEP SEA RED CRAB (GERYON QUINQUEDENS). COLOR: RED. SHELL ALMOST AS LONG AS WIDE. DEPTH RANGE: USUALLY DEEPER THAN 150 FATHOMS (270 METERS), SELDOM TO 100 FATHOMS (180 METERS).

Jonah Crab



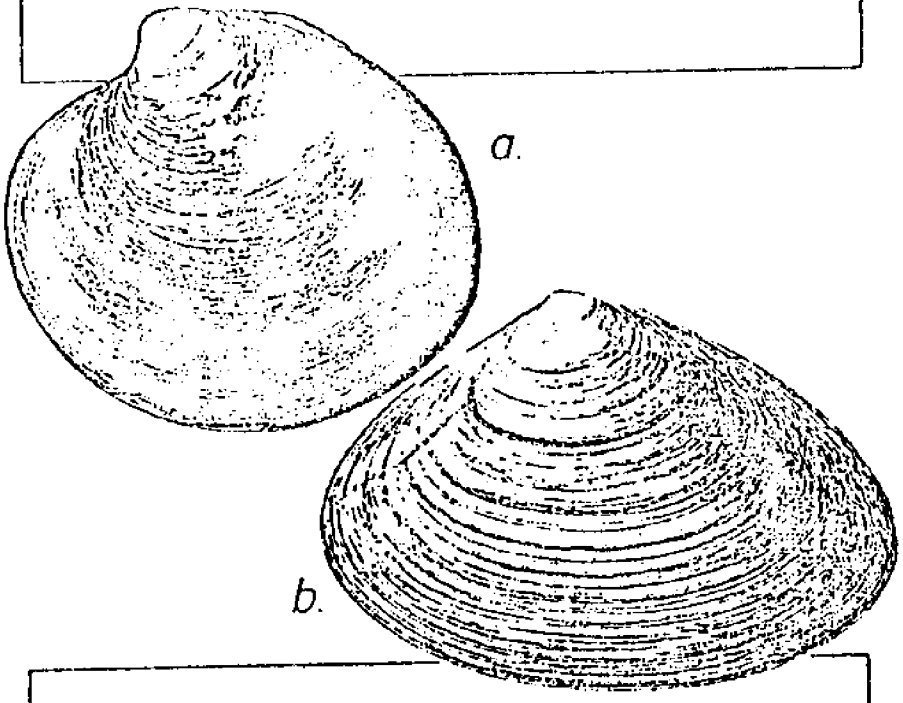
JONAH CRAB (CANCER IRRORATUS). COLOR: TAN TINGED WITH RED AND BROWN. SHELL ABOUT 2/3 AS LONG AS WIDE. DEPTH RANGE: COMMONLY LESS THAN 150 FATHOMS (270 METERS); SELDOM DEEPER. EDGE OF SHELL ON EACH SIDE OF EYES DIVIDED INTO ABOUT 8 "TEETH"; MARGIN OF EACH TOOTH IS IN SHAPE OF A VARIABLE NUMBER OF POINTS EACH HAVING ROUGH EDGES. FINGER OF CLAW HAS A ROUGH OUTER EDGE.

Rock Crab



ROCK CRAB (CANCER BOREALIS). COLOR: TAN TINGED WITH RED AND BROWN. SHELL ABOUT 2/3 AS LONG AS WIDE. DEPTH RANGE: COMMONLY LESS THAN 150 FATHOMS (270 METERS); SELDOM DEEPER. EDGE OF SHELL ON EACH SIDE OF EYES DIVIDED INTO ABOUT 8 "TEETH"; MARGIN OF EACH TOOTH IN SHAPE OF A SINGLE POINT HAVING TWO SMOOTH EDGES. FINGER OF CLAW HAS A SMOOTH OUTER EDGE.

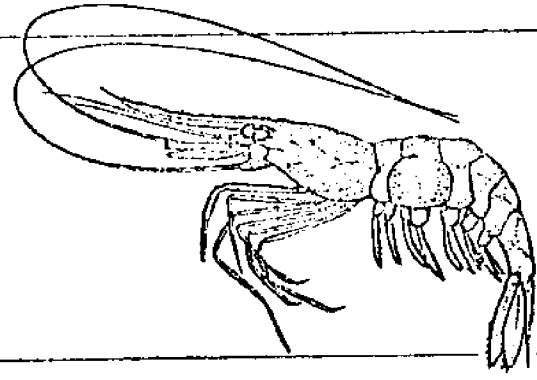
Bivalves



A. OCEAN QUAHOG (ARCTICA ISLANDICA). COLOR FROM STRAW YELLOW IN SMALL ONES TO BROWN TO BLACK IN LARGE ONES. SHELL: HEAVY, THICK, CHALKY. TO 5 INCHES LONG. DEPTH RANGE: 5 TO 80 FATHOMS 99-144M). IN SANDY MUD. NEWFOUNDLAND TO CAPE HATTERAS.

B. ATLANTIC SURF CLAM (SPISULA SOLIDISSIMA). COLOR: SHELL YELLOWISH WHITE WITH THIN YELLOWISH BROWN PERIOSTRACUM. SHELL: SOMEWHAT HEAVY, STRONG, OVAL, SMOOTH. TO 7 INCHES LONG. DEPTH RANGE: LOW TIDE TO 60 FATHOMS. NOVA SCOTIA TO SO. CAROLINA.

Northern Shrimp



NORTHERN SHRIMP (PANDALUS BOREALIS). COLOR: VARIABLE BUT USUALLY PALE PINK TINGED WITH LINES OF DEEPER PINK TO RED. LENGTH TO 172MM. DEPTH RANGE: CONTINENTAL SHELF. FOUND CHIEFLY IN NORTHERN WATERS AND THE WESTERN PORTION OF GULF OF MAINE TO NORTHERN MARGIN OF GEORGES BANK. DIFFERENTIATED FROM OTHER PANDALIDS BY PRESENCE OF A MEDIAN SPINE ON THE 3RD ABDOMINAL SEGMENT ⌒ AND THE FORWARD HALF OF THE ROSTRUM HAS A TOOTHED UPPER SURFACE.

BIOLOGICAL SAMPLING - DATA RECORDING

ESTIMATING THE TOTAL CATCH

The cod ends of large trawls are often divided into several sections by transverse strengthening bands. The total weight of the haul may be determined by counting the number of full sections and multiplying by the average section capacity. The average section capacity may be found in the skipper's or trawlmaster's log.

An alternate method is to calculate the volume of a checker or holding pen into which the catch is emptied. Measure the length, width and height of the pens. Often there are removable pen boards stacked vertically, so that it is a simple matter to count the number of boards to determine the height. The volume can then be calculated using the following formula:

LENGTH (meters) X WIDTH (meters)X HEIGHT (meters) =
VOLUME OF CHECKER (cubic meters).

To determine the weight of the catch, calculate the volume of a small, square container used to weight a small sample using the formula above. Weigh the empty container, then weigh the container filled with fish on three subsamples in kilograms using the kg. scale. Subtract the weight of the container to arrive at the weight of each subsample. Take the average of three trials.

Use the following formula to extrapolate to the total weight of the catch:

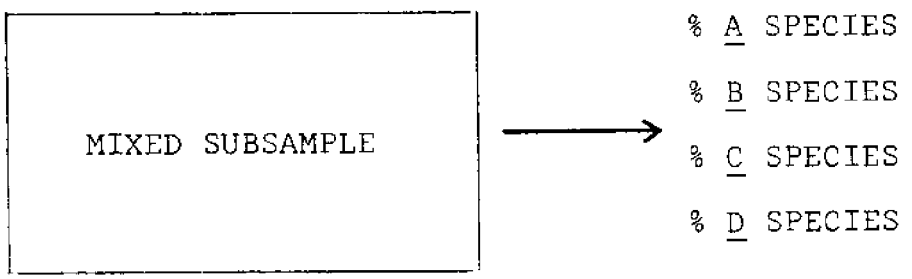
$$\frac{\text{AVER. WEIGHT OF THE SAMPLES}}{\text{VOLUME (cubic meters) OF CONTAINER}} = \frac{\text{TOTAL WEIGHT (KG.) OF THE CATCH}}{\text{VOLUME OF CATCH (cubic meters)}}$$

$$\frac{\text{AVER. WEIGHT OF THE SAMPLES}}{\text{VOLUME (cubic meters) OF CONTAINER}} \times \text{VOLUME OF CATCH (cubic meters)} =$$

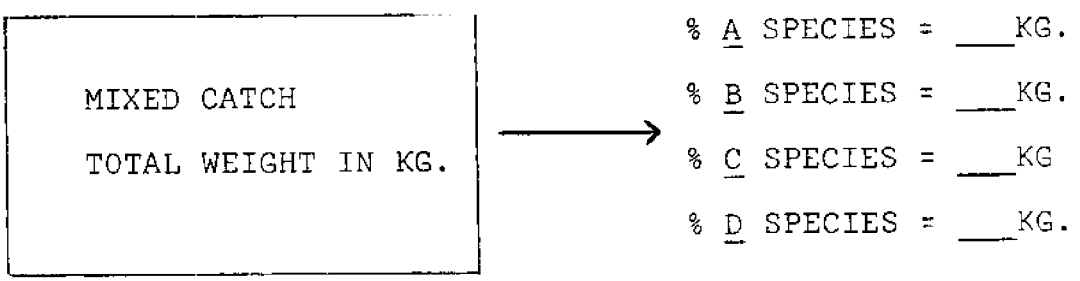
TOTAL WEIGHT OF THE CATCH.

BIOLOGICAL SAMPLING - SPECIES COMPOSITION

The species composition and weights must be determined for each tow. The method used to determine species composition is through random sampling of multiple subsamples of the mixed haul. Each species must be identified and the correct identification number entered on the log sheet along with the percentage composition by weight. First of all, determine the percentage of each species in the subsample. Then multiply this percentage by the total weight of the catch to arrive at the weight of each species.



Extrapolate to the total haul...



...and enter on Biological Sampling Log Sheet 77-01.

The National Marine Fisheries Service requires that you obtain at least three subsamples from the mixed pile or pen of at least 40 kg. Try to sample from three different locations. If sampling from a conveyor, it is suggested that you take three samples at three different time periods during the processing operation. Weigh the subsamples. This equals the total sample weight. Sort the species and determine the weight of each species. Calculate the percentage of each by weight using the following ratio:

$$\frac{\text{WEIGHT OF THE SPECIES}}{\text{TOTAL WEIGHT OF THE SAMPLE}} \times 100 = \% \text{ OF THE SPECIES BY WEIGHT.}$$

If the catch has already been sorted by species, determine the weight of each using the method described earlier for determining the volume of the cod end, or checker and converting to the weight. Large species such as sharks should be sampled individually.

In the event that you are unable to sample the catch, transcribe the information from the vessel log onto Biological Sampling Log Sheet 77-01. Even if you determine the species composition by weight yourself, it is a good idea to compare your estimates with that of the vessel log.

BIOLOGICAL SAMPLING - LENGTH

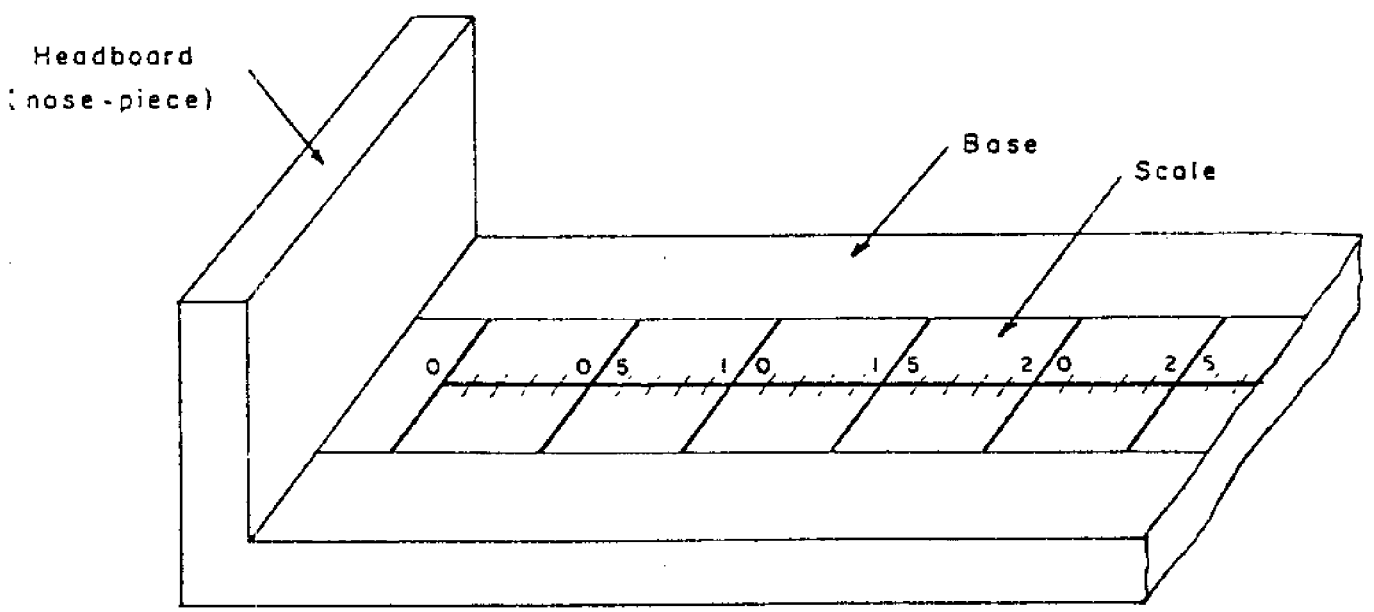
Determination of the length composition of stocks of fish permits the growth rate and other important characteristics to be subsequently quantified. The influence of environmental stimuli and fishing pressure can also be ascertained.

Length distributions of fish samples taken on commercial fishing vessels give a simple index of the composition of the stock from which the catches are being taken.

There are several methods of measuring the overall length of a fish, depending upon the facility and speed with which the measurement can be taken under given working conditions and on the state of the specimen to be measured.

Overall length measurements are generally made with the fish lying on its right side, snout pointing to the left on a measuring board carrying a scale. The mouth is closed, the fish body and tail straightened along the midline and a reading is taken. It is preferable to measure a fish in the fresh condition. Live fish and fish in rigor mortis are often shorter than a relaxed fish after rigor. If rigor mortis has set in, the body should be gently flexed before measuring. Large fish can be measured with calipers or a measuring tape. Fish will tend to lose fluids after death due to the breakdown of tissues. Preserved fish will also lose fluids and be shorter in length.

As observers, you will utilize a measuring board with aluminum or plastic punch strips, such that each measurement can be recorded by a puncture mark. A tape recorder can also be used to record measurements for later transcription.



LENGTH FREQUENCY MEASUREMENTS

The National Marine Fisheries Service requires that one sample of each species for each 30 x 30 minute square per 1000 tons or a fraction thereof each month be measured. The observer should obtain a length sample every time a vessel enters a new 30 x 30 minute square on each trip or at least a minimum of ten samples per trip. The number of day and night samples should be proportional to the amount of time that the vessel fishes during these periods. A length sample includes all species caught on a particular tow or haul sampled. Measure all of the individual fish present in the species composition subsamples for the tow you are sampling. In the event that you are unable to measure all the species, be sure to measure the species engaged in the directed fishery.

Use the following measuring regime:

Species with forked caudal fin . . measure the FORK LENGTH

Species with flat, rounded caudal fin . . . . . measure the TOTAL LENGTH

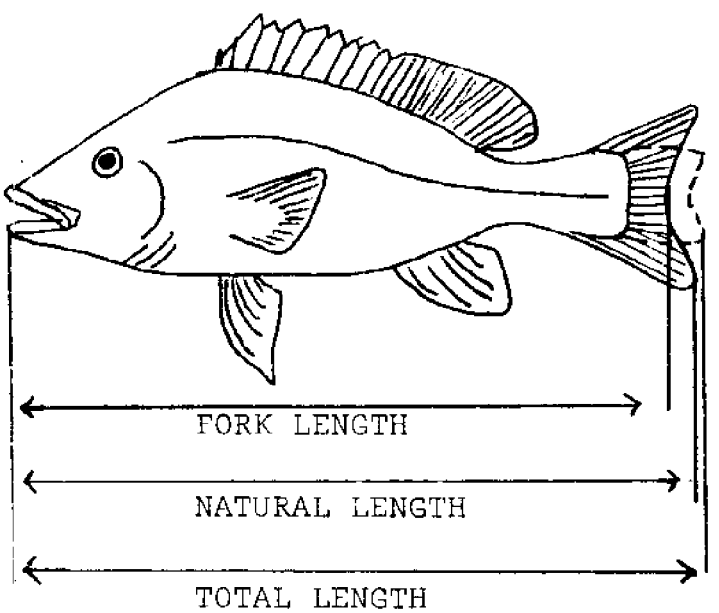
Atlantic Herring . . . . . measure the NATURAL LENGTH, and measure to the centimeter below the actual length.

Use the measuring board and punch strips or the tape recorder to record the data. Large individuals should be measured on deck using a tape measure. Lobsters are measured from the eye sockets to the posterior edge of the carapace using a specialized gauge. Crabs (rock, jonah, deep sea red) are generally measured across the carapace width. Transfer the length data to the Biological Sampling Log 77-02.

FORK LENGTH - measurement from tip of the snout to the cartilagenous tip of the shortest or median caudal fin ray.

