Alaska Underutilized Species

Volume II:

OCTOPUS

J.R. Wilson

Abby H. Gorham

Sea Grant Report 82-3

May 1982

Alaska Sea Grant College Program
University of Alaska
Fairbanks, Alaska 99701

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The appendices to this report have been published in a separate volume. They contain more detailed information relating to the various sections in this report. If you are interested in this additional information, request copies from:

Alaska Sea Grant Communications
University of Alaska
Bunnell Building, Room 3
303 Tanana Drive
Fairbanks, Alaska 99701

The appendices are as follows:

Appendix A: Results of selected cruises of the National Marine Fisheries Service in the Bering Sea, and Gulf of Alaska, by statistical block, showing incidental catches of octopus

Appendix B: Japanese and Korean octopus catch in the Bering Sea and Gulf of Alaska, by statistical block

Appendix C: The estimated incidental octopus catch by mothership and stern trawler, by statistical block, derived from NMFS foreign observer data

Appendix D: Detailed results of the feasibility analysis of trawling operations for octopus

Appendix E: Survey questionnaire and background information

Appendix F: Import and export statistics for countries reporting trade in octopus

Appendix G: A summary of major producers of the world's sea cucumber, sea urchin, squid, octopus, and cuttlefish resources with synopsis on the availability of import-export data from the country

ACKNOWLEDGEMENTS

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ALASKA'S UNDERUTILIZED SPECIES - OCTOPUS

GENERAL DESCRIPTION

The world distribution of octopus is vast. The species also has a wide consumer following. However, each consumer group has a narrow definition of acceptable product, based on preparation methods and species type. Alaska appears to have only one species that is found in commercial quantity: Octopus dofleini--the giant Pacific octopus. However, several other species are found in state waters that are of commercial significance, including Octopus vubescens and Octopus leioderma. The degree to which this species can be marketed overseas depends largely on how similar it is to traditional food items made from octopus found in the importing country. A greater opportunity may present itself closer to home in the form of local halibut bait markets and small-scale ethnic markets. This would circumvent the Japanese export and sale of O. dofleini to Alaska.

WORLD DISTRIBUTION

The order Octopoda is subdivided into two groups of markedly different form and habit (Voss 1973).

> Cirrata (Pteroti): This is a suborder of finned octopods with cirri (hair-like growth) on the arms. They are all deepwater species of little commercial importance.
>
> Incirrata (Apteroti): This diverse suborder is the one that contains all of the commercially relevant species. Most of the commercially important octopods belong to three genera: Octopus, Cistopus and Eledone. There are about 100 species that occur worldwide within these three genera (Voss 1973). However, 19 of these are of prime commercial importance and have been described by Briantais (1974), Voss (1973), Hotta (1976) and Sakamoto (1976).

Table 1 shows the distribution and names of the 19 principal octopus species of the world. Briantais, after Voss, has divided the world's neritic (waters above the continental shelf) zone into 15 different regions from which octopus are obtained. Regions I, II, IV, V, VI, XI, XII, and XV are those that are the most heavily exploited. Species Octopus vulgaris, the smaller counterpart of O. dofleini, is the most heavily exploited octopod worldwide.

The following discussion of Table 1 and Figure 1 come from Voss, 1973 or Briantais, 1974, unless otherwise noted.

Region I - Northeast Atlantic from USSR and Scandinavia to Gibraltar

Three species of octopus occur along the European Atlantic coast. These are the common octopus, Octopus vulgaris, the lesser octopus Eledone cirrhosa, and the musk octopus Eledone moschata. Of these, the common octopus is the most popular for the preparation of food items. The two species of Eledone are not as important.

Table 1. The world's most important octopus species by location and extent of exploitation[1]

Species	Regions														
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV
Octopus vulgaris	*	*	o	o	*	*	o	o	o		*	o		o	o
O. macropus		o		o			o				o	o			
O. maya			o	*			o								
O. briareus				o			o								
O. dofleini								o			o				
O. fitchii								o							
O. chierchiae									o						
O. selene									o						
O. conispadiceus											o				
O. ocellatus											o	o		o	
O. variabilis											o				
O. aegina												*		o	*
O. cyaneus												o	o	*	
O. hongkongensis												o			o
O. globusus													o		
O. herdmani													o		
Eledone cirrhosa		o													
Eledone moschata		o													
Cistopus indicus												*	o		
Total = 19	1	4	2	4	1	1	4	3	3		6	7		4	7

Source: Briantais (1974) after Voss (1973)

[1] * predominant commercial species
o secondary commercial species

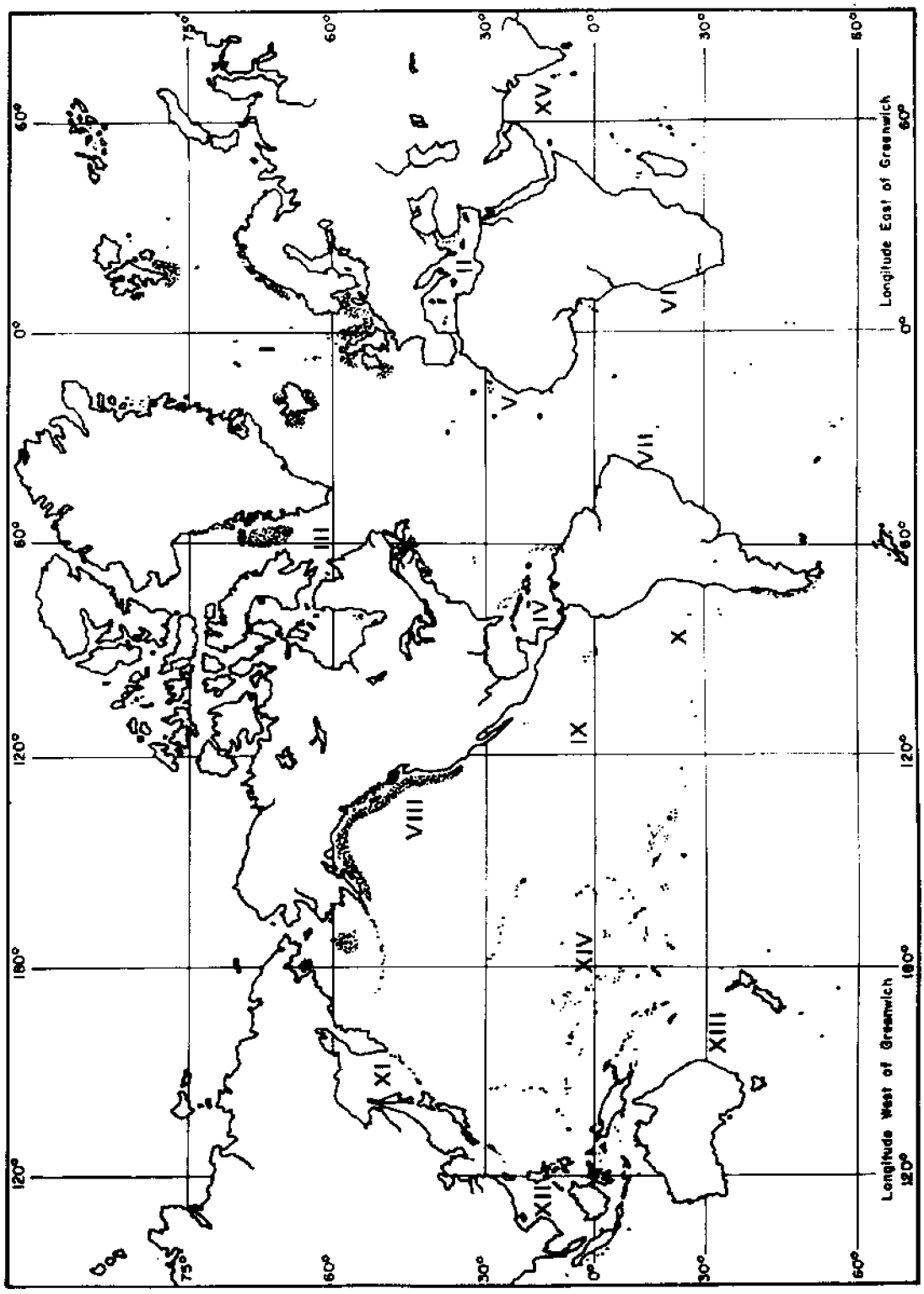

Figure 1. World map with relevant regions of octopus distribution numbered. (Briantais 1974 after Voss 1973)

Region II - Mediterranean Sea

Four different species make up the major octopod fishery in the Mediterranean Sea: Octopus vulgaris and O. macropus (popularly called "poulpe" or "polpo"), Eledone cirrhosa and E. moschata (the "moscardinos").

Region III - Northwest Atlantic

Of the area in the Northwest Atlantic shown, the only octopod fishery of consequence is the Mexican fishery for O. maya. There has been considerable confusion in the past between O. maya and O. vulgaris. The major fisheries are located in the states of Campeche, Champoton and Veracruz.

Region IV - Caribbean and Northern South America

Although octopus is taken locally in many of these areas, most never enter the marketing chain. The major species of this area are Octopus vulgaris, O. briareus, O. macropus, and O. maya.

Region V - Central Eastern Atlantic

Northeast Africa and the Gulf of Guinea are undoubtedly the richest octopus harvesting areas in the world. Both Spain and Japan have explored the Saharan Bank and the Mauritanian coast, and large stocks of Octopus vulgaris were discovered by a Japanese fishing company in Cape Blanc Bay in 1965.