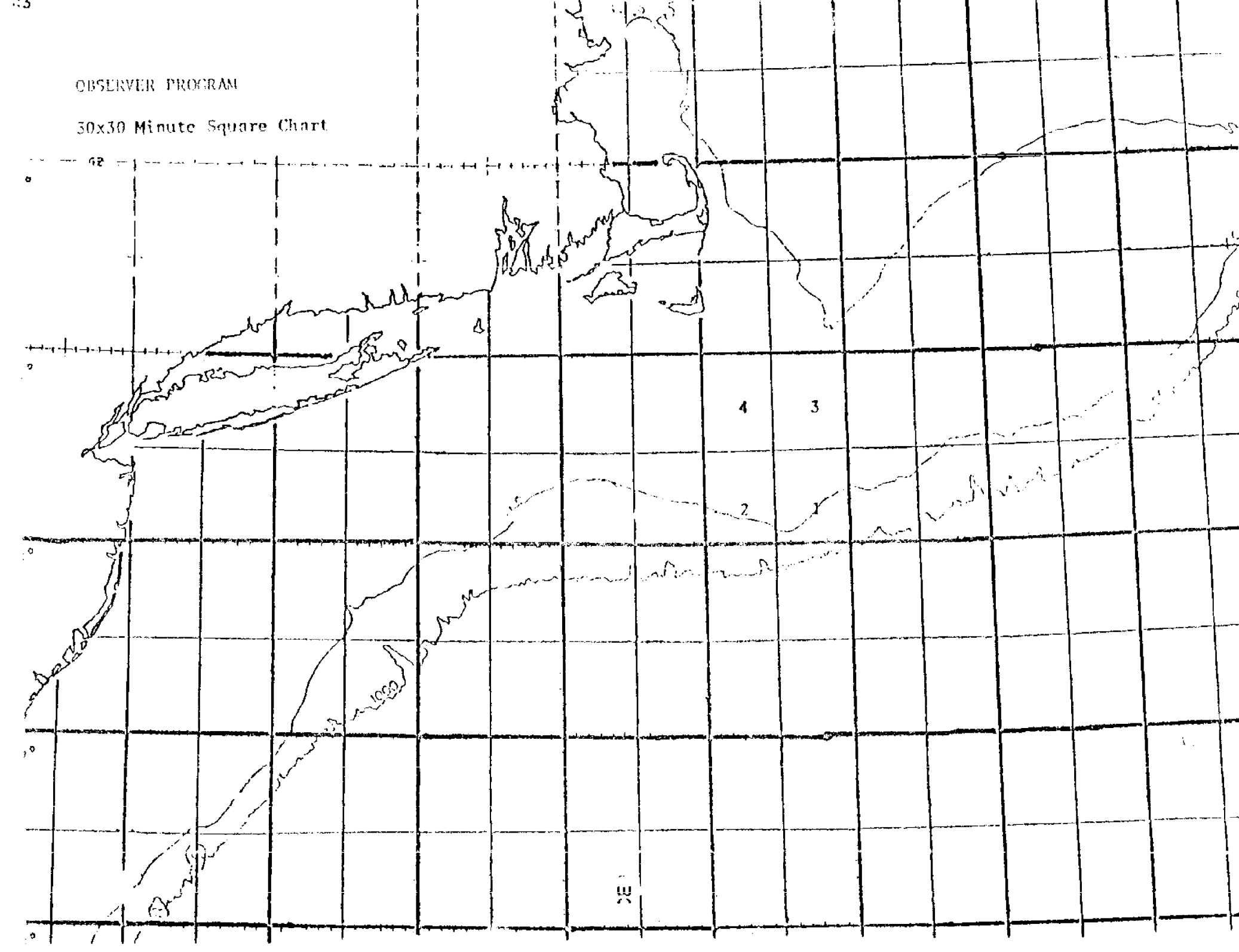
TOTAL LENGTH - measurement from the tip of the snout to the tips of the longest caudal fin rays.

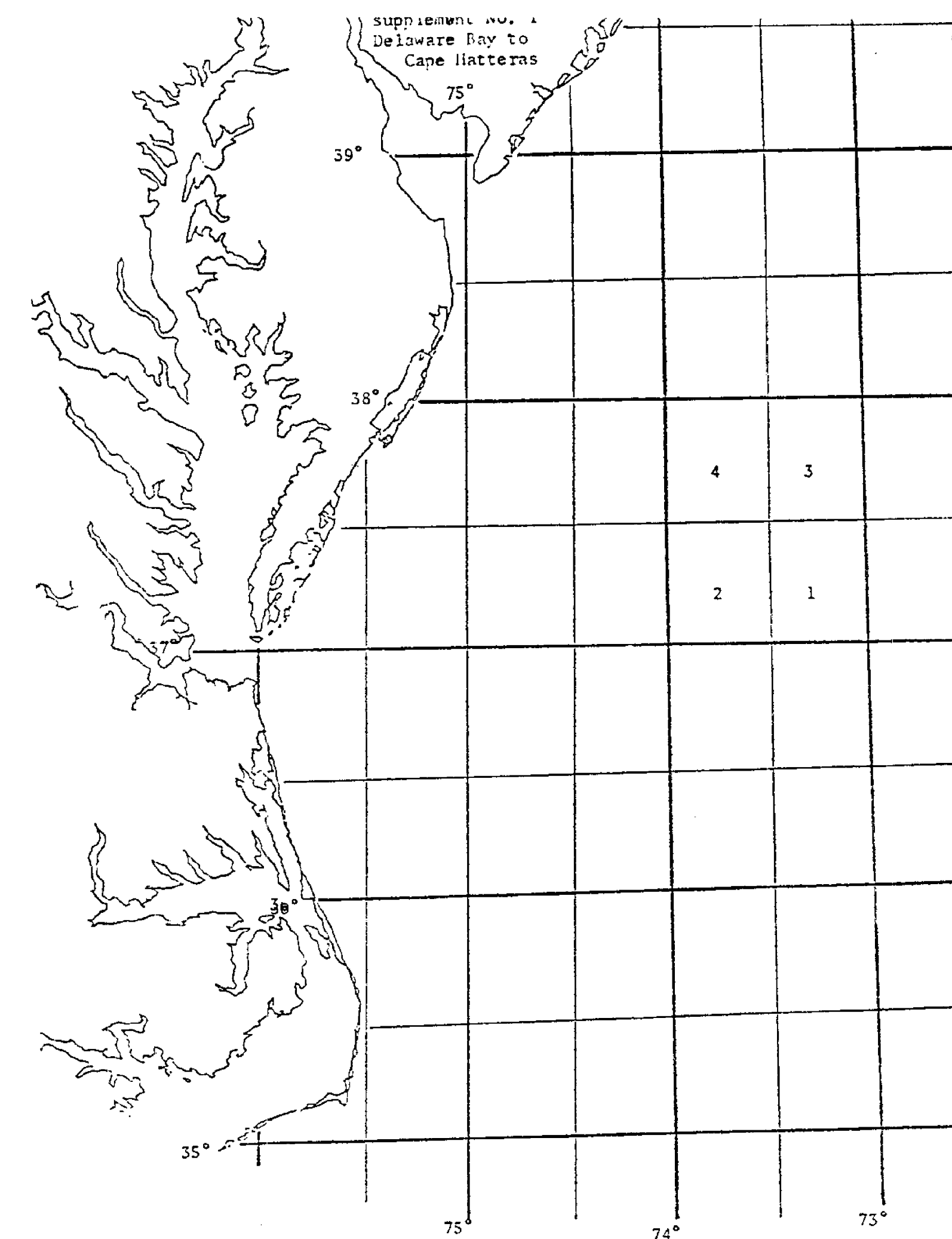
NATURAL LENGTH - the greatest total length with the caudal fin lobes in the natural position.



OBSERVER PROGRAM

30x30 Minute Square Chart




Supplement No.
Delaware Bay to
Cape Hatteras
75°
39°
38°
37°
36°
35°
4
3
2
1
75°
74°
73°

SCALES

Scales are characteristic coverings of cartilagenous and teleost fish. They serve as a protective integument of the body. Their origin, structure, and function vary in different groups of fishes, and for this reason, they are important in classification.

During the life of a fish, the scale grows around its edges and this rate of growth will differ and be subject to seasonal changes. Under a microscope, the concentric rings of growth are seen on the scale, by which it is possible to determine the age of the fish. Among some families of fishes, the scales are reduced, concealed or lost, as in lampreys, hagfish, chimeras, most eels, and the ocean sunfish, to name a few.

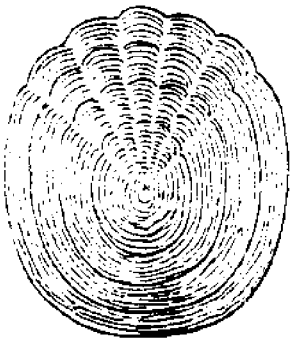
Teleost scales are thin, bony, overlapping plates covered by dermis. They are embedded anteriorly in pockets in the skin with the free, posterior edge overlapping the next scale. They are not replaced when lost. These scales are dermal in structure with no epidermal covering. These CYCLOID scales are essentially round and increase in size as the fish grows. They are marked by growth rings comparable to the growth rings of trees. The rings are most noticeable on the embedded part of the scales in fish whose growth is retarded during the winter as a result of reduced temperature and food supply.

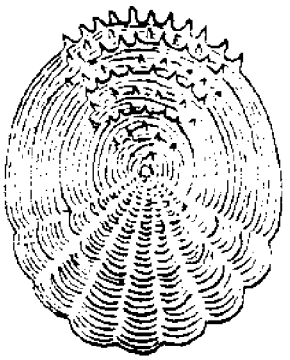
CTENOID scales are similar to cycloid scales, but their free, or posterior margins possess a number of comb-like projections. They are most often found on fish such as perch, bass, flounder, and most advanced teleost fish.

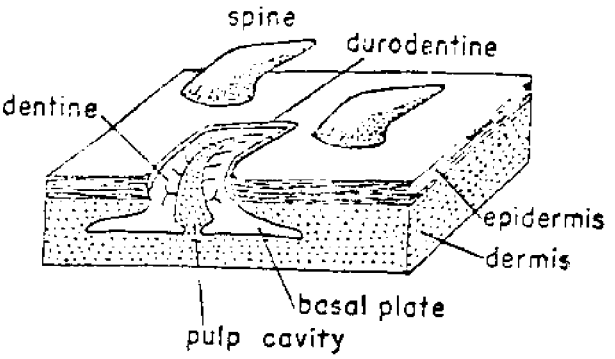
GANOID scales are rhomboidal in shape and are found in the more primitive ray-finned fishes. Examples of fishes possessing this type of scale are sturgeons, paddlefish, and gars.

The skin of a shark or ray feels like sandpaper due to numerous tiny scales embedded in the skin. These scales are called PLACOID and are teeth-like in structure. Each scale is comprised of an inner plate of bone. The cap covering their tips is a form of dentine, homologous to tooth enamel. Essentially, there is no difference between the teeth and scales of a shark. Both are subject to loss and replacement. Placoid scales vary considerably in shape and arrangement in different species of sharks and rays and are used in identification procedures.

Scales are used to determine the age and for the computation of growth in fish. Generally, scales should be sampled from the lateral portion of the fish, avoiding the lateral line, since this area may constitute a greater degree of regeneration. It is often useful to wash the fish slightly to remove slime and loosen the scales. Using a knife or blunted instrument, loosen the scales by stroking in the direction of the head.

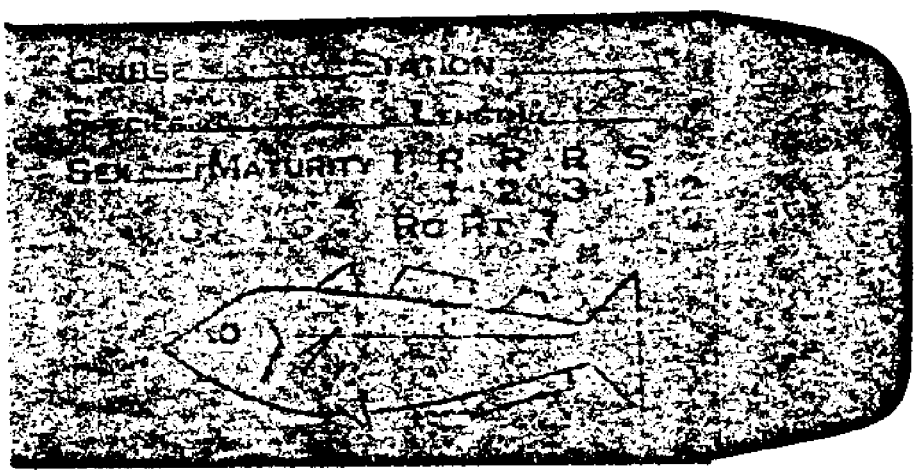




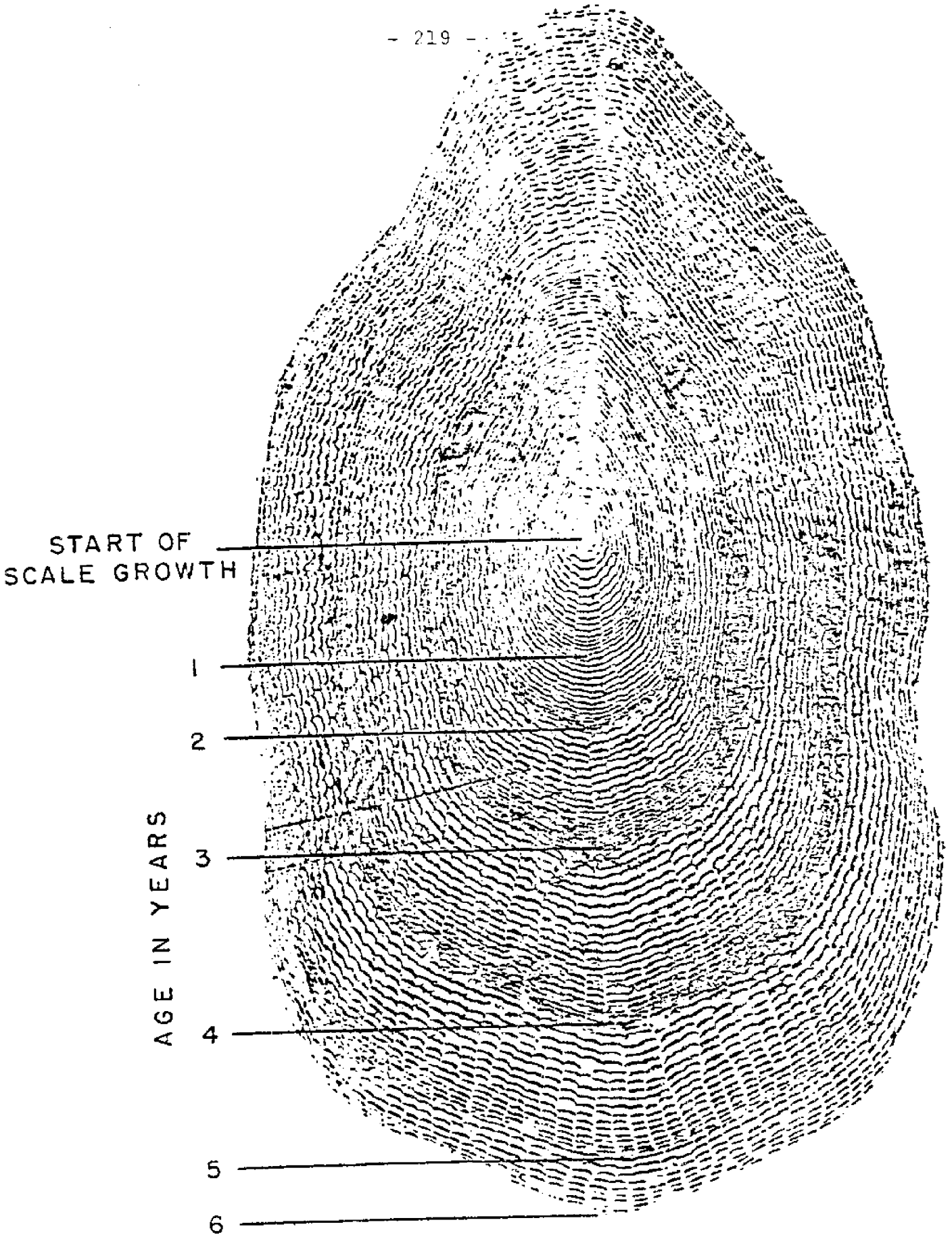


CYCLOID CTENOID PLACOID

Forceps may be used to extract from 10 to 25 scales. Store them in small envelopes which are correctly labelled with species name, length, weight, sampling area, date and log number.



Diagrams from the National Marine Fisheries Service Observer Manual indicating the location on each species from which scales should be extracted, may be found in this section.



Haddock Scale - NMFS Observer Manual

BIOLOGICAL SAMPLING - OTOLITHS

Otoliths are sometimes used for age determination of fish since they carry regular markings corresponding to events in the life of a fish. They are the ear stones located in the auditory space in the skull of the fish and extracted by forceps. The method of sampling depends upon the species of fish and may sometimes be the result of "trial and error" on the part of the sampler. Commonly a sharp knife is used to cut sagitally across the forehead of the fish or cross-section down through the forehead, behind the eyes. A hacksaw or bonesaw is used with large fish or those with hard skulls. The skull is next cracked open along the cut and the exposed cavities or sacculi contain the otoliths. An alternate method is to remove the surface of the mouth and expose the otoliths from below.

The following procedures as suggested in the National Marine Fisheries Service Observer Manual should be used in obtaining otoliths:

For most species:

Grip the head of the fish by the eye sockets. Make a cut with the knife or bonesaw behind the eyes, down and back to the gill cover. Press down on the snout with one hand and the rest of the body with the other hand to, in effect, "crack the skull open". The otoliths will be visible in the two paired chambers exposed.

For flatfish:

Because of their metamorphosed orientation, one otolith is commonly found below the other. Look for a bony ridge behind the eyes. Make a cut at the end of this ridge, close to the eyes. Press down on the bone with the knife until the bone is penetrated. Crack open the skull as described above. If need be, jiggle the knife back and forth to open the crevice. One otolith will be visible; the other will be found in the chamber directly below it.

For herring and mackerel:

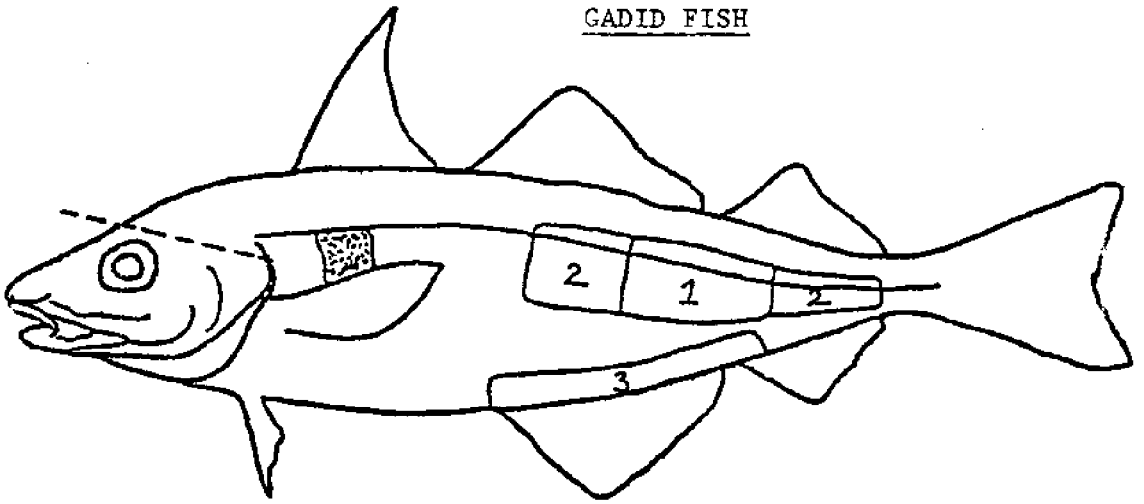
Remove the lower jaw and slice open the bottom of the brain case from the roof of the mouth until the otoliths are found.

For redfish, goosefish, and other spiny fish:

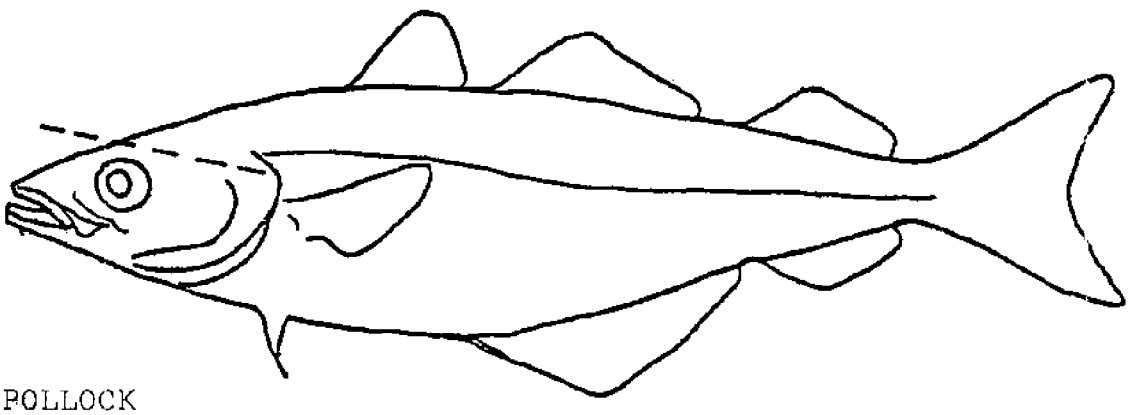
Special care should be taken when sampling from these fish. The same methods described above for most species can be used. It is important to note here that in the goosefish, because of the extended condition of the skull, the otoliths will be found farther back than would be first assumed. Please refer to the following diagrams from the National Marine Fisheries Service Observer Manual which indicate the location of otoliths in different species.

Otoliths should be kept dry in correctly labelled envelopes.

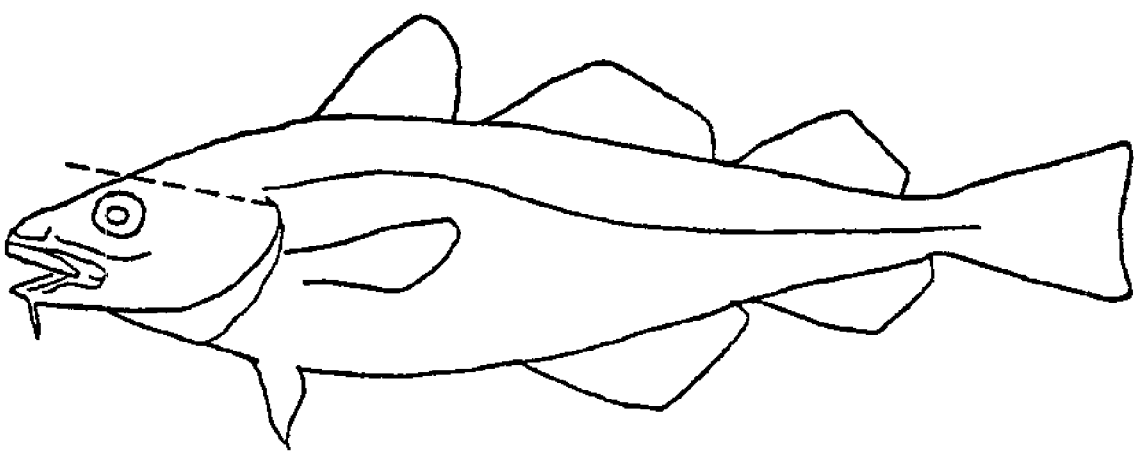
GADID FISH



HADDOCK
Collect scales; if greater than 65 cm., collect otoliths also.

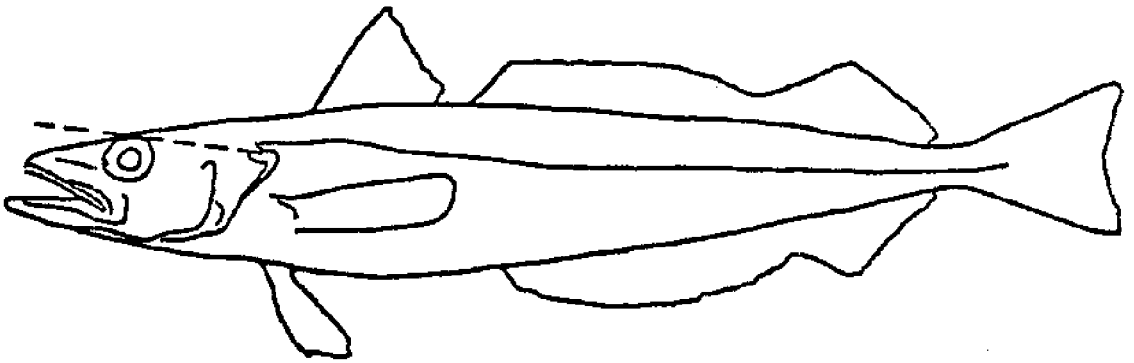


POLLOCK
Collect otoliths.

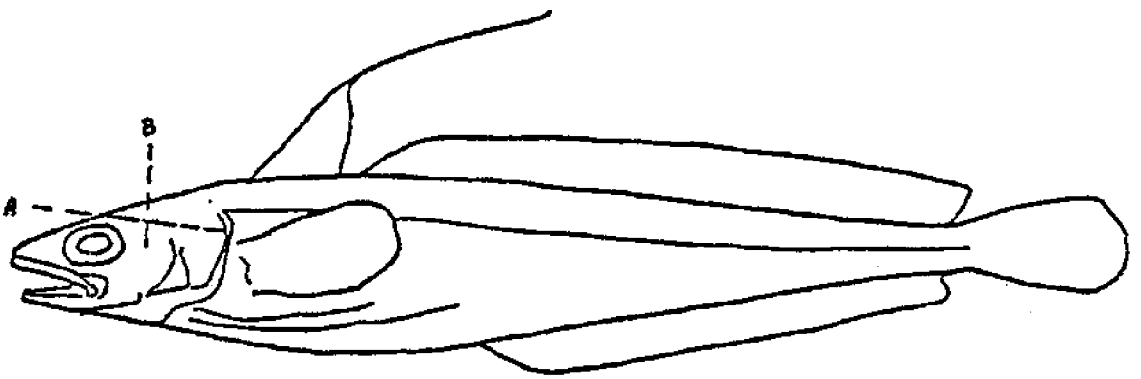


COD
Collect otoliths.

HAKES



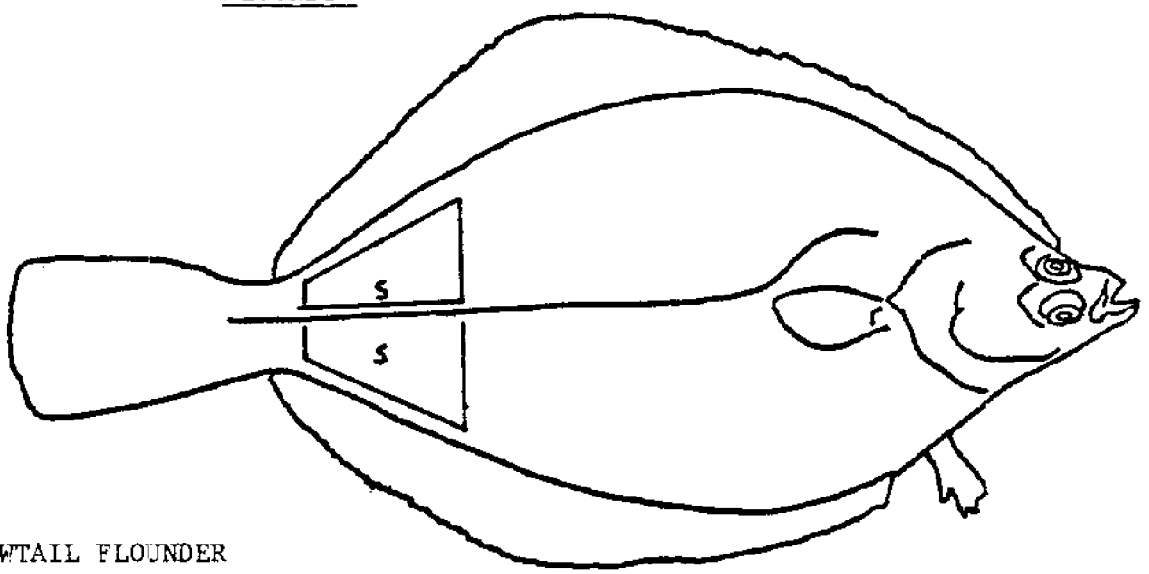
SILVER HAKE
Collect otoliths.



RED HAKE
Collect otoliths.

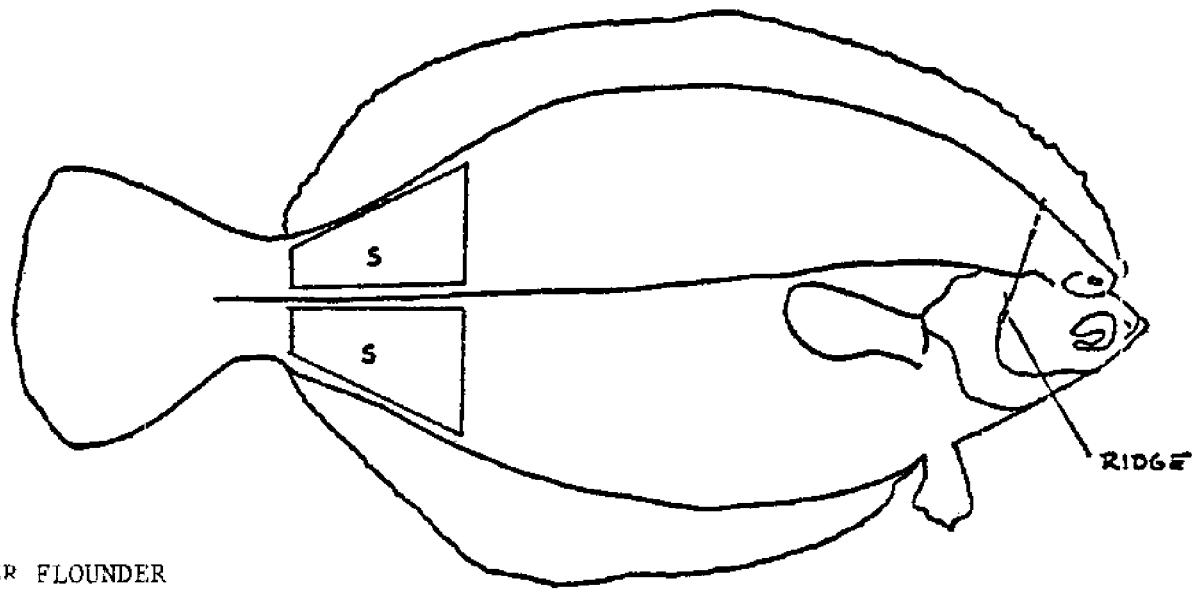
WHITE HAKE
Collect otoliths.

FLOUNDER



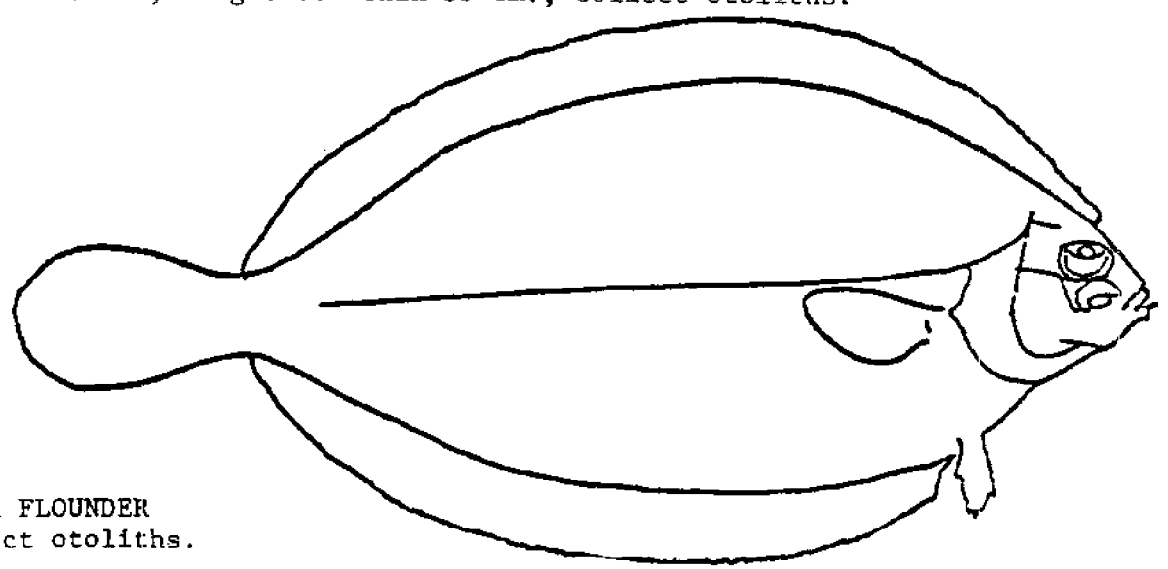
YELLOWTAIL FLOUNDER

Collect scales.



WINTER FLOUNDER

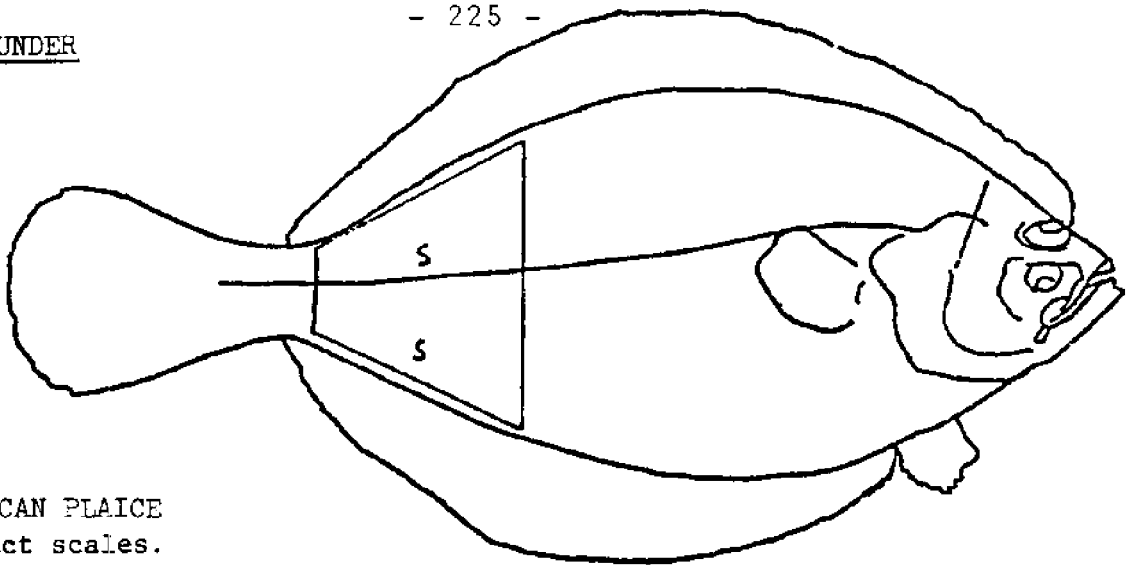
Collect scales; if greater than 35 cm., collect otoliths.



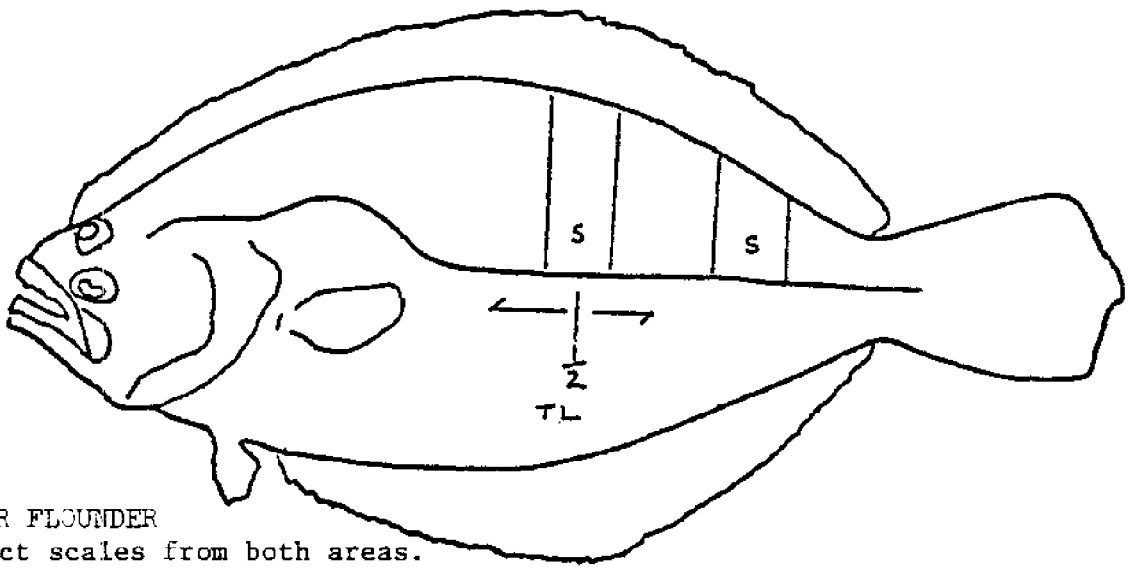
WITCH FLOUNDER

Collect otoliths.