Region VI - Southeast Atlantic

Although there appear to be several species of octopus available for harvest, little of it is taken because of the consumer habits of the southern African nations. This observation is further substantiated by the paucity of information we received from South African fisheries ministers.

Region VII - Southwest Atlantic

From northern Brazil to Cape Horn, the only octopod of obvious commercial importance is O. vulgaris. Its fishery is by hand, incidental to trawling for shrimp.

Region VIII - The Northeast Pacific

For the large areas of Alaska, western Canada, and the west coast of the United States, the principal species that are caught are Octopus vulgaris, O. dofleini, and O. fitchii. This statistical area covers a tremendous range of oceanic temperatures, all of which tend to separate the zoogeography of these species. For instance, Alaska is known to have only one octopus species in commercial abundance, O. dofleini, although other species are present. There are two major, developed pools of demand for octopus on the North American west coast. One is as bait for the North Pacific halibut longline fishery, the other is the Oriental and Mediterranean/European communities on the west coast of the United States.

Region IX - Central East Pacific - Baja California to Ecuador

Although a number of octopus species abound (O. vulgaris, O. chierchiae and O. selene in the tropical portion of the distribution; O. vulgaris, O. fitchii and O. dofleini in the temperate zone) a very small fishery occurs in this area, mostly for use in Mexico or for the growing exports to Japan from Mexico.

Region X - Southeast Pacific - Peru to Cape Horn

Because of the narrow or nonexistent continental shelf, it is doubtful that any octopus fishery of commercial importance will be developed in this area.

Region XI - Northwest Pacific

As would be expected, this area of the world has tremendous octopus fishing activity, far more than any other area of the world. Japan is the largest world consumer of octopus and other cephalopods. China and South Korea are perhaps second and third. The world trend toward establishing territorial seas has caused Japan to become an importer as well as a harvester of cephalopod resources. Voss (1973) speaks of the Northwest Pacific O. dofleini fishery, stating that O. dofleini is caught by local fishermen. Okutani (1977) also speaks of the octopod fishery, stating that O. dofleini is "appreciated" by the Japanese consumer. However, Japan has also been in the business of exporting over 10 kg of Octopus dofleini to Alaska for use as halibut bait. The prized O. vulgaris, however, is retained for food. Mainland China is reported to fish three species of octopus; O. vulgaris, O. ocellatus and O. variabilis (Chang and Chi 1961).

Region XII - Western Central Pacific

Hong Kong, Taiwan, the Phillipines, Malaysia and Thailand constitute the subtropical/temperate part of the West Pacific rim countries. The two major octopods are Cistopus indicus and O. aegina. The exception to this generality is Taiwan, which has a fishery for O. vulgaris, and the Phillipines, which also harvests O. macropus.

Region XIII - Southwestern Pacific

This area, composed of New Zealand, eastern Australia, Tasmania, and New Caledonia, has an abundance of cephalopods, but they are not consumed by local residents. A limited octopus fishery has been initiated lately in Australia and New Zealand to satisfy the demand of their gourmet restaurants as well as those of Japan.

Region XIV - Oceania

This area, which includes islands of the central Pacific excluding the East Indies, are primarily atolls and volcanic islands. They offer little continental shelf for the support of large stocks of neritic or benthic cephalopods. Local fisheries do exist for O. cyaneus, O. aegina, O. ocellatus, O. vulgaris, and others.

Region XV - Indian Ocean Coastal Waters

Octopods of this area include O. vulgaris, O. globusus, O. herdmani, and O. hongkongensis. There has been little written on biology, zoogeography or fishing potential of these areas.

Voss (1973) also cites a region tabbed Southern Ocean, which may have considerable stocks of a benthic shelf dweller, Pareledone spp.

In summary, the widespread distribution of O. vulgaris, its large consumer acceptance, and its potential for more extensive fishing by developing countries, make it a potentially fierce competitor in the export market with O. dofleini.

THE DISTRIBUTION OF OCTOPODS OFF ALASKA

The distribution and abundance of octopus off Alaska is difficult to determine. Comprehensive fisheries-related literature on the subject is often nonexistent or in another language. All readily available experience and survey data has been gathered into this publication, to provide a starting point in determining abundance and distribution of octopus off Alaska. The following data sources were consulted for this task:

1. Data generated from discussions with divers and biologists.

2. Data collected from National Marine Fisheries Service (NMFS) trawl surveys.

3. Data collected from foreign catch reports supplied through NMFS.

4. Data collected from the NMFS Foreign Observer Program.

Each of these sources have specific strengths and weaknesses that are pointed out in the following sections.

TRAWL SURVEY DATA

During the trawl surveys, NMFS uses a variety of trawling gear and attachments for targeting species. There is also a careful record kept of incidental catches.

For this study we selected 10 surveys, taken between 1973 and 1979. They covered the entire Bering Sea and Gulf of Alaska. Figures 2 and 3 show the general survey areas. Appendix A contains detailed information on the seven cruises reporting incidental octopus catches (NMFS 1973, 1975a, 1975b, 1976, 1977a, 1978a, 1978b, 1978c, 1978d, 1979c, 1979a).

Several cautions are in order about this data. First, most of the surveys were taken in deep water and the figures are good only for those depths. Second, most cruises were not conducted in enough detail to identify the octopus caught by species. In many cases, the crew members are not specialists. NMFS encourages interested scientists to take part in the cruises,

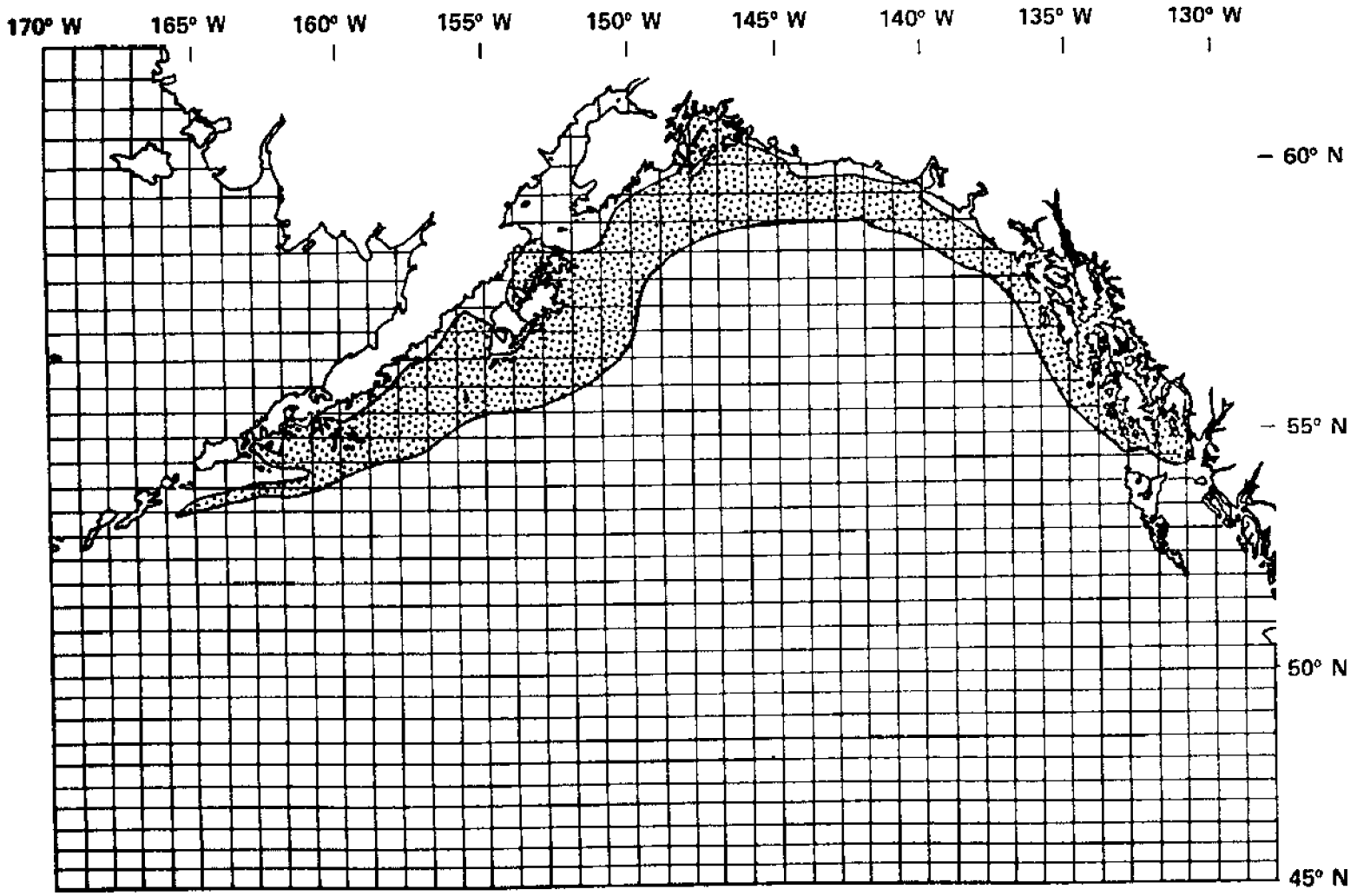

Figure 2. The area encompassed by selected NMFS Gulf of Alaska surveys, 1973-1979. (NMFS 1973, 1975a, 1975b, 1976, 1977, 1978a, 1978b, 1979a, 1979c)