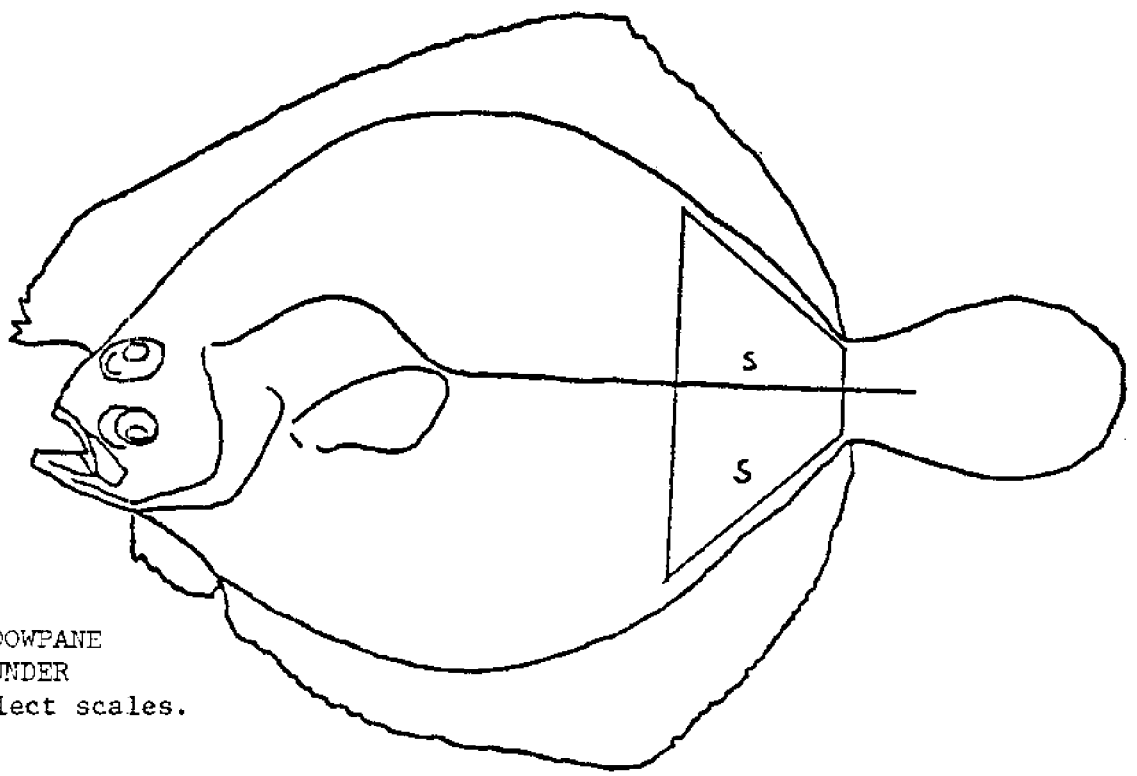
FLOUNDER



AMERICAN PLAICE
Collect scales.

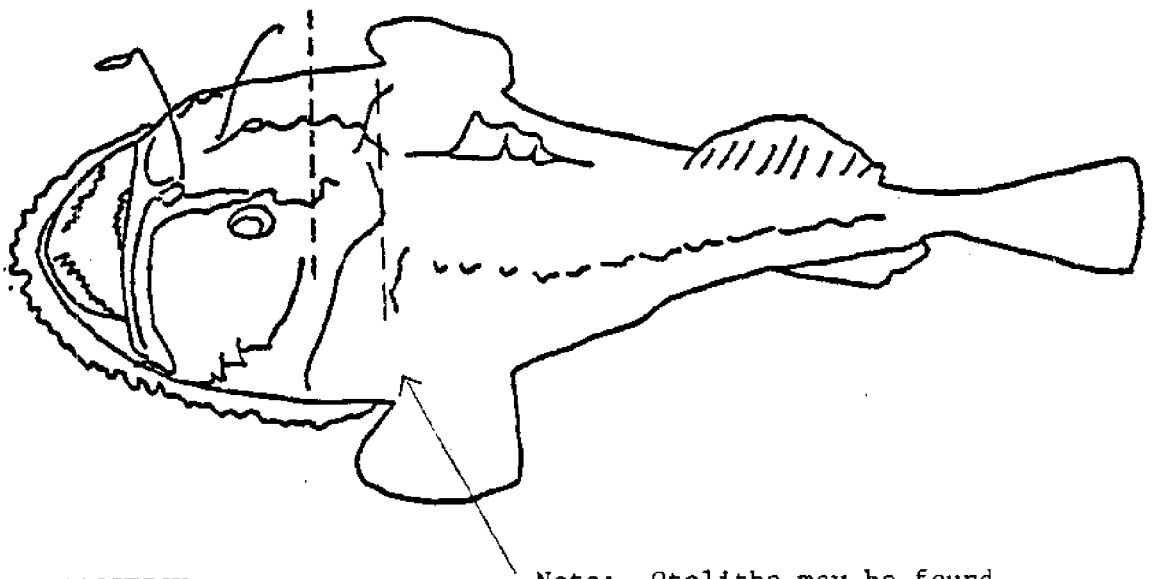


SUMMER FLOUNDER
Collect scales from both areas.



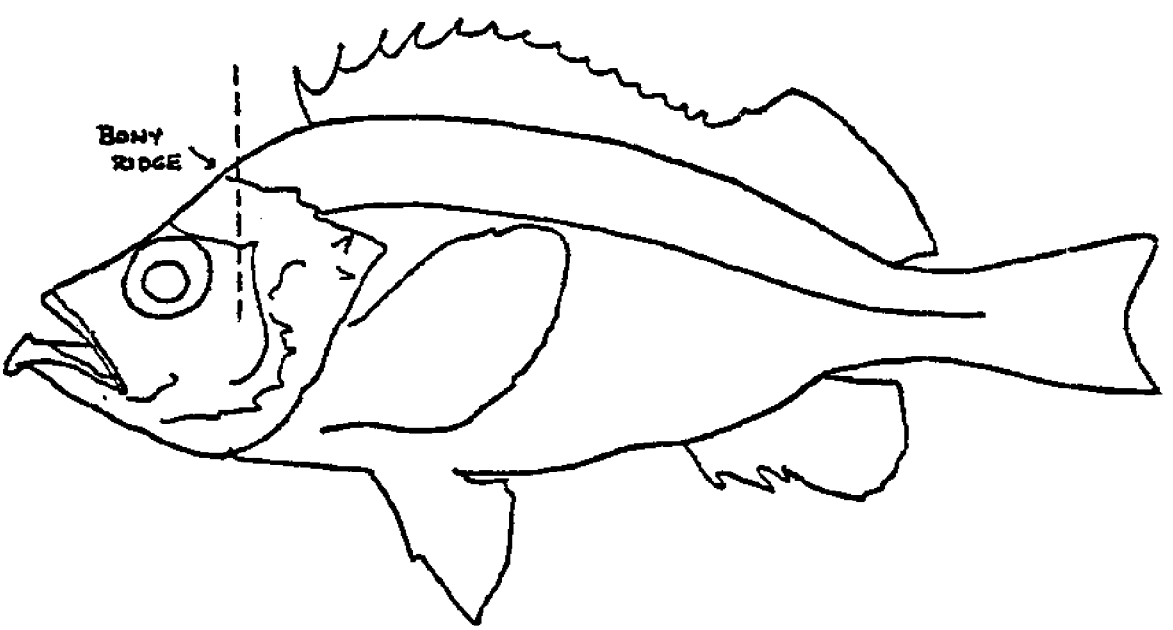
WINDOWPANE
FLOUNDER
Collect scales.

MISCELLANEOUS SPECIES



AMERICAN GOOSEFISH
Collect otoliths.

Note: Otoliths may be found further back.



REDFISH
Collect otoliths.

Scale and Otolith Collections

Haddock - Collect scale samples from area 1 (also, area 2 or 3 if there has been a loss of scales from area 1).

Pollock and Cod - Only the otoliths are collected. (a bone saw should be used on large fish). The scales are poor for collecting purposes and age determination.

Hakes (silver, red, white) - Collect only the otoliths.

Flounders - (yellowtail, american dab, windowpane) - collect only scales.

Winter Flounder - Collect scales and otoliths for those over 35 cm. in length.

Summer Flounder - Collect scales from both of the two areas between the lateral line and the fin.

Witch Flounder - Collect otoliths.

Goosefish - Collect otoliths. They are suspended behind the brain in the open cavity. Note that they may be found further back in the braincase.

Redfish - Collect otoliths. Care should be exercised when sampling from this and other spiny-rayed species. It is suggested that a heavy glove be used to hold the fish.

HADDOCK

COD

POLLACK

SILVER HAKE

RED HAKE

WHITE HAKE

WINTER
FLOUNDER

GREY SOLE

AMERICAN PLAICE

SUMMER FLOUNDER

GOOSEFISH

REDFISH

WINDOWPANE
FLOUNDER

BUTTERFISH

ATLANTIC HERRING

EXAMPLES OF OTOLITHS

SCALE AND OTOLITH SAMPLING REGIME

Selected species will be sampled for scales and otoliths to be chosen on a stratified random basis. One specimen will be sampled at random from the length frequency for each centimeter interval represented in the distribution. Please refer to the chart below:

SPECIES	INTERVAL
1. Cod, Pollock, Cusk, White Hake	3 cm.
2. Haddock, Red Hake, American Plaice, Witch Flounder, Greenland Halibut	2 cm.
3. Atlantic Herring, Mackerel, Argentine, Butterfish, Squids (mantle length)	1 cm.
4. Redfish, Silver Hake, Yellowtail Flounder, Winter Flounder, Summer Flounder	1 cm.
5. All other species	1 cm.

For each individual sampled, the length, sex and gonadal maturity should be recorded. Scale and otolith samples should be placed in envelopes correctly labelled with the Observer Number, Trip Number, Tow Number, Species, Length, Sex, Maturity Stage.

MATURITY STAGE AND SEASONAL CYCLE OF SPAWNING

The gonads of fish are generally found in the posterior of the body cavity. They may be difficult to distinguish in sexually immature fish. The female ovaries and male testis of fish are paired organs found in the posterior section of the body cavity. In sexually mature fish, they comprise a considerable proportion of the body cavity, whereas in immature fish, they are extremely small and difficult to distinguish.

Use the following methodology when sampling for gonads:

Use a sharp knife (ripping knife) and make a ventral cut from the anus toward the head. Use the tip of the knife, at an angle to insure that the underlying organs are not damaged. Open the body cavity and move the liver to one side, exposing the gonads. A quicker but less precise technique is to puncture the side of the fish and slash along the lateral portion. The method used depends upon the type of sampling required. A more cautious method is needed when collecting whole gonads or organs. Surgical scissors are useful for sampling small individuals.

Flatfish are laterally compressed, and as such, could be sexed by using a "candling method". If one were to place the body over a strong light source, one would note that the female ovary extends posteriorly into an ovarial pouch.

The male testis does not normally extend as far back. It is not practical to candle flatfish on deck, so the methods outlined on the previous page will suffice.

Outwardly, fish that are in the ripe stage look pregnant if they are female, and milt can be expressed easily from the male with gentle pressure on the abdomen.

The following maturity stage criteria has been established by the National Marine Fisheries Service for gonadal development.

1. Color - Both testes and ovaries have a color related to the degree of development.
2. Size - The size of the testes and ovaries in relation to the capacity of the body cavity.
3. Appearance - of the surface of the gonad, whether it possesses blood vessel network, has yolked or transparent eggs.
4. Body Length - The size of fish in a particular sample may be indicative of maturity.

DATA RECORDING - MATURITY DATA

It is good practice to gather sex and maturity data while sampling scales and otoliths. The following information should be recorded on the scale envelopes along with location, tow information, length, sex and maturity stage.

STAGE	KEY ABBREVIATION	CODE NO.[1]
Immature	I	1
Developing	D	2
Ripe	R	3
Spawning	S	4
Recovering	R_c	5
Resting	R_t	6

[1]The numerical code is the maturity stage designation data following the cruises.

Reproduction

The following pictures and descriptions are from the National Marine Fisheries Service Observer Manual. They illustrate the male and female reproductive and spawning stages of the Gadidae Family of marine fish.

MALE STAGES

Immature: (Haddock, 39 cm, Georges Bank, May 1968). Small cordlike testis, somewhat translucent; grayish to white.

Comments: Easily confused with resting gonad of small mature male but does not contain any milt nor is the sperm duct readily distinguishable as it is in the "resting" stage. The sperm duct may be difficult to locate in small hakes around 27 cm- probe with tip of knife.

MALE STAGES

Developing: (Pollock, 70 cm, age 5, Bay of Fundy, November 6, 1974). Enlarging and becoming convoluted and lobed, lobes variable in shape; blood vessel network developing.

Comments: Much variation in size in relation to the size of the body cavity and color; blood vessel network and size of testis are good criteria.

MALE STAGES

Ripe: (Cod, 93 cm, NE Georges Bank, February 12, 1972). Continued enlargement but more variable than in female; turning white, blood vessels less noticeable; milt may be squeezed from testis.

Comments: Color is variable but in most species just prior to spawning testis becomes white to chalk white and blood vessels are less noticeable. Big difference in the shape and size of the lobes in members of the cod and hake families.

MALE STAGES

Spawning: (Cod, approximately age 9, NE Georges Bank, February 24, 1972). Chalk-white and liquid, very fragile, with repeated spotting. The lobular part of the testis is beginning to shrink and may contain pockets of milt. The urinary bladder is often inflated. The color change is from white to brownish red.

Comments: Males usually develop ahead of females and remain in a spawning state longer. It is not uncommon to find ripe males in samples and no ripe or spawning females.

MALE STAGES

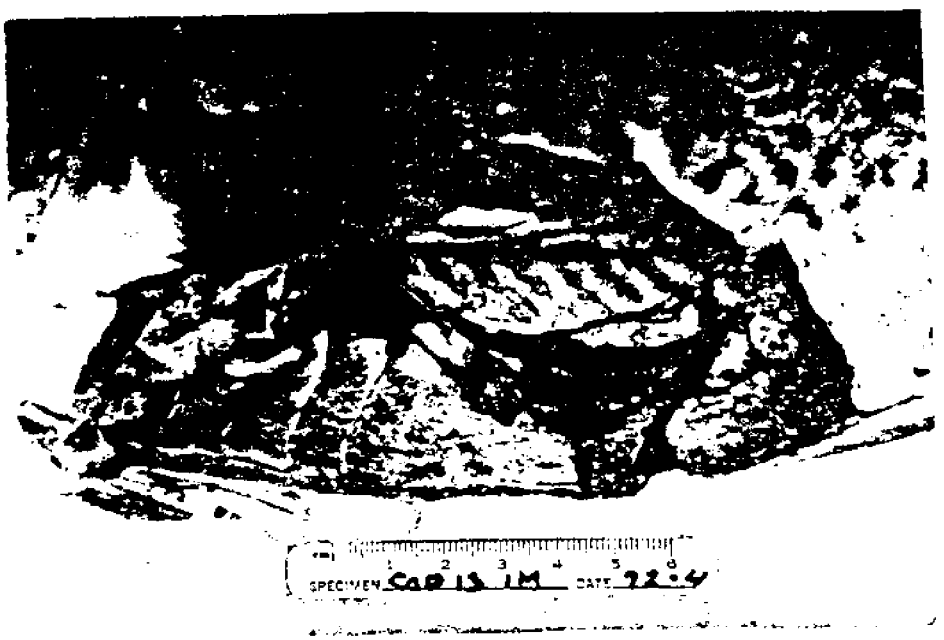
Recovering: (Haddock, Georges Bank, May 1963). Testis much reduced in size and may appear cord-like; the color is brown to pinkish-red and may contain visible pockets of milt in the interior of the testis.
Comments: Small mature individuals may resemble "immature" stage, but check for signs of milt (spawning evidence).

MALE STAGES

Resting: (Pollock, Gulf of Maine, April 17, 1972). Continued reduction in size of testis; the color is brown to red, and the testis has a dried-up look

Comments: Expect difficulties distinguishing small mature males "resting" from "immature"; look for signs of residual milt and translucent sperm duct which is visible some time after spawning.

FEMALE STAGES



Immature: (Cod, about 60 cm, Bay of Fundy, November 7, 1974). Small in relation to body cavity, paired tube-like with outer membrane translucent; eggs not recognizable by eye; ovary is jell-like on inside.

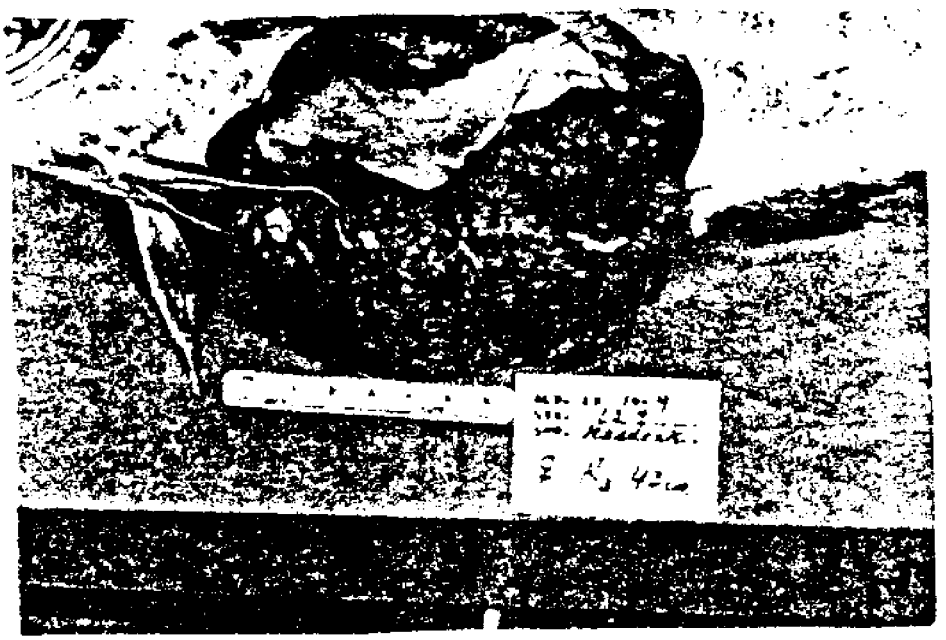
Comments: Same as in most groundfish; translucency and size is the best criteria; location in flounder is inside the ovarial pouch.

FEMALE STAGES

Developing: (Haddock, 51 cm, age 3, NE Georges Bank, February 12, 1972). Enlarging and may fill up to one-half the body cavity; network of blood vessels developed; color is light yellow to orange; yolked eggs are visible to eye, giving the ovary a grainy appearance. Collect this stage for fecundity study.

Comments: Ovary appears to be filling with yolked eggs; in earlier developing stage, the eggs may not be visible and it may be necessary to cut through the membrane to see the eggs.

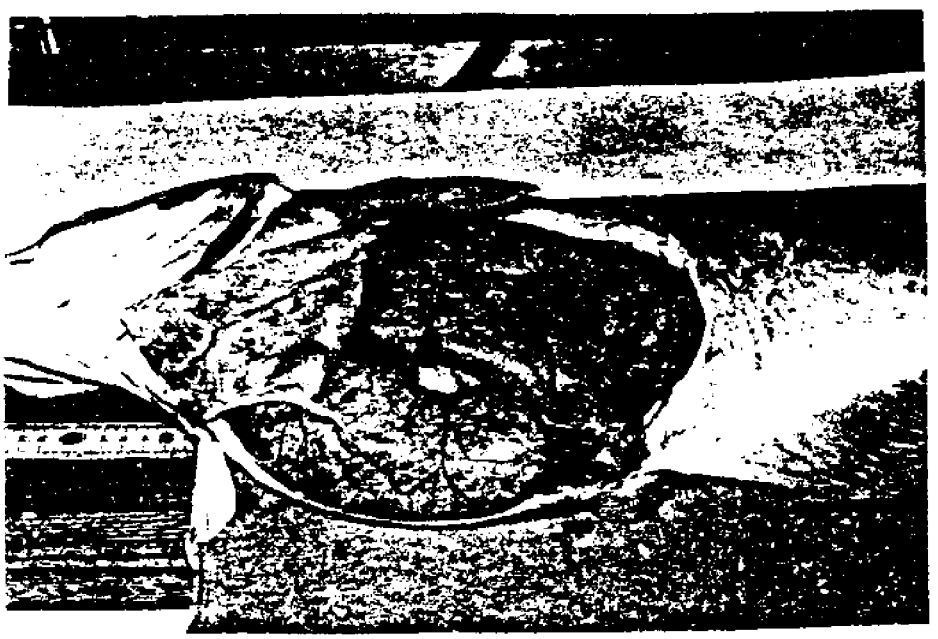
FEMALE STAGES



Ripe: (Haddock, about 42 cm., age 2, NE Georges Bank, April 9, 1974). Continued enlargement and may fill the body cavity, fish looks pregnant; color is light orange to brick red; "tapioca" appearance from mixture of opaque and clear eggs.

Comments: An unmistakable stage for most species because of this "tapioca" appearance; color may vary depending on nearness to spawning. Cut open questionable stages. Note: Do not collect for fecundity.

FEMALE STAGES



Spawning: (Haddock, approximately 73 cm; age 9, SW Georges Bank, February 12, 1969). Size of ovary may vary as eggs are spawned; membrane is generally thin and fragile; eggs and liquid may be easily expressed from the vent; color is variable but generally turns reddish as the ovary gets smaller.

Comments: Best criteria is the liquid eggs; color may be variable from light pink to brick red; flounder may have small area of liquid eggs yet the rest of the ovary appears to be developing. Cut open questionable stages.

FEMALE STAGES

Recovering: (Haddock, Georges Bank, June 1968) The ovary is much reduced in size and becomes a flaccid sac often with remnants of opaque and transparent unspawned eggs, blood and other debris.

Comments: Large silver hake on Georges Bank in October appeared to be "developing" but were reclassified "recovering" after inspection of the inside of the ovary. The best criteria is the purple membrane and the sac containing unspawned eggs and other debris. The size is extremely variable as the amount of eggs and liquid; it is difficult to detect when spawning is over, although most eggs are perhaps degenerated at this stage.

FEMALE STAGES

Resting: (Haddock, Georges Bank, June 1968). Continued reduction in size and noticeable toughening of ovary wall (especially in older fish). The color is purple, bluish-gray and prior to redevelopment, quite a few may contain remnants of egg clusters, still being resorbed or becoming jell-like on the inside.

Comments: This is a difficult stage in all but the older fish; the resting phase may last for several months before redevelopment. One is apt to mis-classify the "resting" stage as "immature". Always cut open to examine for unspawned eggs and other debris which may be present even into the redevelopment stage. In haddock, cod and pollock, the resting ovary was 1) generally larger than the immature stage, 2) more opaque and leathery looking than the immature stage, and 3) there was evidence of unspawned eggs and debris inside the ovary.

REPRODUCTION - SQUID

The following maturity stages and reporting codes for squid are from the National Marine Fisheries Service Observer Manual.

MATURITY STAGES:

Loligo pealei

Male

Code:

0 - Immature	-Spermatophoric gland small. Vas deferens thin and transparent. No stripe in the vas deferens or spermatophoric gland. Testis is small, oval, creamy-white. No sign of spermatophoric development.
1 - Maturing I	-Stripe present in the vas deferens. Beginning of spermatophore development.
2 - Maturing II	-Vas deferens thick and milky-white. Spermatophoric gland developing and visible as a coiled tubule. No spermatophore in the spermatophore sac. Testis larger.
3 - Maturing III	-Similar to stage 2, but spermatophore sac contains spermatophores. Testis enlarged.

Female

Code:

0 - Immature	-Squid less than 6 cm. usually. Ovary small and white; eggs not developed. Nidamental glands small, translucent stripe. May have carotenoid pigment in the accessory nidamental glands, depending upon the season; or they may not be visible at all.

1 - Maturing I -Ovary "feathery", whitish and grainy in appearance.
Accessory nidamental gland may be large, red-orange, mottled spheres of .5 cm. in diameters and may be visible through the mantle.
Nidamental glands are obvious and may exceed 3 cm. in length.

2 - Maturing II -Eggs visible in the ovary, mostly white, some yellowish, all the same size.
Ovary with eggs may fill the entire posterior body cavity.

3 - Maturing III -Eggs on the ventrum of the ovary loose and larger than the rest, yellowish in color and appear to be forming into capsules.
Oviductal gland enlarged.

Ilex illacebrosus

Male

Code:

0 - Immature -As in Loligo peali

1 - Maturing I -As in Loligo pealei

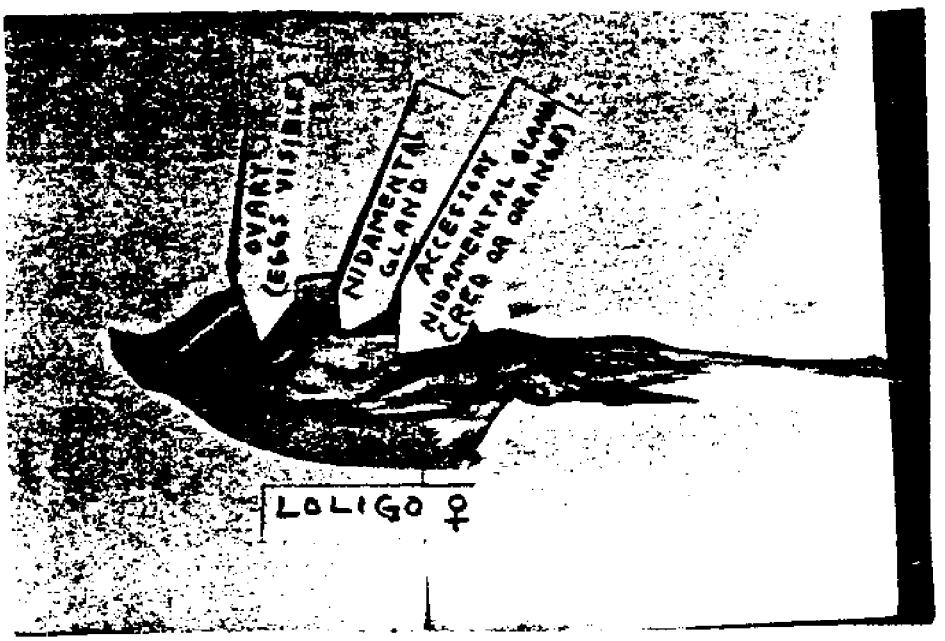
2 - Maturing II -Ovary is enlarged and becoming creamy-orange in color.
Ova are visible to the naked eye.
Nidamental glands are orange and enlarged.

3 - Maturing III -Eggs enlarged to 1 mm. in diameter, ready to be released. Nidamental glands are orange in color and greatly enlarged.

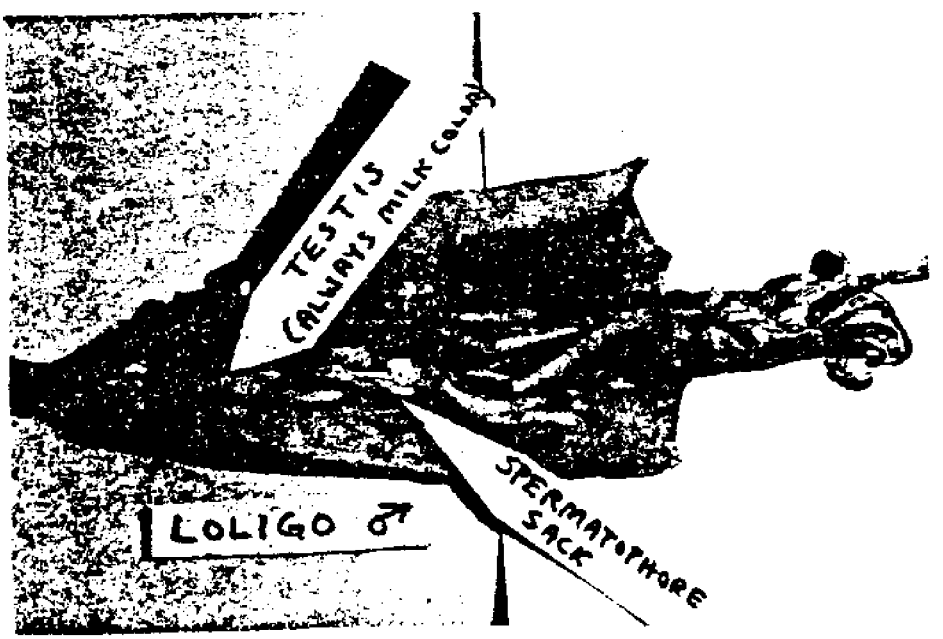
Reproduction

The following pictures and descriptions are from the National Marine Fisheries Service, Observer Manual. They illustrate the male and female internal anatomy of Loligo pealei and Ilex illacebrosus.

LOLIGO

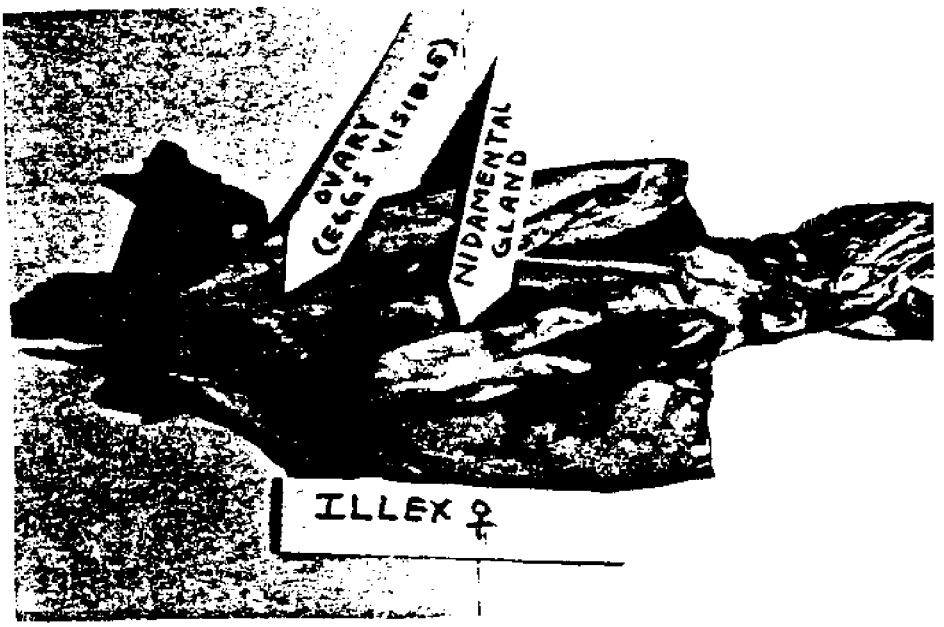


Loligo: Female. This is a mature individual. In most Loligo, especially in autumn, the ovary will be smaller, and the nidamental glands will appear only as thin translucent strips.

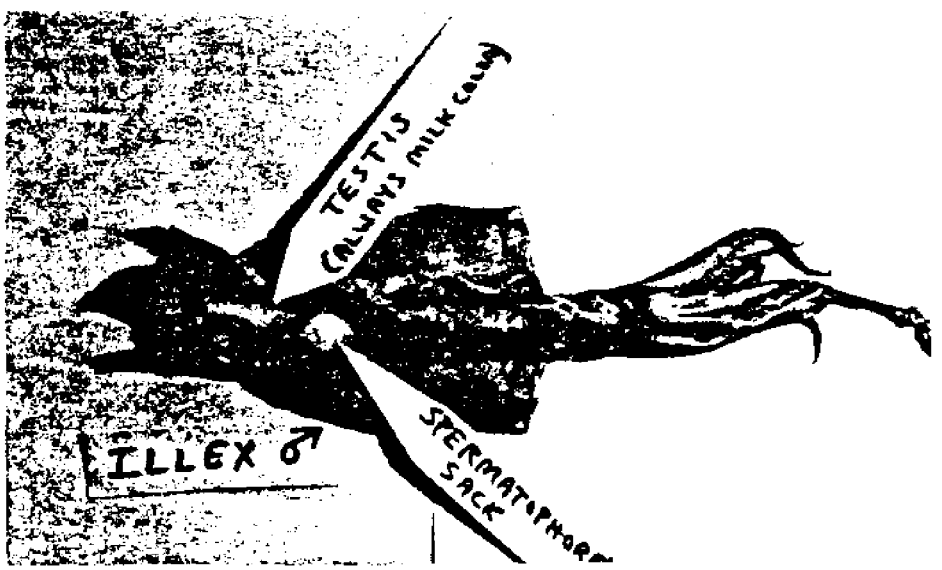


Loligo: Male. This is a mature individual, in immature the spermatophore sac will appear as a small, translucent sac, and the 'coil' will not be present.

ILEX



Ilex: Female. This is a maturing individual. In most females that you will observe, the ovary will be a thin white strip and the nidamentals will be much smaller and translucent.



Ilex: Male. This is a mature individual. In immature individuals, the testis will be much smaller and white, and the spermatophore sac will be empty and translucent.

MATURITY STAGE LOGSHEET SHEET NO. _____

OBSERVER NO. _____

TRIP NO._____ SPECIES _____

TOW NO.	LENGTH (cm)	SEX		MATURITY STAGE						AGE	COMMENT
		M	F	I	D	R	S	Rc	Rt		

MATURITY CODES:

I = Immature D = Developing R = Ripe S = Spawning Rc = Recovering
Rt = Resting

DATA RECORDING - SAMPLING PRIORITIES

The National Marine Fisheries Service requires one sample per 30' x 30' square per month, per species per 100 tons or a fraction thereof caught. Each observer should obtain one sample every time the vessel enters a new 30' x 30' minute square on each trip.

The priorities for sampling are as follows:

1. Obtain a length frequency sample of the directed species.
2. Sample the bycatch. If not sorted, determine species composition of the mixed pile processed and/or discarded, before proceeding further.
3. Obtain length sample of bycatch.
4. Collect scales and otoliths from the directed species.
5. Collect scales and otoliths from the bycatch species.
6. Requests for special samples such as gonads, stomachs, livers, etc.

MAMMAL OBSERVATIONS

The following are some suggestions for mammal observations:

I. STUDY KEY FIELD MARKS

a. size of animal
b. do colors vary from dorsal to ventral, anterior to posterior, lateral surfaces, fins and tail flukes.
c. shape of head; fins and tail flukes; position of dorsal fin; is there a dorsal fin?
d. what shape was the vapor when the animal exhaled, e.g. low and spherical, high and straight, tilted to one side, more than one spout.
e. was the back area behind the dorsal fin arched when diving?

II. GENERAL BEHAVIOR

a. was animal basking on the surface?
b. was animal attracted to or did it ignore vessel?
c. how many times did animal spout before it sounded; did it sound?

III. SIMULTANEOUS OBSERVATIONS

It will be important to note such observations as:

a. weather and sea conditions
b. fish schools
c. birds
d. oil slicks
e. floating debris

Photographs and sketches are also very helpful in the identification of these large animals.

BASIC IDENTIFICATION

Seals, dolphins, porpoises and whales are common along the New England coast. The following list of major characteristics will aid you in identifying the most common marine mammals.

A. Seals (Order Pinnepedia)
   1. Harbor Seal (Phoca vitulina).
      a) Fur present, the color ranging from light grey or tan to brown and red, with irregular spots.
      b) Approximate length of adult males is 6 feet, females 5 feet.
      c) Catshaped head with a concave forehead.

B. Baleen Whales (Order Mysteceti)
   1) Fin Whale (Balaenoptera physalus)
      a) Average length is approximately 70 feet.
      b) Slender body with very prominent, triangular shaped dorsal fin.
      c) Back is grey in color while undersides, lower side of flukes and flippers are white.
      d) Color of baleen and jaws is not uniform; lower jaw is white on the right side and pigmented on the left. The front third section of the baleen is white while the remainder is grey streaked with yellow. Fringes of all the plates are white.
      e) On right side, a large, white patch extends from corner of jaw to behind blowhole.
      f) Two light colored stripes in shape of a "V" extend from the blowhole along back of animal.

   2) Minke Whale (Balaenoptera acutorostrata)
      a) Ranges from 15-30 feet in length.
      b) Back is blue-grey in color with a "broad, light crescent-shaped streak" stretching from near the blowhole to base of each flipper.
      c) White underside and broad white patch on outer side.
      d) Baleen often only 8 inches long and is yellowish white in color.
      e) Head is triangular shaped. When viewed from above, and the fin is "sickle-shaped" with tip pointing backwards.

   3) Humpback Whale (Megaptera novaengliae)
      a) Bulkier and stouter than other whales, average length is approximately 48 feet.
      b) Flippers are white and almost 1/3 of the body length.

c) Baleen and back of body are black, with varying amounts of white underneath.
d) Irregular "knob-like" protuberances on head, snout and flippers.
e) Flukes have scalloped or serrated trailing edges, with white, often in patches, on the underside.

4) Right Whale (Eubalaena glacialis)
a) Adults range from 35-50 feet in length.
b) Body is stout and dark in color, with irregular white patches.
c) No dorsal fin or throat grooves present.
d) Horny protuberances located on jaws, around blow-hole and eyes.
e) Baleen is very dark in color and up to 7 feet.

C. Toothed Whales (Order Odontoceti)
1) Sperm Whale (Physeter catodon)
a) Average length of adult males is 50 feet, females 35 feet.
b) Head has a characteristic oblong shape, the sides of it having longitudinal depressions and the underside is narrow. The jaw is long and narrow with up to 30 pairs of teeth found only in the lower jaw.
c) Dorsal fin is very reduced and followed by a series of low ridges on the caudal region of the back.
d) Brown or dark bluish-grey in color with a gradual lightening on the flanks.
e) Body is often wrinkled or irregularly corrugated.