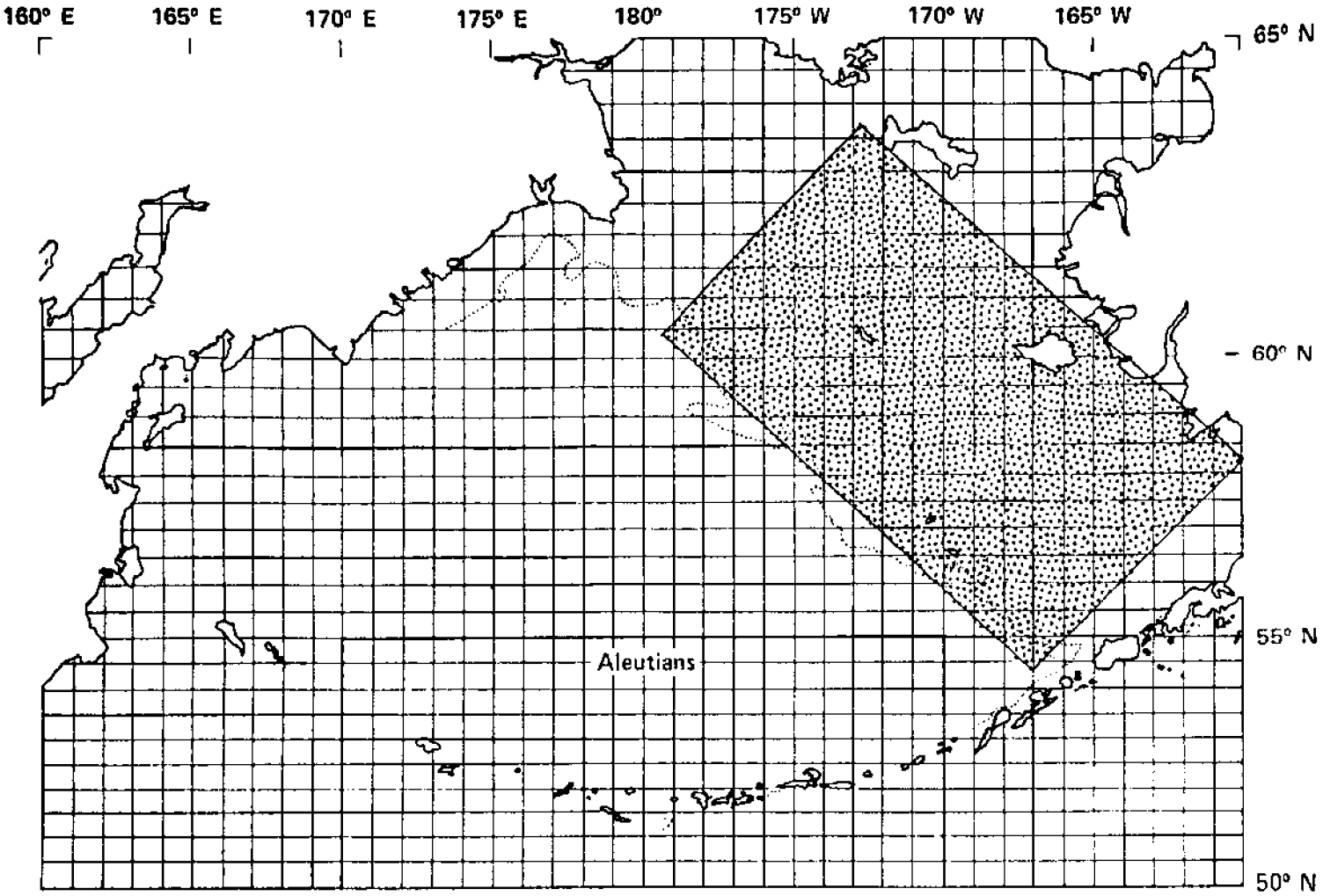

Figure 3. The area encompassed by the NMFS 1979 Bering Sea Survey. (NMFS 1979b)

however. This is an excellent opportunity for those who wish to conduct field work on octopus. Third, almost none of the gear described in Appendix A is useful for harvesting octopus. Mid-water trawls, for example, will produce a much different sampling from bottom nets with bobbin gear. Octopus can move quickly and have a good sense of where nets are. They can often avoid bottom nets, and are more likely to be a larger component in mid-water trawl samples.

DATA FROM DIVERS AND BIOLOGISTS

Prominent divers and biologists from private, state, and federal agencies who dive in specific areas of Alaska were consulted. Available literature or survey data on the subject of distribution of the species group Octopoda was also consulted. The divers included: William High, NMFS, Seattle; Del Hansen and Robert Earl, Ketchikan; Lou Barr and Bob Ellis, NMFS, Auke Bay; Ron Shimek, University of Alaska, Anchorage; Guy Powell, Alaska Department of Fish and Game, Kodiak; Steve Jewett, Institute of Marine Science, University of Alaska, Fairbanks; and a number of other dive shop owners and sport divers. These observations, as well as other available literature were used to describe the existence and abundance of octopods in the shallower subtidal areas of Alaska.

The distributional map in Figure 4 was based on these sources. Although it shows the ranges of octopods that we believe exist in Alaska, the map is a gross generalization of specific area information and different survey data. Since diving is a highly localized survey technique, one should not infer from the map that all shaded areas have been explored. Rather, these are best guesses of distribution based on isolated diving expeditions and available data. Northern and western extreme distributions for each species are also described, based not only on information supplied by divers but also that supplied by authors of existing works. Other works consulted to create this map include: Mottet (1975); NMFS, Foreign fisheries data for 1978; and NMFS Gulf of Alaska and Bering Sea Cruises from 1973 to 1979.

FOREIGN CATCH DATA

Catch reports are collected by NMFS directly from foreign vessels fishing in U.S. waters. For selected species of commercial importance, NMFS processes the data into statistical blocks and uses it to manage the fishery.

Figure 5 shows the 1978 catch rate per hour figures for Japanese and Korean efforts. The raw data used to create these figures appears in Appendix B.

Although we have no measure of their accuracy, these reports do have figures for homogenous catches of different octopus species reported by the Japanese.

FOREIGN OBSERVER PROGRAM DATA

1978 foreign observer data was also used. It appears by statistical block (.5° lat. x 1° long.). Most of the observations were taken from Japanese mother ships or independent stern trawlers. In some cases we also have information from Soviet, Polish and Korean vessels, shown in Appendix C.

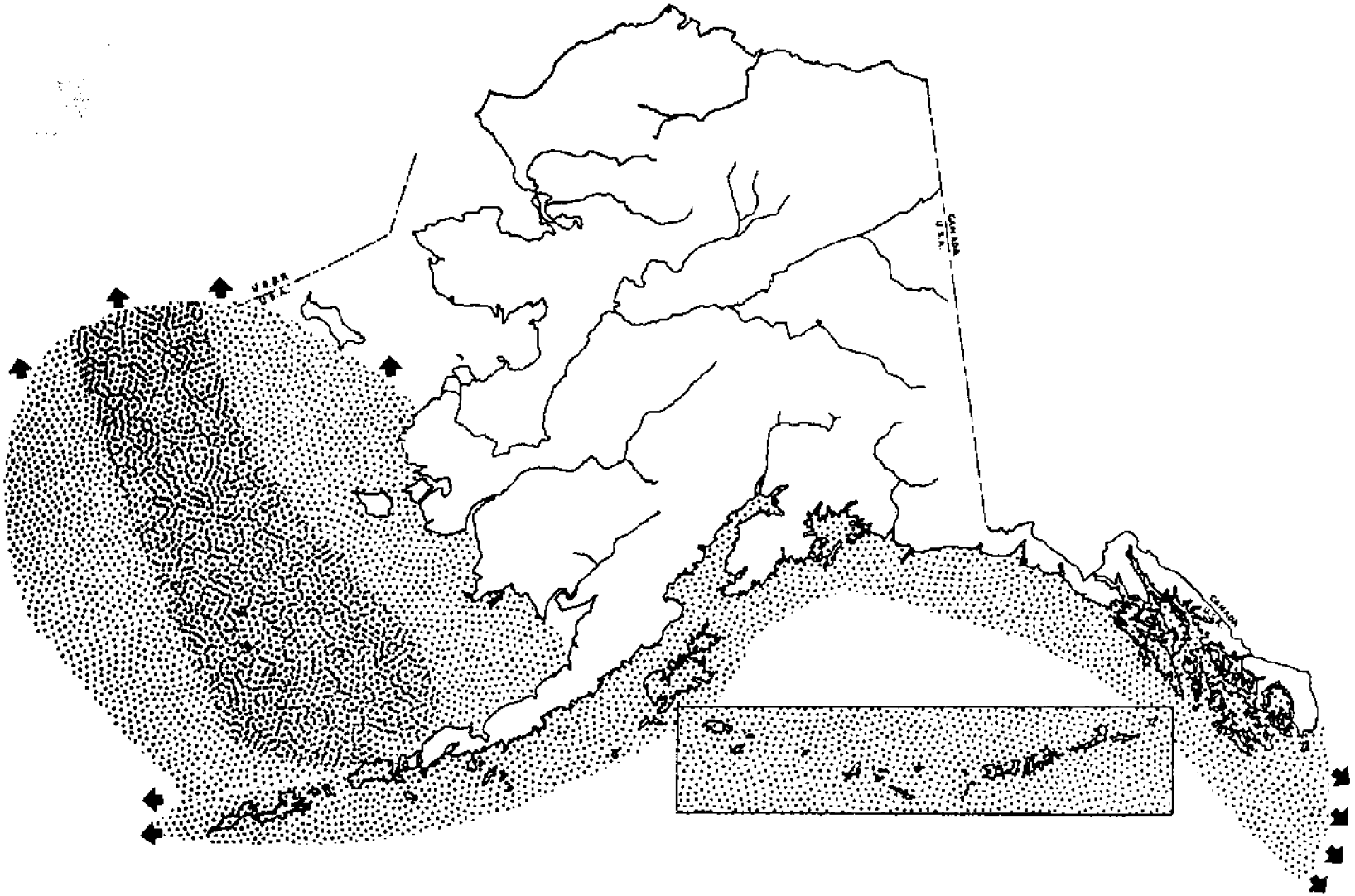

Figure 4. A general distribution of Octopoda off Alaska. Double-shaded area indicates region where distribution is best known. Southern arrows indicate distribution into northern California waters, western arrows indicate distribution in western Pacific. Northern extent not defined. (Mottet 1976, NMFS 1973-1979, Barr 1980, Powell 1980, Shimek 1980)

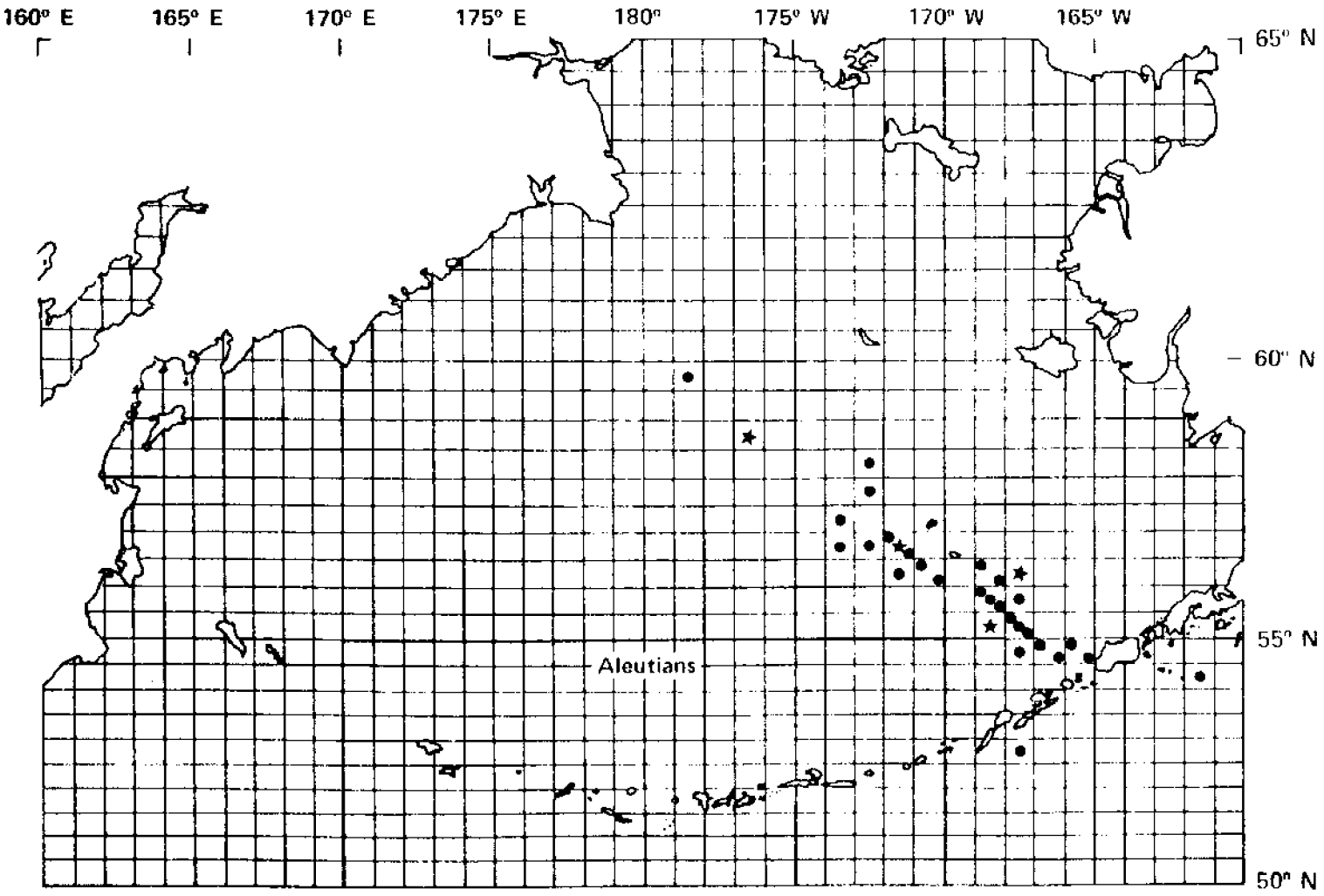

Figure 5. Distribution of incidental catch rates of unidentified octopus in 1978 by foreign stern trawl and mothership fleets. Key: star= .1 to 149 mt/hr; circle= .01 to .09 mt/hr. (NMFS 1978c)

Figure 6 shows estimated catch rates for octopus (mt/hr) and the location of statistical blocks. The catch rates used in this data were extrapolated from raw data appearing in Appendix C. They represent the highest hourly catch rates yielded by this data.

Remember that the catch and catch rate numbers are not absolute numbers but statistical inferences based on samples of a whole catch. It is impossible to assume that each observer sampled with the same efficiency or was treated with the same helpfulness by the crew. Also, the data does not reflect the type of gear used or the conditions under which catches were taken. It is therefore hard to use this data to compare efficiency of various harvesting methods.

BIOLOGY OF O. DOFLEINI (WULKER)

The giant octopus O. dofleini is found in the northern Pacific along the coasts of Korea, Japan, eastern USSR, the Aleutian Islands, Alaska, western Canada, and as far south as northern California (Pickford 1964; Mottet 1976). O. dofleini is also referred to as Paroctopus hongkongensis and Paroctopus dofleini (Okutani 1977; Sakamoto 1976) but these names are falling into disuse.

The larvae hatch from eggs, usually laid in the lair of the female and kept by her until her death, some two months before the larvae actually hatch. The eggs are about 7 mm long (Mottet 1976). The young are planktonic, and do not begin bottom dwelling until they are at least 35 mm long. It appears from sampling that O. dofleini hatch throughout the year. This suggests different spawning stocks or that there is no specific season for mating. Other Japanese research translated by Mottet suggests that the eggs take about 6.5 months to hatch, depending on temperature.

This suggests post hatching survival rate of 4 percent to 6 mm and 1 percent to 10 mm (Green 1973). Survival to maturity then, is high, when compared with some of the more prolific species like herring.

Mottet (1976) reviews a number of Japanese articles on the immature octopus and migrations off Hokkaido. This material may be of use in determining fishing patterns of octopods in Alaska. Fishing and tagging data show that immature octopus, weighing over 1 kg, make two seasonal onshore- offshore migrations a year in Hokkaido. The populations are deep water from about February through April and again from August through October. The octopods do not make long migrations parallel to the shore, however. The fishing seasons for O. dofleini correlate with the migrations, with the majority of the fishing taking place in depths of 80 m or less.

Migrations have also been recorded in Washington by divers when the octopods winter in shallow water less than 50 ft deep. In the spring, these octopods move to deeper water over 100 ft.

Although sexual maturity does not come until late in the life cycle, the growth of the immature octopod is extremely rapid. Within a short time it can become quite large. Mottet, in translations of Japanese articles, relates that two specimens reared by Kanamaru and Yamashita (1969) increased in weight 1.78 percent per day for 1 kg, and 1.43 percent per day for 2 kg.