2) Pilot Whale (Globicephala melaena)
a) Adult length is approximately 25 feet.
b) Animal is entirely black in color except for a white splodge beneath the chin.
c) Dorsal fin is high and strongly arched with a very long base.
d) Head is bulbous shaped.

3) Killer Whale (Orcinus orca)
a) Males reach length of 30 feet, females 15-19 feet.
b) Coloration is black with distinctive white areas on the belly, below the chin, above and behind the eye and on the flank behind the dorsal fin.
c) The dorsal fin is very tall; sharply pointed in the males and curved in females.
d) Flippers are rounded and black in color.

4) Harbor Porpoise (Phocoena phocoena)
   a) Average length is 5.5 feet.
   b) The back can be dark grey, greenish brown or black, while undersides are white.
   c) Presence of a light grey patch in front of dorsal fin.
   d) Body is "tubby" shaped and head is blunt shaped due to absence of projecting beack.
   e) Teeth are flattened and spade shaped as opposed to conical shaped found in dolphins.

5) Whitesided Dolphin (Lagenorhynchus acutus)
   a) Average length ranges 6.5 to 9 feet.
   b) Dorsal fin, back, flippers and flukes are black, ventral side is white, sides are grey with a characteristic narrow, white streak running from dorsal fin to fluke area. Overlying this streak is a yellow or tan patch which continues to the right ridge of the tail.

6) Common Dolphin (Delphinus delphis)
   a) Average length is 6.8 feet.
   b) Back is darkly pigmented, belly is white.
   c) Characteristic "crisscross" pattern of light grey or ochre running along sides.
   d) Body is slender with a narrow pronounced beak, separated from the forehead by a groove.
   e) White streak extends across the melon, a thin "black mask" encloses the eyes, and a black band runs from chin to front edge of flipper.

7) Striped Dolphin (Stanella coeruleoalba)
   a) Average length ranges from 6-7 feet.
   b) Characteristic "bilge stripe" - black stripe extending from eye to anus along ventral side.
   c) Light patch above bilge stripe extending toward dorsal fin and ridge of back.

GULF OF MAINE

Cruise-port Copy — WHALE SIGHTING NETWORK

Return to: Survey Unit
N.E.F.S.C.
Woods Hole

Your name _____ Address _____ Phone _____

OBSERVATIONS: Please fill out as completely as possible. There is room for additional remarks on the back.

Date ____ / ____ / ____ Time _____ am/pm. Weather and sea conditions _____

Location _____ Coordinates _____

Type of whale or porpoise sighted _____ Size _____ How many? _____ In a tight school? _____

How far were you from the animals? _____ Which direction were they swimming? _____ How fast? _____

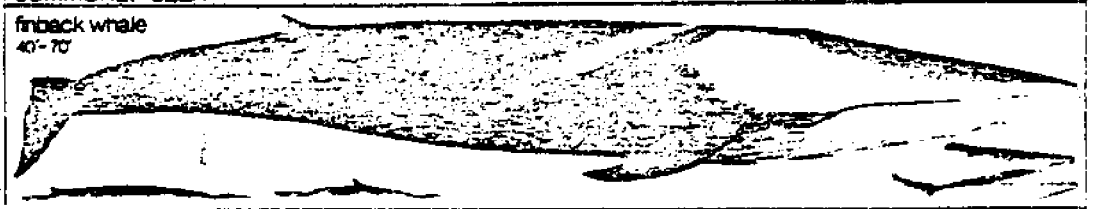
The whale spouted _____ times, with _____ seconds between spouts. Then it dived for _____ minutes before spouting again.

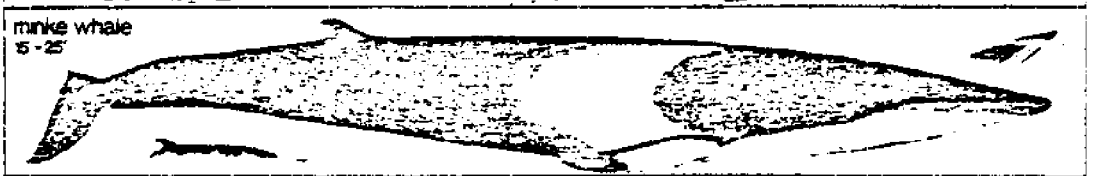
Describe the animal's behavior (did it jump, make noise, ignore boat, like approach, etc.). _____

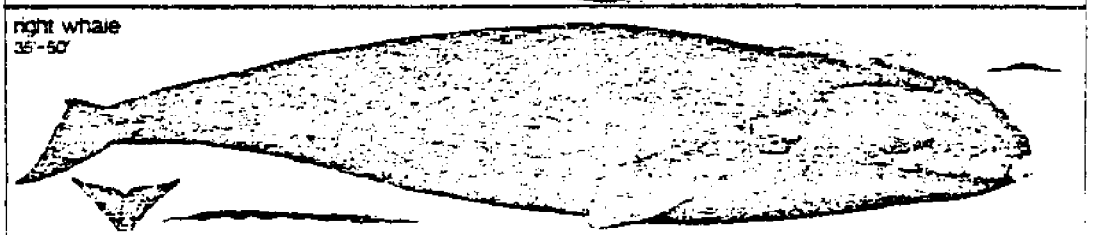
Describe any fishes, birds, or other marine life seen near the whales or porpoises _____

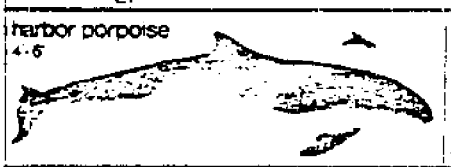
IDENTIFICATION: Please circle any feature that you saw. Sketch any additional observations at bottom right. If you saw a tag, or any unusual markings, scars, colors or deformities, please describe and sketch your observations. Photographs of the undersides of humpback whale flukes can help to identify individual whales. Please notify us if you have such photographs.

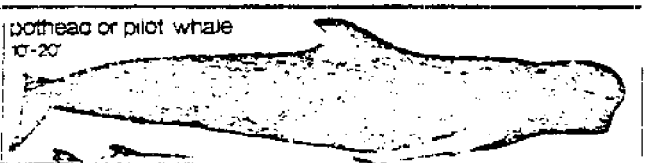
COMMONLY SEEN:



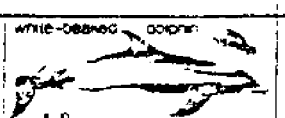


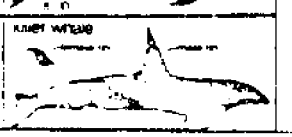






OCCASIONALLY SEEN:



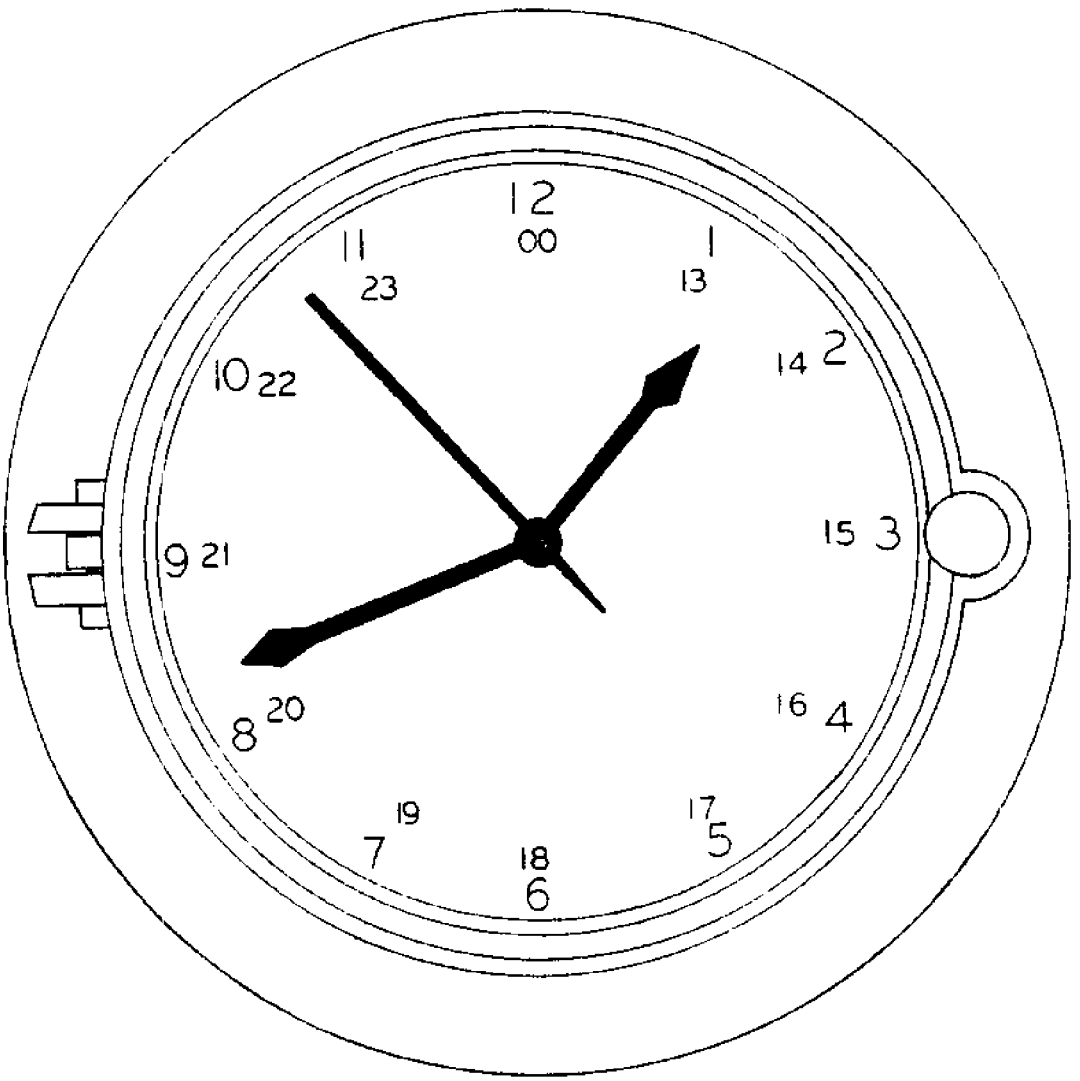


OTHER - DRAW WHAT YOU SAW:

TIME KEEPING AT SEA

For purposes of data recording, the 24-hour clock is used. The following time conversions should be learned. Please refer to the diagram on the accompanying page.

0000 -	(Zero-zero-hundred) -	12 midnight
0100 -	(Zero-one-hundred) -	1 a.m.
0200 -		2 a.m.
0300 -		3 a.m.
0400 -		4 a.m.
0500 -		5 a.m.
0600 -		6 a.m.
0700 -		7 a.m.
0800 -		8 a.m.
0900 -		9 a.m.
1000 -	(Ten hundred) -	10 a.m.
1100 -		11 a.m.
1200 -		12 noon
1300 -		1 p.m.
1400 -		2 p.m.
1500 -		3 p.m.
1600 -		4 p.m.
1700 -		5 p.m.
1800 -		6 p.m.
1900 -		7 p.m.
2000 -	(Twenty hundred) -	8 p.m.
2100 -		9 p.m.
2200 -		10 p.m.
2300 -		11 p.m.
2400 -		12 midnight



SHIP'S CLOCK

SHIP'S BELLS AND WATCHES

12:30 a.m. - 1 bell	12:30 p.m. - 1 bell
1:00 a.m. - 2 bells	1:00 p.m. - 2 bells
1:30 a.m. - 3 bells	1:30 p.m. - 3 bells
2:00 a.m. - 4 bells	2:00 p.m. - 4 bells
2:30 a.m. - 5 bells	2:30 p.m. - 5 bells
3:00 a.m. - 6 bells	3:00 p.m. - 6 bells
3:30 a.m. - 7 bells	3:30 p.m. - 7 bells
4:00 a.m. - 8 bells	4:00 p.m. - 8 bells
4:30 a.m. - 1 bell	4:30 p.m. - 1 bell
5:00 a.m. - 2 bells	5:00 p.m. - 2 bells
5:30 a.m. - 3 bells	5:30 p.m. - 3 bells
6:00 a.m. - 4 bells	6:00 p.m. - 4 bells
6:30 a.m. - 5 bells	6:30 p.m. - 5 bells
7:00 a.m. - 6 bells	7:00 p.m. - 6 bells
7:30 a.m. - 7 bells	7:30 p.m. - 7 bells
8:00 a.m. - 8 bells	8:00 p.m. - 8 bells
8:30 a.m. - 1 bell	8:30 p.m. - 1 bell
9:00 a.m. - 2 bells	9:00 p.m. - 2 bells
9:30 a.m. - 3 bells	9:30 p.m. - 3 bells
10:00 a.m. - 4 bells	10:00 p.m. - 4 bells
10:30 a.m. - 5 bells	10:30 p.m. - 5 bells
11:00 a.m. - 6 bells	11:00 p.m. - 6 bells
11:30 a.m. - 7 bells	11:30 p.m. - 7 bells
12 noon - 8 bells	12 midnight- 8 bells

The nautical clock is divided into six - four hour watches:

0000 - 0400 - first watch, graveyard, middle watch

0400 - 0800 - morning watch

0800 - noon - forenoon watch

1200 - 1600 - afternoon watch

1600 - 2000 - dogs watch
1600 - 1800 - first dog watch
1800 - 2000 - second dog watch

2000 - midnight - evening watch, first night watch

DATA RECORDING

PROCESSING CODE

Preserved:

Brine	B
Discarded	D
Fresh	R
Frozen	F
Iced	I
Salted	S
Other	O
Undetermined	X

Processed:

Fillet	F
Gutted	G
Headed and Gutted	B
Headed	H
Meal (reduced to)	M
Shelled/Shucked	S
Whole	W
Other	O
Undetermined	X

FISHING AREA CODES

Herring Area 1	HER 1
Mackerel Area 2	MAC 1
Hake Area A	HAK A
Hake Area B	HAK B
Squid Area 1	SQU 1
Squid Area 2	SQU 2
Squid Area 3	SQU 3
Squid Area 4	SQU 4
Squid Area 5	SQU 5

COUNTRY CODES

Bulgaria	BU
Canada	CA
Cuba	CU
Denmark	DA
France	FR
German Democratic Republic	GC
Federal Republic of Germany	GB
Greece	GR
Ireland	EI
Italy	IT
Japan	JA
Korea	KS
Poland	PL
Romania	RO
Spain	SP
United Kingdom	UK
U.S.S.R.	UR

SPECIES CODE

List of Northwest Atlantic Species Arranged According to the ICNAF Groups

The following revised list of common and scientific names of species and groups for the Northwest Atlantic is the result of recent consultations between the ICNAF Secretariat and the Secretary of the CWP (Coordinating Working Party on Atlantic Fishery Statistics) to ensure agreement on species names used by ICNAF and FAO, in accordance with a recommendation from the 1975 Annual Meeting (ICNAF *Redbook* 1975, p. 76). The order of presentation of the catches by species and by species groups in the various tables of Part II corresponds with the order in the following list, where applicable.

ICNAF Code	Common English Name	Scientific Name
	PRINCIPAL GROUNDFISH (EXCEPT FLATFISHES)	
101	Atlantic cod	*Gadus morhua*
102	Haddock	*Melanogrammus aeglefinus*
103	Atlantic redfish	*Sebastes marinus*
104	Silver hake	*Merluccius bilinearis*
105	*Red hake	*Urophycis chuss*
106	Pollock (=Saithe)	*Pollachius virens*
	FLATFISHES	
112	American plaice	*Hippoglossoides platessoides*
114	Witch flounder	*Glyptocephalus cynoglossus*
116	Yellowtail flounder	*Limanda ferruginea*
118	Greenland halibut	*Reinhardtius hippoglossoides*
120	Atlantic halibut	*Hippoglossus hippoglossus*
122	Winter flounder	*Pseudopleuronectes americanus*
124	Summer flounder	*Paralichthys dentatus*
125	Windowpane flounder	*Scophthalmus aquosus*
129	Flatfishes (NS)	*Pleuronectiformes*
	OTHER GROUNDFISH	
132	American angler	*Lophius americanus*
136	Atlantic searobins	*Prionotus* sp.
138	Atlantic tomcod	*Microgadus tomcod*
142	Cunner	*Tautogolabrus adspersus*
144	Cusk (=Tusk)	*Brosme brosme*
148	Greenland cod	*Gadus ogac*
152	Ling	*Molva molva*
154	Lumpfish (=Lumpsucker)	*Cyclopterus lumpus*
158	Northern kingfish	*Menticirrhus saxatilis*
160	Northern puffer	*Sphoeroides maculatus*
164	Ocean pout	*Macrozoarces americanus*
166	Polar cod	*Boreogadus saida*
168	Roundnose grenadier	*Macrourus rupestris*
172	Sandeels (=Sand lances)	*Ammodytes* sp.
174	Sculpins	*Myoxocephalus* sp.
175	Scup	*Stenotomus chrysops*
180	Tautog	*Tautoga onitis*
182	Tilefish	*Lopholatilus chamaeleonticeps*
186	White hake	*Urophycis tenuis*
188	Wolffishes (=Catfishes)	*Anarhichas* sp.
199	Groundfish (NS)	...