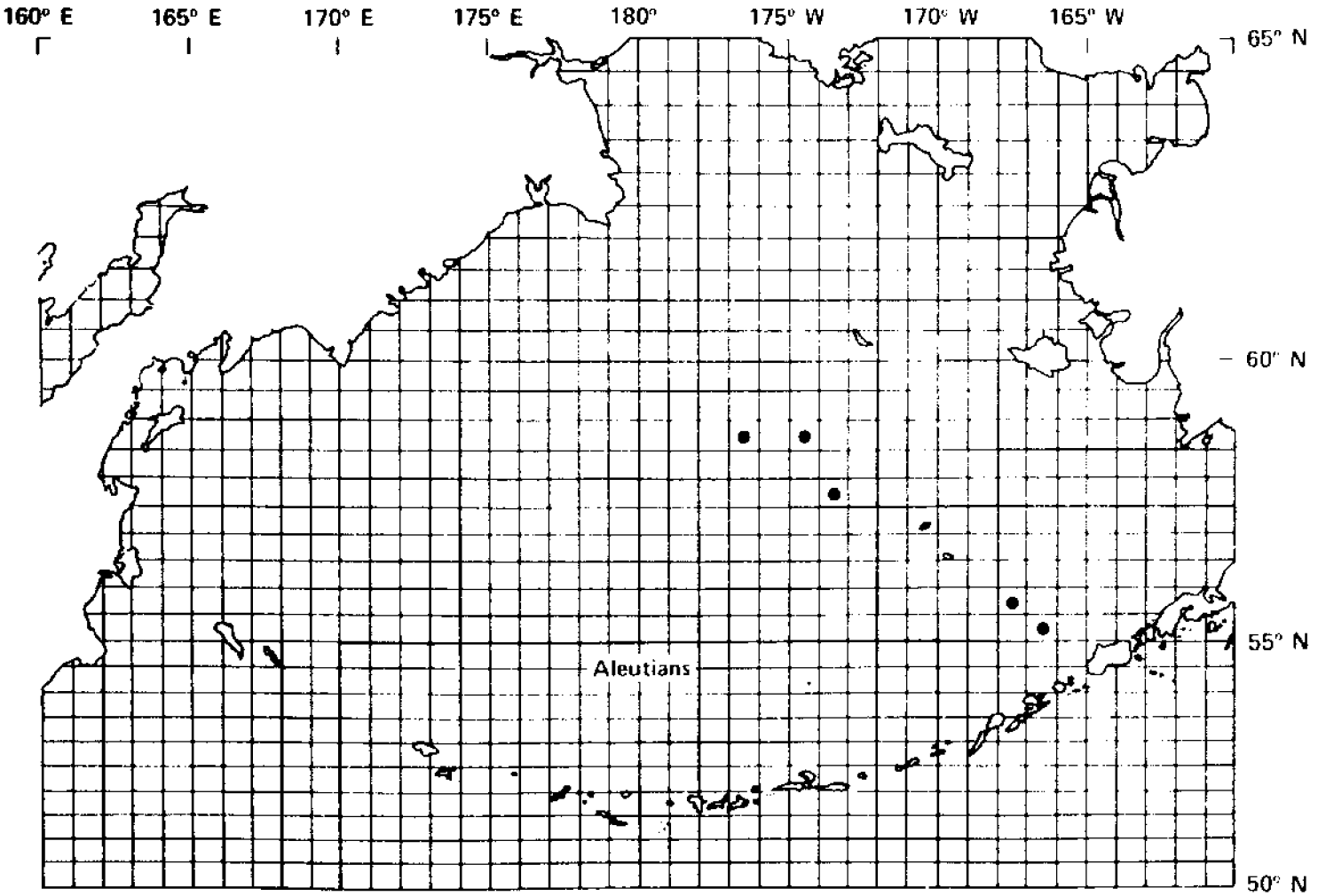

Figure 6. Distribution of catch rate of unidentified octopods by Japanese stern trawl in the Bering Sea, 1978. Key: circle= .01 to .09 mt/hr. (NMFS 1978d)

Other rearing experiments lasting from July to September showed a tripling of average specimen size. The greatest percentage increase per day was in specimens weighing about 1.5 kg at the beginning of rearing (3.7 percent per day). It was less for larger specimens weighing 4 kg (1.9 percent per day) (Kanamaru 1964).

It is known from this and other work that wild specimens of O. dofleini can increase in weight from 1 kg to 10 kg in a year. It is fairly certain that O. dofleini may start to sexually mature 18 months to two years after hatching (Mottet 1976). Apparently, males sexually mature before females, since the breeding often occurs with immature females. The breeding season of O. dofleini in Hokkaido is quite long with a season peak from October through December. However, breeding can apparently take place well into spring, overlapping spawning from May to June.

The interesting aspect of the octopod's life history, however, is that despite its enormous size (some fishermen report up to 400 lbs), the life expectancy appears to be only about four to five years. This creates an interesting problem for fisheries management: its relatively short life and sedentary existence cause the octopus to be especially susceptible to overfishing. This may exhibit itself as boom and bust cycles in the established fishery.

Figure 7 shows a general anatomy of Octopus spp. which may be useful for following discussions on harvest and processing techniques.

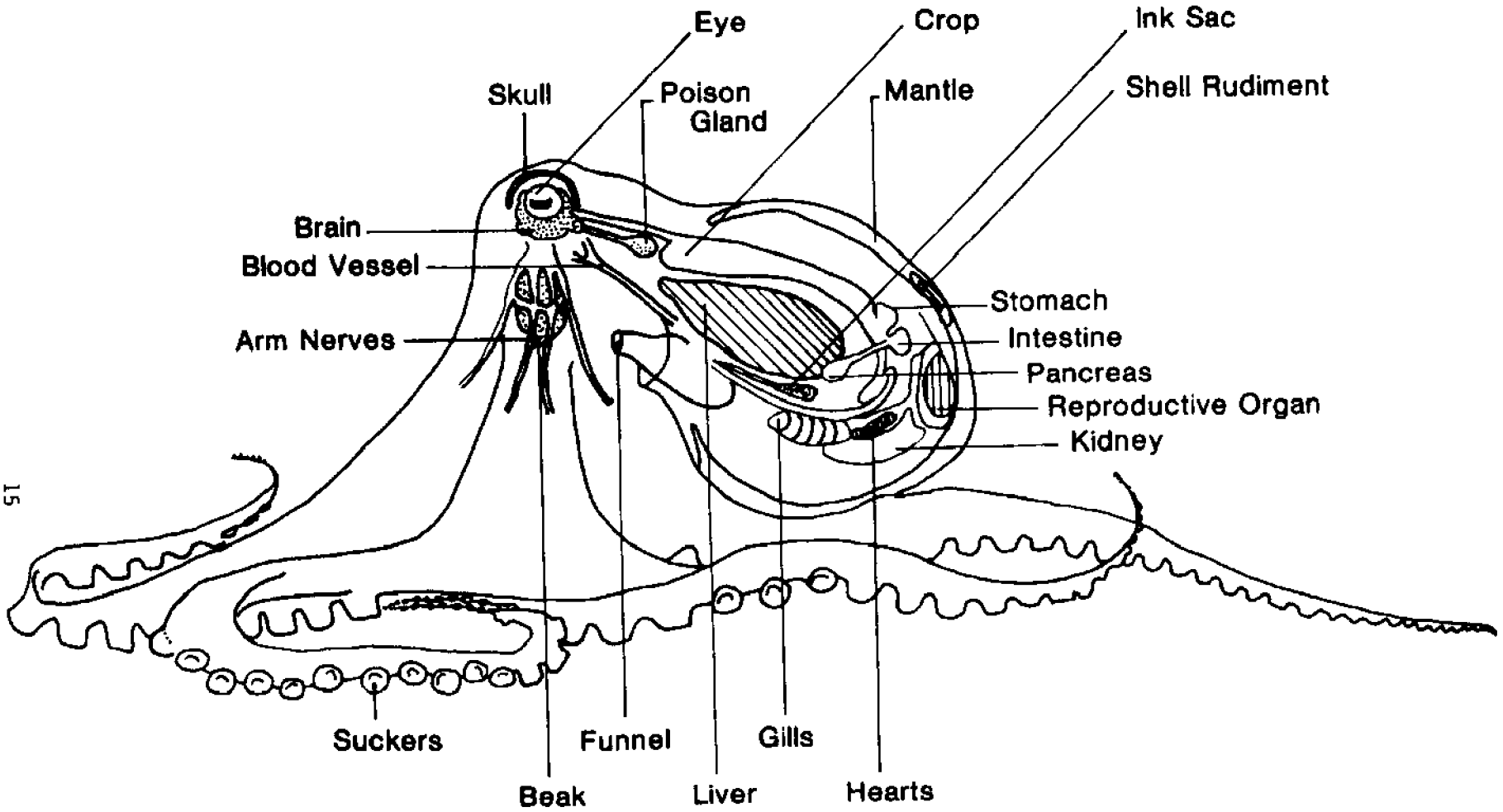

Figure 7. A general anatomy of the octopod.

OCTOPUS HARVESTING

Much has been written about octopus catching techniques. Two recent works are Mottet (1976) and Pennington (1979). In both articles, several different techniques are discussed, listing advantages and disadvantages. Although the typical octopus fishing boat in Japan is relatively small with an outboard motor, just about any small craft would be suitable for most fishing methods discussed (Pennington 1979). The advantage of octopus fishing is that it is a relatively high value fishery that requires very little special equipment.

The most likely fishing method, and one that is in common practice throughout most of the world, is the octopus "lair" pot/longline system. These are typically unbiated recepticals made to resemble octopus lairs. The variations on the lair pot seem endless. Pennington (1979) suggests old tires or tire sections (Figure 8), wooden crates, sewer tiles, clay pots, 5 gal cans or plastic buckets. Mottet (1976) reports that the Japanese octopus lair pot is 19,000 to 28,000 cm^3 or 37 to 45 cm long, 27 to 33 cm wide, and 18 to 22 cm high with variable openings of between 165 to 178 cm^2. The lair pot size varies with fishing efficiency.

The most important factor in determining octopus pot size and dimension is the size of octopus desired. Mottet cites that a maximum weight of octopus for marketing as fresh octopus in Japan is 10 kg or about 22 lbs. Pennington identifies a minimum size of about 3 kg or 6.6 lbs for the same market. Although O. dofleini grows to be very large, it has been found that these larger animals are well into spawning stage. They are avoided in Japan because of their lower food quality due to toughness. They command about half the price that one under 22 lbs would obtain. Octopus over 22 lbs are used for smoking, drying, canning, or pickling, as well as for bait.

Octopods for use in the bait markets of Alaska may be from 10 lbs upward (20 lbs or more tend to be preferred) with an estimated expressed price per lb of between 60¢ and 90¢ (Pennington 1979). This is compared with wholesale prices quoted by Japanese of approximately $1.50 per lb.

Japanese tariffs and import quotas imposed on imported octpus indicate air freighting fresh octopus from Alaska to Japan is a losing proposition. On the other hand, there appears to be a substantial and well-developed bait market for octopus in Alaska. There is also potential for replacing substantial Japanese trade to Alaska in large octopus.

The octopus pot is usually fished in areas where few natural lairs are available for octopus but food is plentiful. They are also fished where the currents and other water conditions are too adverse for other methods of capture.

Most octopus pots are of the dimension described above and weighted to sink and prevent shifting in bottom currents. This ballast keeps the pots from moving around in currents. Ballast may be rocks or cement slabs poured on the bottom of the trap, or sandbags as used by Japanese fishermen. Most traps in Japan are run parallel to prevailing currents. Where there is no current, the traps are run parallel to shore.

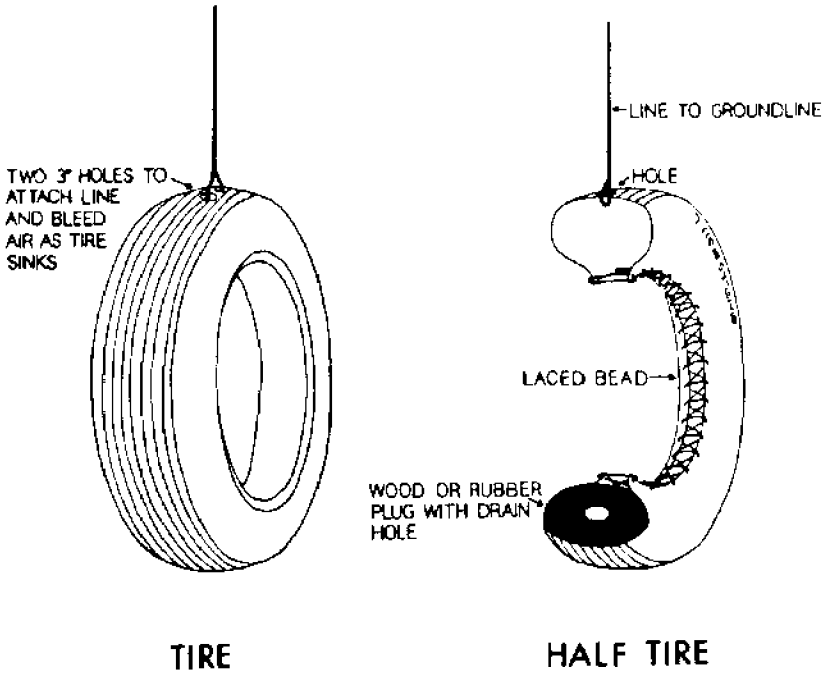

Figure 8. Octopus pot made from tire sections. (Pennington 1979)

The soak time may be from three days to a week or longer depending on the time of season. It is not necessary to get an early morning start to check octopus traps, since the octopus usually does not get settled into its lair until about mid- morning. The retrieval of the pots is somewhat similar to the procedure used on a halibut rig. The string is winched up and the octopus laden pot is removed from the becket loop or snap. The octopus is removed using a coaxing probe through one of the drain holes after a new box has been placed on the string (Mottet 1976).

There have been numerous improvements on the trap system, many of which have been initiated by the Japanese. Experiments suggest that black traps have a statistically better chance of providing high yields than red, blue, green or cream colored traps. This suggests octopus prefer black and substantiates the contention by some biologists that octopods perceive color.

There are also a number of other methods of octopus harvest that are even simpler than the one discussed above. These have been covered in great detail by Pennington (1979) and are discussed here in summary.

In areas of high octopus density or where substantial migration occurs, a longline tangle hook system may be used. The longline is set up such that the hooks, spaced about 1 ft apart hang a few inches off the bottom. The octopus becomes entangled in the hook system.

Another method described by Pennington is roughly similar to the one described above. In this scheme, hooks are more widely spaced and each is baited with a lure or bait about 6 in. above the actual hook. The hook is placed so that the average size octopus would have a difficult time tearing loose by attaching himself to the bottom (Figure 9A). Yet another method described by Pennington is perhaps the simplest of all, calling for alternating floats and weights placed every 4 ft on the groundlines with fairly large treble hooks (similar to a Mustad Strong No. 4/0 treble hook) attached to 6 in. gangions (Figure 9B). The idea is to entice the octopus to take the float (which serves as a lure). During its attack, the octopus is fouled in the hook below the bait.

The other two gear types described by Pennington and Mottet are drift lures and gaffs. Both of these methods are used in shallow or rocky areas, but are highly labor intensive. The drifted lure is simply a cluster of soft wire hooks, twisted into an eye at the front of the lure and attached to a cast iron, lead or stone weight, weighing between 180 and 220 g. To determine whether or not an octopus is on the drifting line (Figure 10), see which ones of the group of lures set is traveling slower than the others. The fisherman then pulls up the lagging piece of gear and checks to see if there is an octopus entangled.

Gaffing is usually done from the boat, with a long gaff and a view box. Bait is dangled on a line over a probable lair to entice the octopus from his quarters. As the octopus makes his attack on the bait, the fisherman makes his attack with the gaff.

A highly sophisticated trawl gear type for catching octopus has been used by the Japanese and Spanish fleets since the early 1960s, mostly for fishing the Saharan Bank along northwest Africa and the Gulf of Guinea. This is one of

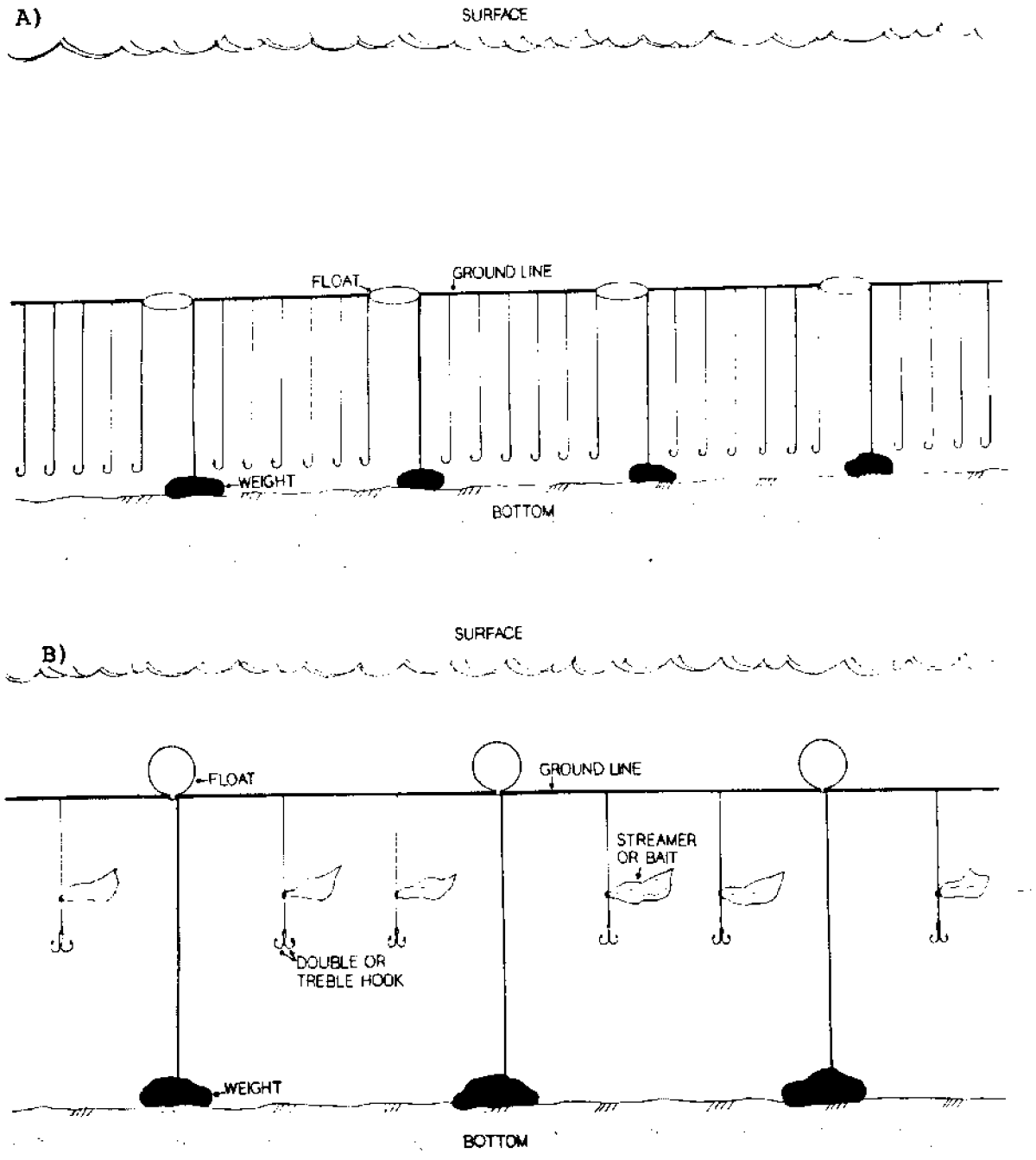

Figure 9. Other octopus catching methods. A) A longline tangle hook system; B) A "baited" longline rigged off the bottom. (Pennington 1979)