ICNAF Code	Common English Name	Scientific Name
	PRINCIPAL PELAGICS	
202	Atlantic herring	*Clupea harengus*
204	Atlantic mackerel	*Scomber scombrus*
	OTHER PELAGIC FISH	
212	Atlantic butterfish	*Peprilus triacanthus*
216	Atlantic menhaden	*Brevoortia tyrannus*
220	Atlantic saury	*Scomberesox saurus*
224	Bay anchovy	*Anchoa mitchilli*
228	Bluefish	*Pomatomus saltatrix*
232	Crevalle jack	*Caranx hippos*
236	Frigate mackerels	*Auxis* sp.
240	King mackerel	*Scomberomorus cavalla*
244	Spotted Spanish mackerel	*Scomberomorus maculatus*
252	Atlantic sailfish	*Istiophorus albicans*
256	Atlantic white marlin	*Tetrapturus albidus*
260	Blue marlin	*Makaira nigricans*
264	Swordfish	*Xiphias gladius*
272	Albacore	*Thunnus alalunga*
274	Atlantic bonito	*Sarda sarda*
276	Atlantic little tunny	*Euthynnus alletteratus*
278	Bigeye tuna	*Thunnus obesus*
280	Bluefin tuna	*Thunnus thynnus*
282	Skipjack tuna	*Katsuwonus pelamis*
284	Yellowfin tuna	*Thunnus albacares*
289	Tunas (NS)	*Scombridae*
299	Pelagic fish (NS)	...
	OTHER FISH	
302	Alewife	*Alosa pseudoharengus*
304	Amberjacks	*Seriola* sp.
306	American conger	*Conger oceanicus*
308	American eel	*Anguilla rostrata*
310	American shad	*Alosa sapidissima*
312	Atlantic argentine	*Argentina silus*
314	Atlantic croaker	*Micropogon undulatus*
316	Atlantic needlefish	*Strongylura marina*
318	Atlantic salmon	*Salmo salar*
320	Atlantic silverside	*Menidia menidia*
322	Atlantic thread herring	*Opisthonema oglinum*
330	Black drum	*Pogonias cromis*
332	Black seabass	*Centropristis striata*
334	Blueback herring	*Alosa aestivalis*
340	Capelin	*Mallotus villosus*
342	Chars (NS)	*Salvelinus* sp.
344	Cobia	*Rachycentron canadum*
346	Common pompano	*Trachinotus carolinus*
354	Gizzard shad	*Dorosoma cepedianum*
356	Grunts (NS)	*Pomadasyidae*
360	Hickory shad	*Alosa mediocris*
370	Mullets	*Mugilidae*
380	North Atlantic harvestfish	*Peprilus alepidotus*
390	Pigfish	*Orthopristis chrysoptera*
400	Rainbow smelt	*Osmerus mordax*
402	Red drum	*Sciaenops ocellata*
404	Red porgy	*Pagrus sedecim*
405	Rough scad	*Trachurus lathami*
410	Sand perch	*Diplectrum formosum*
412	Sheepshead	*Archosargus probatocephalus*
414	Spot	*Leiostomus xanthurus*
415	Spotted weakfish	*Cynoscion nebulosus*
418	Squeteague	*Cynoscion regalis*

ICNAF Code	Common English Name	Scientific Name
420	Striped bass	*Morone saxatilis*
422	Sturgeons	*Acipenseridae*
430	Tarpon	*Megalops atlantica*
432	Trouts (NS)	*Salmo* sp.
440	White perch	*Morone americana*
452	Spiny (=picked) dogfish	*Squalus acanthias*
459	Dogfishes (NS)	*Squalidae*
462	Porbeagle	*Lamna nasus*
469	Sharks (NS)	*Squaliformes*
479	Skates (NS)	*Raja* sp.
499	Finfishes (NS)	...
	INVERTEBRATES	
502	Long-finned squid	*Loligo pealei*
504	Short-finned squid	*Illex illecebrosus*
509	Squids (NS)	*Loliginidae, ommastrephidae*
512	Atlantic razor clam	*Ensis directus*
514	Hard clam	*Mercenaria mercenaria*
516	Ocean quahog	*Arctica islandica*
518	Soft clam	*Mya arenaria*
520	Surf clam	*Spisula solidissima*
529	Clams (NS)	...
532	Bay scallop	*Argopecten irradians*
534	Calico scallop	*Argopecten gibbus*
536	Sea scallop	*Placopecten magellanicus*
539	Scallops (NS)	*Pectinidae*
542	American cupped oyster	*Crassostrea virginica*
552	Blue mussel	*Mytilus edulis*
559	Mussels (NS)	...
562	Conchs	*Strombus* and *Busycon* sp.
564	Periwinkles	*Littorina* sp.
589	Marine molluscs (NS)	...
602	Atlantic rock crab	*Cancer irroratus*
604	Blue crab	*Callinectes sapidus*
606	Green crab	*Carcinus maenas*
608	Jonah crab	*Cancer borealis*
610	Queen crab	*Chionoecetes opilio*
612	Red crab	*Geryon quinquedens*
619	Marine crabs (NS)	...
622	Northern lobster	*Homarus americanus*
632	Northern deepwater prawn	*Pandalus borealis*
639	Pink shrimps (=prawns)	*Pandalus* sp.
649	Marine crustaceans (NS)	...
652	American sea-urchin	*Strongylocentrotus* sp.
669	Marine worms (NS)	*Polychaeta*
672	Horseshoe crab	*Limulus polyphemus*
699	Marine invertebrates (NS)	...
	SEAWEEDS	
702	Brown seaweeds	*Phaeophyceae*
704	Red seaweeds	*Rhodophyceae*
709	Seaweeds (NS)	...
	SEALS	
901	Harp seal	*Pagophilus groenlandicus*
902	Hooded seal	*Cystophora cristata*

BEAUFORT WIND SCALE AND ITS SPECIFICATION FOR SEA AND COASTAL USE

Beaufort scale number	Descriptive Term	Sea Criterion
0	Calm	Sea like mirror
1	Light airs	Ripples with the appearance of scale are formed but without foam crests.
2	Light breeze	Small wavelets still short but more pronounced. Crests have a glassy appearance and do not break.
3	Gentle breeze	Large wavelets, crests begin to break. Foam of glassy appearance. Perhaps scattered with white horses.
4	Moderate breeze	Small waves becoming larger; fairly frequent white horses.
5	Fresh breeze	Moderate waves, taking a more pronounced long form many white horses are formed. Chances of some spray.

Beaufort scale number	Descriptive Term	Sea Criterion
6	Strong breeze	Large waves begin to form; the white foam crests are more extensive everywhere. Probably more spray
7	Near gale	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind.
8	Gale	Moderately big waves of greater length; edges of crests begin to break into spindrift. The foam is blown in well-marked streaks along the direction of the wind.
9	Strong gale	High waves. Dense streaks of foam along the direction of the wind. Sea begins to "roll". Spray may affect visibility.
10	Storm	Very big waves with long overhanging crests. The resulting foam, in great patches, is blown in dense white streaks along the direction of the wind. On the whole the surface of the sea assumes a white appearance. The rolling of the sea becomes heavy and shock-like. Visibility affected.
11	Violent Storm	The conditions become progressively worse.
12	Hurricane	

CODE FOR REPORTING SEA CONDITION

Code Figure		Height	
		Meters	Feet (approx.)
0	Calm-glassy	0	0
1	Calm-rippled	0 - 0.1	0 - 1/3
2	Smooth-wavelets	0.1 - 0.5	1/3 - 1 2/3
3	Slight	0.5 - 1.25	1 2/3 - 4
4	Moderate	1.25 - 2.5	4 - 8
5	Rough	2.5 - 4	8 - 13
6	Very rough	4 - 6	13 - 20
7	High	6 - 9	20 - 30
8	Very high	9 - 14	30 - 45
9	Phenomenal	over 14	over 45

BIOLOGICAL SAMPLING LOG 77-01

Instructions for Recording Catch, Effort, and Position Data on Tow by Tow Logsheets
R.K. Mayo - May, 1977

1. Observer No. - Your individual 2 or 3 digit identification number.

2. Trip No. - New number each time you arrive on a vessel. To be numbered consecutively within a calendar year.

3. Arr. Date - The date you arrive on the vessel.

4. Dep. Date - The date you depart the vessel.

5. Quarter Degree Square - The 30' x 30' square that the vessel is fishing in during this tow.

6. Vessel Name - The alphabetic name of the vessel.

7. Vessel No. - The numeric vessel identification.

8. Permit No. - The vessel's current permit number(if available).

9. Country - The vessel's 2 letter alphabetic country code.

10. Gear Used - The number designation for the type of trawl being used.

11. Mesh Size - The size in mm of the mesh (stretched) in the main body of the trawl.

12. Fishery - The fishery in which the vessel is currently engaged.

13. Permit Area - The name of the window currently being fished by the vessel (e.g., Hake - B).

Note: The following blocks, 14-41, refer to an individual tow.

14. Consecutive Tow No. - The number of the tow from the vessel's log, if available. If not, use your own consecutive numbering scheme for the vessel.

Biological Sampling Log 77-01
(continued)

15. Start Date - Date when net was set for this tow.

16. Time - Time of day when net was set for this tow. Use 24-hour clock.

17. Depth - Water depth (meters) when net was set.

18. Latitude - Latitude at time of set. (degrees and minutes)

19. Longitude - Longitude at time of set. (degrees and minutes)

20. End Date - Date when net hauled back for this tow.

21. Time - Time of day when net was hauled back. Use 24-hour clock.

22. Depth - Water depth (meters) when net was hauled back.

23. Latitude - Latitude at time of haulback. (degrees and minutes)

24. Longitude - Longitude at time of haulback. (degrees and minutes.

25. Max Depth - The maximum depth (m) that the gear fished during this tow.

26. Min Depth - The minimum depth (m) that the gear fished during this tow.

27. Tow Photogtaphed - Check appropriate box to indicate whether you took a photo of the full net and write "1" if yes, "0" if no.

28. Sampled - Check box to indicate whether a length and/or age composition sample was obtained and write "1" if yes, "0" if no.

29. Total Weight - Enter the total weight of all species in the haul to the nearest kg from the vessel log.

29A. Total Weight - Enter your best estimate of the total haul wt. to the nearest kg.

Biological Sampling Log 77-01
(continued)

30. Cloud Cover - Estimate the amount of cloud cover to the nearest 1/8th. Enter the number 0-9.

    0 : Clear
    1-7: As appropriate
    8 : Completely covered
    9 : Cannot determine due to darkness

31. Surface Temp. - Enter the sea surface temperature to the nearest 0.1° C if available.

32. Sea State - Estimate wave height and use the scale on page to determine sea state code.

    Note: (The bounding height is to be assigned to the) (lower code, that is, a height of 4 feet is) (coded as 3.)

32A. Vessel Speed (kts) - The vessel speed while towing to the nearest tenth, e.g. 3.5 knots.

    Note: For each species you observe in the haul, fill in the following blocks:

33. SPP Name - The common name of the species.

34. SPP Code - The correct species

35. Proc Code - Enter the appropriate two letter code to indicate the type of processing including discarded.

36. WT (kg) - Enter your best estimate of the weight (kg) of this species in the tow.

37. % - Enter your best estimate of the percent that this species comprises. This may be entered in place of or in addition to the weight.

38. Number - Enter the number of individuals in the tow if feasible (when only a few individuals are present). This may be entered in place of or in addition to the weight and/or %.

39. SPP Code - Repeat the species code in block 34.

Biological Sampling 77-01
(continued)

40. Proc Code - Repeat the processing code in block 35.

41. Weight (kg) - Enter the weight of this species in kg as it was recorded in the vessel's catch log.

42. Comments - Any appropriate comments pertaining to the data encoded on this log.

OBSERVER PROGRAM - BIOLOGICAL SAMPLING LOG 77-01

OBSERVER NO	TRIP NO	ARR DATE (DAY, MO, YR)	DEP DATE (DAY, MO, YR)	[illegible]

VESSEL NAME	VESSEL NO	PERMIT NO	COUNTRY

GEAR USED	MESH SIZE (MM)	FISHERY	PERMIT AREA

CONSEC TOW NO	DATE (DAY, MO, YR)	TIME (HR, MIN)	DEPTH (M)	LATITUDE		LONGITUDE	
→ START →				°	′	°	′
→ END →				°	′	°	′

MAX DEPTH (M)	MIN DEPTH (M)	TOW PHOTOGRAPHED YES ☐ NO ☐	SAMPLED YES ☐ NO ☐	TOTAL WGT (KG) - VES	TOTAL WGT (KG) - OBS
CLOUD COVER	SURFACE TEMP (°C)	SEA STATE	VESSEL SPEED (KNOTS)		

SPP NAME	OBSERVERS ESTIMATES					VESSEL LOG DATA		
	SPP CODE	PROC CODE	WGT (KG)	%	NUMBER	SPP CODE	PROC CODE	WEIGHT (KG)

COMMENTS

BIOLOGICAL SAMPLING LOG - 77-02

Instructions for Recording Length Frequency Information

R. K. Mayo - July, 1977

1. Observer No. - Your individual 2 or 3 digit identification number.

2. Trip No. - New number each time you arrive on a vessel. To be numbered consecutively within a calendar year. Use same number as on Log 77-01.

3. Consecutive Tow No. - The number of the tow from the vessel's log, if available. Use same number for this tow as on Log 77-01.

4. Day/Month/Year - Enter the date when sample was taken. Use numerics only, e.g. 22/5/77.

5. Nearest Hour - Enter the hour closest to when sample was taken. Use 24-hour clock, e.g. 2200 = 10 p.m.

Note: The following Blocks, 6-13 shall be filled in for each species in the sample.

6. Species Name - The common name of the species.

7. Spp Code - The correct species code from your list.

Sample Weights (kg)

8. Basket - Enter the container weight.

9. Gross - Enter weight of the container plus sample.

10. Net - Enter the gross minus container weight, i.e. the weight of the species.

11. Lenghts of individual fish - If you have less than 5 specimens of a particular species, enter the lenghts here directly.

12. Samples Taken - if you take scales or otoliths, enter the number here, e.g. 25 otoliths would be entered as 25 (0).

13. Fill in length frequency stroke tally as in example log.

14. Comments - Any useful notations pertaining to this sample.

Observer Number	Trip Number	Consec Tow No	Day	Month	Year	Nearest Hour

Species Sampled — Name	Spp Code	Sample Weight (Kilograms) — Basket	Gross	Net	Lengths of Individual Fish > 10 Specimens	Samples taken — (S) Scales, Otoliths (O)

COMMENTS

LENGTH MEASUREMENTS (CM)

1		1			1	
2		2			2	
3		3			3	
4		4			4	
5		5			5	
6		6			6	
7		7			7	
8		8			8	
9		9			9	
0		0			0	
1		1			1	
2		2			2	
3		3			3	
4		4			4	
5		5			5	
6		6			6	
7		7			7	
8		8			8	
9		9			9	
0		0			0	
1		1			1	
2		2			2	
3		3			3	
4		4			4	
5		5			5	
6		6			6	
7		7			7	
8		8			8	
9		9			9	
0		0			0	
1		1			1	
2		2			2	
3		3			3	
4		4			4	
5		5			5	
6		6			6	
7		7			7	
8		8			8	
9		9			9	
0		0			0	
1		1			1	
2		2			2	
3		3			3	
4		4			4	
5		5			5	
6		6			6	
7		7			7	
8		8			8	
9		9			9	
0		0			0	

OBSERVER PROGRAM – *Biological Sampling Log 77-02*

DATA RECORDING - BYCATCH LOG SHEET

Directions for filling out bycatch sheets:

1. Enter the vessel name and permit number.
2. Enter observer number
3. Period covered - the actual dates in which an observation was made.
4. Total catch in metric tons - the total fish that were caught within this time period, including directed and bycatch species.
5. The number of days fished, even if only a partial day - it counts as one day.
6. The number of hours fished includes only that time the net is in the water.
7. List each species separately; avoid using collective terms such as flatfish.
8. List invertebrates such as lobsters, crabs, squid, etc. at the bottom of the list in numbers of individuals if possible, not weight estimates.
9. Under the processed weight heading, indicate the utilization of any bycatch using the correct code and give in kilogram weight.
10. The intent of the bycatch log sheet is to give an accurate picture of the total bycatch for the observer trip. For those haul-backs that you do not witness,

the information can be read off the trawl logs. It is a good idea to compare your recorded bycatch and that of the trawl logs. Of course, your figures are the ones to be entered on the sheet.

BYCATCH

Vessel: ______________________________ Permit No. ________

Observer: ______________________________

Period Covered: ______________________________

Area Fished: ______________________________

Total catch in metric tons: ____________________ 100%

Total Bycatch in metric tons: ____________________ __%

Total number of days fished: ____________________

Total number of hours fished: ____________________

Average Trawling Effort: ____________________ hrs/day

Bycatch estimates:

Observers Estimates

Species Name	Weight (kg)	% of Bycatch	Proc. Code	Round Wt. if Processed

The following instructions from the National Marine Fisheries Service Observer Manual are for completing the Report on Foreign Fishing Vessel Operations - Observer Generated.

1. Vessel Identification Section:

NAME	The name of the vessel up to 20 characters flush left. Spelling of the name should be the same as that used on the Permit.
PERMIT NO.	The assigned permit number without hyphens.

2. Reporting Circumstance Section:

MONTH	The number of the month, with leading zero if necessary, during which the report is generated.
DATE	The date, with leading zero if necessary, on which the report is generated.
FISHING AREA	The authorized fishing area, flush left, in which the vessel was operating during the period covered by the report. See FISHING AREA CODE.
TYPE	Type of report; enter REPORTING CIRCUMSTANCE TYPE CODE.
SOURCE	The person or unit submitting the data. Use SOURCE CODE to indicate the individual Observer.

3. Effort Section:

This section defines the period of the report. Data for separate reports should be compiled commencing on the date of embarkation of the observer and on each date the vessel leaves one fishing area to begin operating in another fishing area.

BGN DATE	Beginning date. The month and date of the first day covered by this report.
END DATE	Ending date. The month and date of the last day covered by this report.
FISH DAYS	The number of days actually fished during the period covered by this report.

4. Yield Section:

This section of the report contains the total yield in fish resulting from the effort expended during the period of this report. Data will not be taken from the production log for processed fish and from the trawl log for discarded fish. All fish taken during the period should be included, regardless of disposition. It is of utmost importance that the Yield Data and the Effort Data cover exactly the same period.

SPECIES	Species taken; enter SPECIES CODE.
TONS	Enter metric tons.
PROC	Processed. How processed and preserved; enter PROCESSING CODES.

Make a separate entry for each processing method used per species. DO NOT enter species if the amount is less than eight species/processing methods, enter only the seven present in the greatest amounts and as an eighth entry, enter the total amount in general terms, i.e. using SPECIES CODE 499 and PROCESSING CODE XX.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

REPORT ON FOREIGN FISHING VESSEL OPERATIONS

OBSERVER GENERATED

VESSEL IDENTIFICATION:

Name

Permit No.

REPORTING CIRCUMSTANCES:

Mo. Date | Fishing Area | Type | Source

EFFORT:

Bgn. Date | End Date | Fish Days

YIELD:

Species	Tons	Proc.	Species	Tons	Proc.

LABORATORY WORK

Laboratory exercises in this discipline are important as a learning tool and can be directly applied to field work. In field sampling or observational procedures, one is often working alone or solely responsible for one particular aspect of the sampling regime. Careful attention to the correct procedure and instruments and respect for the delicacy of specimens is essential. Notes, drawings, and photos may be the only record of an observation - especially if the specimen is too large, perishable or other reasons preclude bringing it back. These procedures must be followed if the objective and critical method is to be acquired.