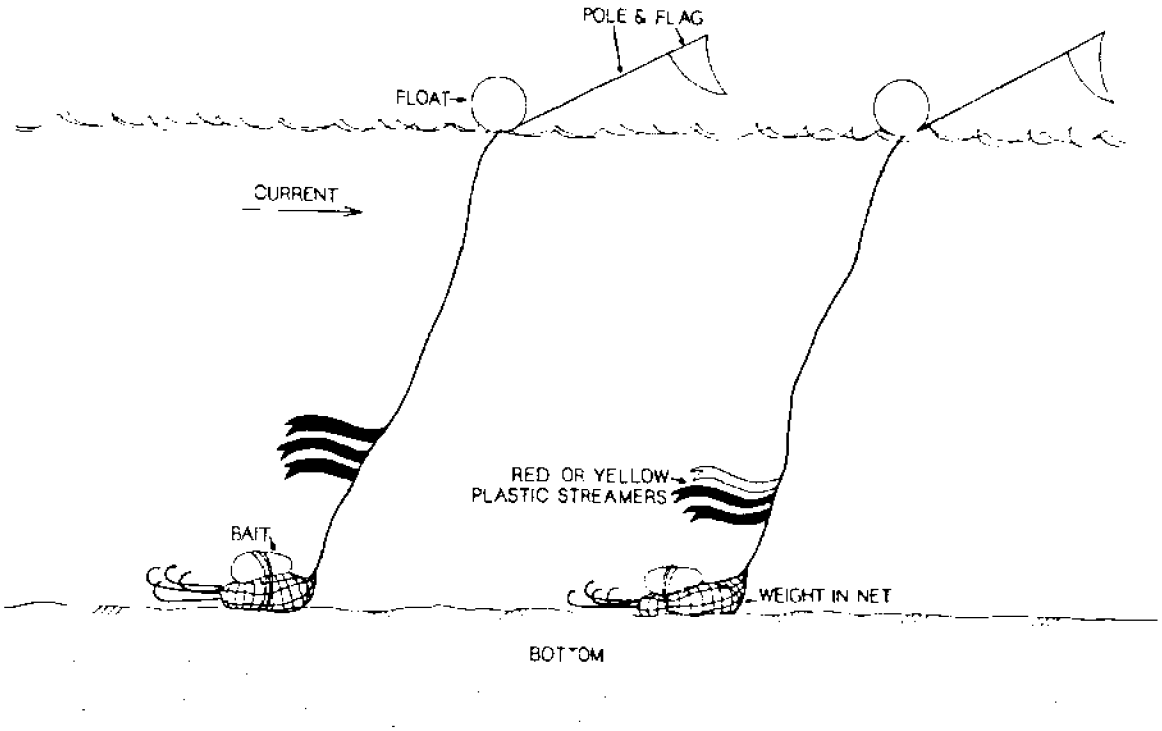

Figure 10. The drifting, baited octopus lure. (Pennington 1979)

the richest cephalopod fisheries of the world. With the advent of the large Japanese and Spanish harvest methods also came a substantially depressed price structure of octopods in Japan during the year 1967 (Koyama 1976).

The trawl gear shown in Figure 11 has been designed by Tokai Regional Fisheries Research Laboratory with some design suggestion from Fr. Sueberkrueb of West Germany. This trawl was designed with six panels rather than the less expensive four panels. The trawl has an opening height of about 3 m and is usually towed at 3 to 4 knots by trawlers of 1,500 gt and 2,700 hp. The trawl is usually equipped with what has been called an "octopus lifter," a tickler chain stretched between the two doors of the trawl which irritates the octopus so that it can be scooped up by the trawl itself. Apparently this method can only be used where the density of the octopus resource is very great. It has been ventured by Voss (1973) and others that the possible reason for such high octopus density is the massive amount of dead fish returned as "trash" to the ocean in what appears to be a relatively small area. The North African grounds are an example of this. The hypothesis is that cephalopods have taken the place of the scaled fish as the highest consumers in the food chain.

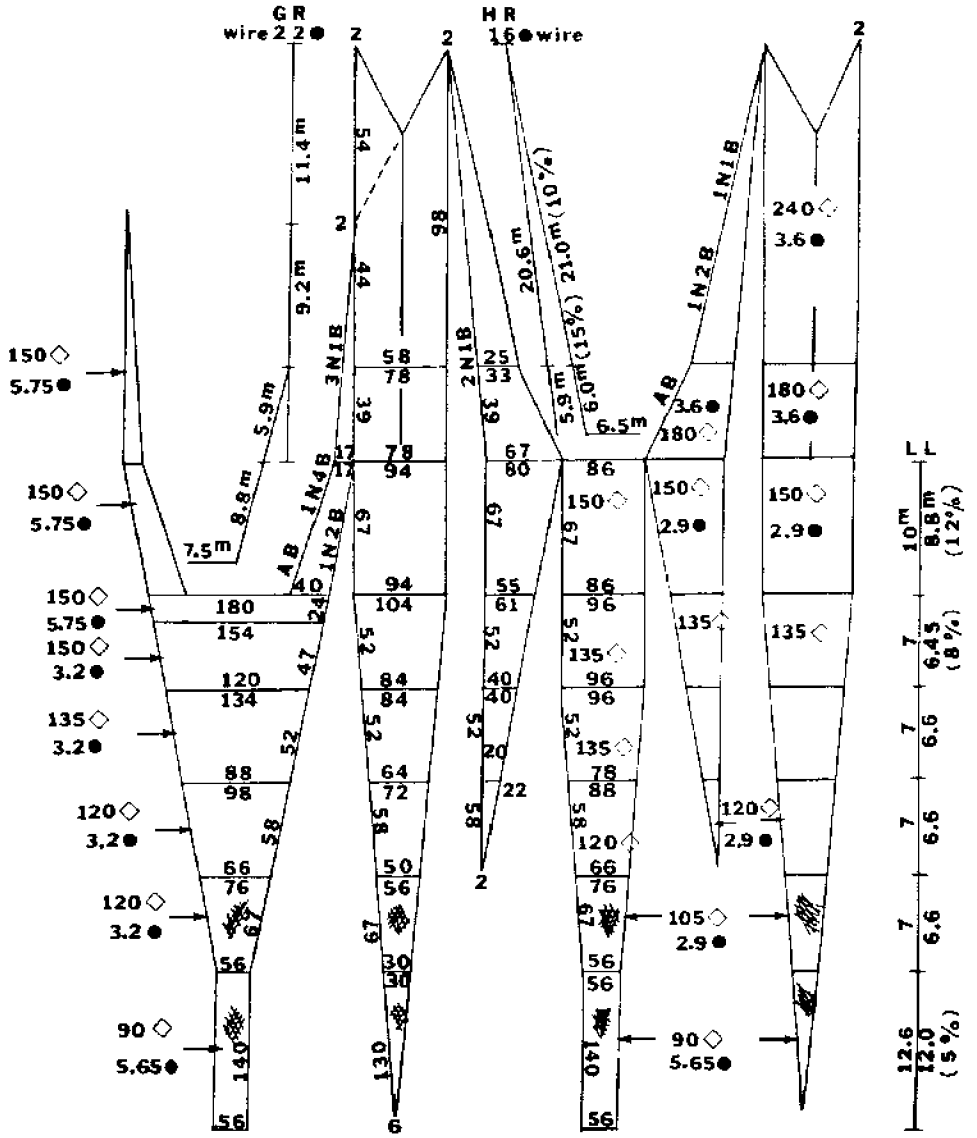

Figure 11. Octopus bottom trawl net for trawlers of 1,500 gt and 2,700 hp. HR= headrope, GR= groundrope. The diamond-shaped symbol indicates stretched mesh measurement. Black dot indicates diameter. (Koyama 1976)

OCTOPUS PROCESSING

Processing octopus for human consumption generally follows methods developed by the Japanese and the Spanish. Since the countries are the two largest producers, and since Spain is a leading exporter to Japan, the processing techniques described here are indicative of common practice.

SPAIN

Octopus is landed in Spanish ports either as wet or frozen fish (Schwartz 1972). Apparently, the larger vessels fishing for octopus over periods of several months freeze the octopus whole with an ice glaze.

When landed at port, the glaze is melted away with a strong jet of salt water and the octopus is allowed to thaw. Then the viscera is cut away by hand, and the mouth apparatus is removed. The octopus is then placed into a vat of running water to remove ink, sand and other material. The gutted octopus is then graded and placed in cartons for freezing.

The Spanish trade has developed two different size classifications for grading octopus, one for Spanish markets, (Table 2) and one for octopus exported to Japan (Table 3). It should be noted that these classifications aren't strictly followed.

In either case, the octopus are placed in frozen blocks with the tentacles laid back to expose the mouth and the suckers. Octopus for export to Japan also undergo a beating process, where the flesh is tenderized by placing it in a rotating drum with ridges on the inside. Mottet (1976) describes this as a barrel, about 1 m in diameter. The ridges are about 7 cm high. Constantly bumping the octopus against the ridges tenderizes the meat without damaging the skin of the octopus. About 7 liter of salt and 120 ml of the chemical Mioban are added to the octopus. The salt removes slime while the chemical improves color.

After this operation, the octopus are either frozen in boxes as described above, or they are cooked in boiling water from 15 to 30 minutes depending on the size of the individual octopus. These octopus are placed in a block and frozen at -35°C for five to seven hours or until the core temperature is at least -18°C. Some processors produce octopus in packages smaller than 10 kg, usually around 1 kg. These are usually individually bagged whole octopods, raw or cooked, that have been frozen to a core temperature of -18°C. In some regions of Spain octopus are also chopped into bite-size pieces, then frozen in 250 g blocks at -25° to -35°C.