In order to develop the field skills listed above, it is essential that you learn the following laboratory procedures. First of all, work alone, rather than depending upon others. Read the directions of the laboratory exercise before you begin to work. Handle the materials and specimens carefully to avoid obliteration of important features. Preserved specimens should be handled with care and not allowed to dry out. If being used again, store them in the appropriate containers, completely submerged in the preservative. Keep your dissection instruments sharp and clean.

Dispose of specimens in a proper receptacle. After you have completed the exercise, answer the questions at the end of each exercise and have the instructor correct your work. Look at the other students' completed work and the demonstration specimens. You are responsible for all of them.

In addition, you will be required to keep an up-to-date laboratory notebook of all exercises, exams, notes and drawings. It is beneficial to make a record of your laboratory observations by notes and line drawings. Preferably, use a number 3 or 4 lead pencil. Clear notes and drawings indicate to the instructor that you have done the assignment, but more importantly, they help fix the observation in your mind in a way that dissection alone can never do. They also comprise a record for review.

LABORATORY EXERCISE I - EXTERNAL ANATOMY OF MARINE FISH

MATERIALS:

Marine fish specimens (fresh and preserved)
Dissecting trays and pins
Blank oaktag labels

DIRECTIONS:

The fish specimens have been divided into several groups. Choose one fish from each group and label the structures listed below. Look at other students' labelled specimens and demonstration specimens. You are responsible for all of them. Complete the questions at the end of the exercise.

STRUCTURES TO BE LABELLED:

Ventrum
Dorsum
Posterior
Anterior
Lateral
Dorsal Fin (if more than one, so designate)
Pectoral Fins
Pelvic Fins
Anal Fin (if more than one, so designate)
Caudal Fin
Caudal Peduncle
Adipose Fin
Finlets
Keels
Operculum
Lateral Line

QUESTIONS:

1. Draw each specimen and label the structures.
2. Give the common and scientific name of each of your specimens.
3. For each specimen, which feature do you think serves to distinguish it from the other specimens?
4. For each group, what is the main distinguishing feature?

LABORATORY EXERCISE II - INTERNAL ANATOMY OF MARINE FISH

MATERIALS:

Marine fish specimens (fresh and preserved)
Dissecting trays and pins
Dissecting kits; forceps and surgical scissors
Blank oaktag labels

DIRECTIONS:

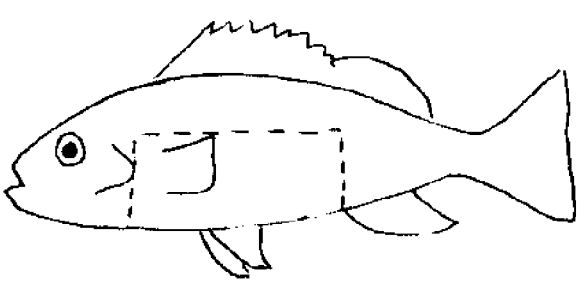
The fish samples have been grouped into several sections. Each student will choose one fish from each group to dissect. Before you begin to work, read the cautionary note below.

******SPECIAL INSTRUCTIONS FOR PRESERVED SPECIMENS********

If you are using a preserved fish specimen, it most likely has been preserved in a solution containing formalin, an extremely volatile substance. Be sure to wash off the surface of the fish thoroughly. Cut into the fish carefully, avoiding puncturing the internal organs. It is common for preserved specimens to have been injected with the preserving solution and the organs will have absorbed the solution. Do not place your face close to the specimen while cutting or probing! You may cause the preserving fluid to squirt in your eye. If this happens, rinse the eye liberally with cold water. If burning persists, get medical attention immediately. Rinse the internal gut cavity with water to remove most of the preserving solution before you begin to work.

****

When cutting into the specimen, try to avoid puncturing the underlying internal organs. Make a ventral belly cut from the anal pore to the operculum using the surgical or dissecting scissors. Next, cut perpendicularly behind the operculum and above the anal pore. Cut across laterally and remove the skin flap. In effect, you have made a "window" in the lateral portion of the specimen.



Label the internal anatomical structures listed below. Extract a gill segment, mount it on a piece of cardboard and label its parts. Observe other students' labelled specimens and the demonstration specimens. Complete the questions at the end of the exercise.

STRUCTURES TO BE LABELLED:

Stomach
Intestine
Pyloric Caeca
Heart
Kidney
Liver
Swim Bladder
Testis
Ovary
Gill Raker
Gill Filament

QUESTIONS:

1. Draw, label, and describe each fish specimen.

2. Give the common and scientific name of each of your specimens.

3. Designate the sex and maturity stage of each of your specimens.

4. Are your specimens carnivores or plankton feeders? Give several reasons for your choices.

5. Do your fish possess swim bladders? What does their presence or absence tell you about their lifestyle?

6. What type of reproduction is represented by each species?

LABORATORY EXERCISE III - SQUID EXTERNAL ANATOMY

MATERIALS:

Samples of squid (fresh and preserved)
Dissecting trays and pins
Blank oaktag labels

DIRECTIONS:

The squid specimens have been divided into two groups. Each student will choose one sample from each group and label the structures listed below. Complete the questions at the end of the exercise.

STRUCTURES TO BE LABELLED:

Anterior Surface
Posterior Surface
Dorsal End
Ventral End
Lateral Surface
"foot region"
Arms (Posterior and Anterior)
Tentacles
Fin
Mantle
Collar
Siphon
Eye

QUESTIONS:

1. Give the common and scientific name of each of your specimens.

2. Draw and label each specimen.

3. What features serve to differentiate between the two species?

LABORATORY EXERCISE IV - SQUID INTERNAL ANATOMY: SEX AND MATURITY STAGE

MATERIALS:

Samples of squid (fresh and preserved)
Dissecting trays and pins
Dissecting kits, forceps, surgical scissors
Blank oaktag labels

DIRECTIONS:

The squid specimens have been divided into two groups. Choose one specimen from each group to dissect. On each specimen, cut it open along the posterior plane and expose the internal organs. Each student is responsible for a familiarity with the male and female reproductive organs. If you were unable to dissect both sexes, make sure that you look at another student's specimen. Label the organs specified below. Complete the questions at the end of the exercise.

STRUCTURES TO BE LABELLED:

Siphon	Kidney	Oviduct
Mantle	Testis	Nidamental Gland
Stomach	Ovary	
Intestine	Spermatophoric Gland	
Caecum	Penis	
Ink Sac	Oviductal Gland	
Gill		

QUESTIONS:

1. Draw, label and describe each of your specimens. Include drawings of both sexes in your notebook.

2. Give the common and scientific names of your specimens.

3. Are your specimens male or female?

4. What is the one obvious feature that serves to distinguish the male from the female?

5. What maturity stage were your specimens in?

LABORATORY EXERCISE V - MARINE FISH IDENTIFICATION

MATERIALS:

Marine fish species collection (fresh and preserved)
Dissecting trays and pins
Forceps
Probe
Bigelow and Schroeder - Fishes of the Gulf of Maine
National Marine Fisheries Service - Observer Manual key

DIRECTIONS:

Each student will utilize the laboratory period to familiarize himself with the labelled collection of marine fish species. In addition, you will be provided with a bin of unlabelled specimens. Choose two different unlabelled fish and "key out" using the key in the front of Bigelow and Schroeder - Fishes of the Gulf of Maine and the National Marine Fisheries Service - Observer Manual key. Look at the other students' labelled specimens. You are responsible for a familiarity with all the specimens provided in the lab. Complete the questions at the end of the exercise.

QUESTIONS:

1. Draw your two unknown species and give the common, (colloquial, if any), and scientific names.

2. What major feature serves to distinguish them?

3. To what other species are they closely related and why?

4. What are the major groups of fish represented in the species collection and what serves to differentiate them?

LABORATORY EXERCISE VI - MARINE INVERTEBRATE IDENTIFICATION

MATERIALS:

Marine invertebrate species collection (fresh and preserved)
Dissecting trays and pins
Forceps
Probe
Smith - Keys to the Marine Invertebrates of the Woods Hole Region
National Marine Fisheries Service - Observer Manual key

DIRECTIONS:

Each student will utilize the laboratory period to familiarize himself with the labelled collection of marine invertebrate species. In addition, you will be provided with a bin of unlabelled specimens. Choose two different unlabelled invertebrates and "key out" using the Woods Hole and Observer Manual keys. Look at other students' labelled specimens. You are responsible for all the specimens provided in the lab. Complete the questions at the end of the exercise.

QUESTIONS:

1. Draw your two specimens and give the common, and scientific names.

2. To what "classes" do they belong?

3. What major feature serves to differentiate them?

4. To what other species are they closely related and why?

5. What are the major groups of invertebrates represented in the species collection and what serves to differentiate them?

LABORATORY EXERCISE VII - LENGTH SAMPLING

MATERIALS:

Marine fish and invertebrate species (fresh and preserved)
Measuring board
Aluminum and/or plastic punch strips
Awl
Tape measure
Calipers

DIRECTIONS:

Each student will choose one fish and one invertebrate species and measure the length of each individual accord-ing to the criteria established by the National Marine Fisheries Service and included in the text material. Com-plete the questions at the end of the exercise.

QUESTIONS:

1. Give the common and scientific name of the species you measured.

2. Which measuring technique did you use for your species and why?

3. Why do you think that the fork length is used for herring?

4. Add your data to the rest of the class on Biological Sampling Log Sheet 77-02.

LABORATORY EXERCISE XIII - ESTIMATION OF WEIGHT AND SPECIES COMPOSITION OF THE CATCH

MATERIALS:

Marine fish and invertebrate specimens (fresh and preserved)
Portable fish checkers (wooden frames, approximately 6 ft. square.)
Small, square container (approximately 1 - 1½ ft. square, 4 inches deep.)
30 kg. scale
Tape measure

DIRECTIONS:

Students will be required to work in pairs for this exercise. Each group will have one basket of mixed species to sample.

First, dump the basket of fish into the checker, and using the sub-sampling technique, calculate the weight.

Next, determine the species composition of the total basket of fish, calculate the percentage of each and weight of each species in the basket. You will be required to use the formulas and techniques given in the text.

Enter the data on a copy of the Biological Sampling Log form 77 - 01.

LABORATORY EXERCISE IX - SCALE SAMPLING

MATERIALS:

Marine fish species (fresh and preserved)
Forceps
Blunt knife
Microscope
Scale envelopes

DIRECTIONS:

Each student will choose one fish from each group and sample the scales according to the criteria established by the National Marine Fisheries Service. This material will be found in the text. Observe the scales under the microscope and place them in correctly labelled envelopes. Complete the questions at the end of the exercise.

QUESTIONS:

1. Draw each species' scale and give the common and scientific name.

2. What type of scale does each species possess?

3. What do you estimate to be the age of each of your specimens?

LABORATORY EXERCISE X - OTOLITH SAMPLING

MATERIALS:

Marine fish species (fresh and preserved)
Dissection kits
Forceps
Surgical Scissors
Hacksaw/bonesaw
Fillet (boning) knife
Microscope
Otolith envelopes

DIRECTIONS:

Each student will choose one fish from each group and sample for both otoliths. Refer to the text material for the correct method of extraction according to species. If you do not find the otoliths on the first try, keep digging with the knife or forceps. They are hard, bony, intact structures not likely to be confused with bone fragments. If there is enough time and specimens, practice extracting otoliths until you feel that you are proficient.

Observe the otoliths under the microscope. Place the otoliths in correctly labelled envelopes and complete the questions at the end of the exercise.

QUESTIONS:

1. Draw each species' otolith and give the common and scientific name.

2. What do you estimate to be the age of each of your specimens?

APPENDIX

Standard Supply List for 1 Observer Making a Three Week Trip

ITEM	QUANTITY
Sampling box	1
Padlock-for sampling box	1
Fish gloves	3 Pair
Cotton gloves	3 Pair
Resin coated apron	1
Measuring board	1
Punch-strips-approx.	50
Punch strip overlays	2
Awls-for punch strips	2
Boning knives	3
Pocket knife	1
Dividers, drafting	1
Steel tape measure	1
14" Butcher's saw (hacksaw)	1
Forceps	3
Scissors	1
Screwdriver	1
Scale envelopes	50
Formalin	1 qt. 100%
Specimen jar	12 pint jars
Plastic bags	several
Length-frequency sheets	100
Sampled logs	25
Tow by tow logs	100
Clipboards	1
3 ring binders	1
Pencils	1 dozen
Pens	5
Mechanical Pencils	4
Pencil sharpeners	2
Lined paper	3 pads
Rubber bands	several dozen
Paper clips	1 box
Field diaries	1-2
Water-proof marking pens	2-4
Erasers	1-2
Fishes of Gulf of Maine by Bigelow & Schroeder	1 copy

FISHING GEAR RESOURCES:

Literature

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Holdgate, B.A. 1970. Net Making for All. Mills and Boon Ltd.: London. 136p.

Kostyunin, yu.n. 1971. Trawls and Trawling. Israel Program for Scientific Translations: Jerusalem. 144p.

Kristjonsson, Hilmar. 1975. Modern Fishing Gear of the World. Fishing News Books, Ltd.: Surrey. 607p.

Kutakov, B., Kudryavtsev, N. and V. Savrosov. 1971. Midwater Trawling. Israel Program for Scientific Translations: Jerusalem.

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Sainsbury, John C. 1975. Commercial Fishing Methods. Fishing News (Books) Ltd.: Surrey.

VonBrandt, Andreas. 1972. Fish Catching Methods of the World. Hienmann Publ. Co.: New York.

FILMS

41° North, 67° West: Associated Films, Inc. - fishing on Georges Bank.

Maines Harvesters of the Sea: Association Films, Inc. -trawlers, draggers, purse seiners, lobstering.

Two Faces of the Sea: Association Films, Inc. -Maine fishermen, methods, gear.

Fishing for a Living: Johnson Hunt Production, U.S.A. F.A.O. - tuna fishing methods and gear, handling.

Fishing Grounds of the World: The Rank Organization, U.K. - survey of principle fishing grounds of the world, net mending, trawl fishing.

Journey of the Star-Kist: Star Kist Foods, Inc. U.S.A. -pelagic fishing methods and gear.

Man's World: Anthony Barrier Prod. Ltd., U.K. -theoretical and practical training of fishermen.

Mustad Autoline System for Mechanized Longline Fisheries: O. Mustad and Son, A/S, Norway. - modern developments in long-lining.

Pacific Halibut Fishing - U.S. Dept. of the Interior -fishing methods, gear, handling, processing.

Peche Industrielle du Poisson Frais: (French) Compagnie Radio - Maritime (CRM), France. -French stern trawler operations.

The Port of New Bedford: New Bedford Seafood Council. -(film strip), processing, packaging, economic, social importance of the industry.

Trawler Fishermen: National Film Board of Canada. -fishing methods and gear.

Trawling: Vickers Ltd., U.K. - fishing methods and gear.

Trawlers in Action II: Ministry of Agriculture, Fisheries and Food, U.K. - various trawl designs and gear.

Basic Net Mending: N.O.A.A.

BIOLOGICAL RESOURCES:

Literature

Alexander, Gordon. 1967. General Zoology. 5th ed. Barnes and Noble, Inc.: New York. 296p.

Bailey, Reeve M., Fitch, John E., Herald, Earl S., Lachner, Earnest A., Lindsey, C.C., Robins, C. Richard, and W.B. Scott. 1970. A list of common and scientific names of fishes from the United States and Canada. Am.Fish. Soc. Spec. Publ. No.6 Washington, D.C.

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McConnaughey, Bayard H. 1974. Introduction to Marine Biology. 2nd ed. The C.V. Mosky Co.: St. Louis. 544p.

Marshall, N.B. 1965. The Life of Fishes. Weidenfeld and Nicolson: London. 402p.

Meglitsch, Paul A. 1972. Invertebrate Zoology. Oxford University Press: New York. 834p.

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Orr, Robert T. 1971. Vertebrate Biology. 3rd ed. W.B. Saunders Co.: Philadelphia. 544p.

Perlmutter, Alfred. 1974. Guide to Marine Fishes. New York University Press: New York. 431p.

Royce, William F. 1972. Introduction to the Fishery Sciences. Academic Press: New York. 351p.

Smith, Ralph I. (ed.) 1964. Keys to Marine Invertebrates of the Woods Hole Region. Cont. No. 11 Systematics-Ecology Program Mar. Biol. Lab. Woods Hole, Ma. 208p.

Thorson,Gunnar. 1973. Life in the Sea. McGraw-Hill Book Company: New York. 256p.

U.S. Dept. Comm. N.O.A.A., N.M.F.S., Northeast Region "Manual for Observers aboard Foreign Fishing Vessels". Foreign Fisheries Observer Program. Fisheries Management Division - Law Enforcement Branch, Otis Air Force Base, Ma.

FILMS

Embryonic Development of Fish. National Film Board of Canada.

Pearl of the Atlantic. New Bedford Seafood Council - deep sea scallop biology and fishery.

Crustaceans. University of Maine Film Rental Library.

Time of Migration. Brandon Films, U.S.A. - migration, spawning of the alewife.

Tomorrow is Too Late. National Film Board of Canada - conservation, management.

ADDRESSES OF FILM DISTRIBUTORS

Anthony Barrier Prod. Ltd.
1-6 Falconberg Court
London W1V 5FG
U.K.

Association Films, Inc.
410 Great Road
Littleton, MA

Brandon Films
221 West 57th Street
New York, N.Y. 10019
U.S.A.

Compagnie Radio-Maritime (CRM)
8 rue Lavoisier
75008 Paris
France

FAO
Film and TV Section
Via delle Terme di Caracalla
00100 Rome
Italy

Film Loan Library
Information Division
F.A.O.
Via delle terme di Caracalla
00100, Rome, Italy

Johnson Hunt Productions
6508 De Longpre Avenue
Hollywood, Calif.
U.S.A.

Ministry of Agriculture, Fisheries and Food
Technical Visual Aids Branch
Gt. Westminster House
Horseferry Road
London SWI
U.K.

Motion Picture Service
Department of Commerce-N.O.A.A.
12231 Wilkins Avenue
Rochville, MD 20852

O. Mustad & Son, A/S
Oslo
Norway

National Film Board of Canada
International Division
P.O. Box 6100
Montreal 3
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Canada

New Bedford Seafood Council
848 Pleasant Street
Suite 3B
New Bedford, MA 02740

The Rank Organization
Rank Film Library
1 Aintree Road
Perivale, Greenford
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U.S.A.

United States Department of the Interior
Bureau of Commercial Fisheries
Attn: Chief, Audio-Visual Services, Rm.601
1815 North Fort Myer Drive
Arlington, VA 22209
U.S.A.

University of Miami
P.O. Box 80533, Coral Gables, Fla.
U.S.A.

Vickers, Ltd.
Vickers House, Broadway
London, SW1
U.K.