Canning octopus is also common in Spain. After cleaning and washing, the tentacles are separated from the head, and then sprinkled with salt. The octopus are placed on trays and cooked at 104°C to 105°C for as long as 55 minutes for large sizes and for 45 minutes for medium sizes. The skin is then removed from the tentacles by hand while they are still warm. The mantle, however, is not skinned.

Table 2. Sizes of octopus for the Spanish market

Number	Grams of octopus (O. vulgaris)
1	over 3,000
2	1,000 - 3,000
3	500 - 1,000
4	200 - 500
5	less than 200

SOURCE: Schwartz (1972)

Table 3. Octopus size prepared for Japan, frozen

Grade	Octopus	Pieces in one frozen block[1]
T1	Over 4,000	2 - 3
T2	3,000 - 4,000	3 - 4
T3	2,000 - 3,000	4 - 6
T4	1,500 - 2,000	6 - 7
T5	1,000 - 1,500	7 - 11
T6	500 - 1,000	11 - 25
T7	300 - 500	25 - 33
T8	Less than 300	Over 34
Tr	damaged octopus w/mixed sizes	-

SOURCE: Schwartz 1972
[1]One frozen block contains 10 kg.

It has been estimated by Schwartz (1972) that one worker can skin between 100 and 150 kg of octopus in one hour. After cooling to an ambient temperature (about 45 minutes) the mantle and skinned tentacles are chopped into 25 mm pieces and canned. The unskinned mantle gives the canned octopus a desirable odor and color. A more complete discussion of processing procedures is included in the section on world trade.

Japanese authors have not only researched the market aspects of octopus trade but have also done extensive work in identifying processing techniques that yield good product quality for Japanese consumers as well as for other consumers. Tanekawa (1971) notes that O. dofleini (mizudako)is a less palatable species of octopus and is usually canned with many seasonings or is an important ingredient in Yamato-ni or teriyaki dishes. Japanese processing also includes dried, season-smoked, and pickled octopus meat.

THE FEASIBILITY OF HARVESTING OCTOPUS

INTRODUCTION

An analysis was performed on the feasibility of using pots to harvest octopus for five months out of the year. The study is based on data collected on the costs and earnings of the shellfish fleet in 1976 by the Commercial Fisheries Entry Commission (CFEC) and data collected by the Alaska Sea Grant Program on costs and earnings of the salmon and herring fleets for 1979 (Larson 1980). These are at present the only published sources of cost and earnings information on the Alaska fishing fleet. The results of the analysis and instructions on how to interpret them are in Appendices D and E. Since the feasibility study was performed on two different sets of data, these analyses are discussed separately.

We analyzed the range of boat sizes commonly found in Alaska, but expected success rates at different catch levels and prices gradually lose meaning as the vessels get larger. This is because, based on our trade contacts from Europe and the Orient, the octopus market may not be open to us in the near future. We have a larger, and therefore, less desirable (or unknown) octopus. The local bait market is tied to the longline fisheries, specifically halibut, and tends to fluctuate with them. Owners of larger vessels and their processor/broker contacts must be willing to spend extra time and money to develop food markets for the large octopus and break down the consumer barriers to this new product. Otherwise they will not be able to effectively compete with smaller vessels, regardless of what this analysis shows.

The ex vessel prices used are representative of prices currently paid for bait octopus at different ports in Alaska and Washington. It is clear that the octopus fishery will be founded on the limited demand for bait. This market could be saturated quite easily by deliveries from a large vessel. Extreme caution must be exercised to keep prices for the bait octopus at a level that would support the fishery. Any upward surge in catch that exceeds the supply, now controlled by Japan, might lead to decreased ex vessel prices in an octopus fishery even though Japanese octopus are often of inferior quality.

For this reason, we suggest seriously considering octopus harvesting if your vessel is under 80 ft, or if you are already set up for longlining and can do it without some of the expenses we have included here.

There is also the issue of resource durability. Some experienced researchers on the life history of the octopus suggest that a major fishery may harm the octopus population (High 1980). Rapid recruitment of octopus would tend to refute this. Further, although octopods prey on commercially valuable species like crab, it is not conclusive that the predatory activity is harmful in the long run. These issues, however, cause concern among some fisheries biologists apprehensive about degradation of the environment and a possible change in the structure of other major fisheries due to a rapidly expanding octopus fishery.

POT HARVESTING

A total of 91 cases were investigated from the CFEC data. Of these 91 cases, 62 were used for the analysis. The keel lengths ranged from 56 to 152 ft. We chose only vessels that fished for either Tanner crab or king crab in 1976. Because the octopus fishery is essentially a combination of a pot and longline fishery, it was felt that the deck space and the use of pots in the crab fishery would be good starting points for considering the feasibility of another pot fishery.

Another major assumption was that in this new fishery, the crew shares, skipper shares, food and fuel costs, as well as the days per trip should remain the same as in the crab fishery. For this reason, there is great variability in the success of different vessels.

Although we tried to maintain the integrity of the original data, there were many missing values for each of the variables necessary to complete the analysis. Where applicable, we substituted the average of each variable when there were missing values. These averages are reported further on. Within cases, there were numerous examples of misleading data, particularly with regard to relationships among crew shares, skipper shares, and crew cost shares, as well as in the relationships among trips per year, trips per month, and days per trip.

A number of data adjustments had to be made to reconcile these problems. Average weighted galley costs (AVGALY) over king and Tanner fisheries for five months were adjusted to 1980 by a ratio of the February 1980 Anchorage Consumer Price Index and the May 1976 index. This multiplier was calculated at 1.3547. Average weighted fuel costs for the king and Tanner crab fisheries (AVELFU) for five months were also adjusted to 1980, using a ratio of the combined wholesale price indexes of gasoline and diesel fuel for commercial consumers in the Pacific states from June 1976 to February 1980. This ratio was calculated at 2.1706.

Four different scale sizes of equipment were created for the feasibility analysis based on reel sizes. All of the analysis was based on the traditional 5/16 in., 1,800 ft halibut groundline with a pot every 50 ft (36 pots).

An unpublished manuscript by Clifton (1980) and telephone conversations with the same author revealed that in his research, he was able to make wooden octopus pots approximately 30 in. long and 1 ft square for less than $10, including labor. However, he cautioned that a ballasted box might weigh nearly 70 lbs when finished. We have suggested an alternative to this, for those wanting a large number of lighter weight octopus pots. Many plastic moulding companies could produce a similarly dimensioned box for about $20. In fact, there are dark colored standard production containers available in these dimensions which can be readily adapted to octopus fishing. Table 4 shows the complete cost of a single skate of line with 36 octopus pots. This table also shows the cost of the end lines and the necessary hardware.

These calculations were applied to four different reel sizes, the dimensions and capacities of which are shown in Table 5. These are aluminum combination reels with dished heads, which can be used for other fisheries. We have assumed the fisherman will need to buy equipment to fish octopus. We have

Table 4. Skate and end fixture costs for octopus fishing

Cost of pot gear per skate at 50 ft centers

1 skate 5/16 in., 1,800 ft	$105.00
36 plastic pots, black 12 in. x 12 in. x 30 in. @ $20 ea.	720.00
36 snap-ons @ $.38 ea.	13.68
36 gangion lines @ $.1528 ea.	5.50
	$844.18

End fixture costs

2 end lines: each 300 ft, 1/2 in. polypropylene rope @ $.15/ft	$ 90.00
2 kedge anchors, 30 to 35 lbs @ $50.65 ea.	101.30
2 bouys 70 in. circumference @ $23.00 ea.	46.00
2 anchor shackles @ $4.00 ea.	8.00
2 groundline shackles @ $3.00 ea.	6.00
2 6 ft zinc plated 5/16 in. chain @ $2.65/ft	31.80
	$283.10

Table 5. Gear costs for four different scale sizes of octopus operations[1]

Aluminum Combination reel-dished heads		Level wind	Total No. of pots[2]	Total pot cost[3]	Total skate costs[4]	Cost of endline assembly/ 3 skates[5]	Fairlead and other retrievel gear	Total cost	Skate capacity of reel[6] (1,800 ft skate
Dimenaion (in.)									
48x36x62[7]	$3,570	$1,200	540	$10,800	$1,862.70	$1,415.50	$2,000	$20,848.20	15
48x48x73	3,625	1,500	792	15,840	2,731.96	2,264.80	2,500	28,461.76	22
60x48x85.5	3,890	1,500	1,440	28,800	4,967.00	3,775.66	3,000	45,931.86	40
60x60x107.1[7]	3,960	2,000	1,800	3,600	6,209.00	4,812.70	3,500	56,351.70	50

SOURCE: Kolstrand Co. (1980); Kem Equipment Co. (1980); Clifton (1980).
[1]Based on four sizes of reels produced by Kem Equipment Co.
[2]Based on 50 ft spacing on an 1,800 ft groundline, multiplied by the skate capacity of the reel.
[3]Based on an estimated cost of $20 per pot, multiplied by 36 pots per skate and the skate capacity of the reel.
[4]Estimated by multiplying $105 per skate times the skate capacity of the reel, adding the cost of snap-ons and gangion line.
[5]This estimate is based on a three-skate string, divided into the reel skate capactiy and multiplied by the end fixture cost shown in Table 4.
[6]Based on maximum safe loading of the combination reel.
[7]Overall width interpolated.

included the cost of the reels and attendant gear in the analysis. In determining the minimum size boat required for installation of this gear, we have allowed a clearance of 3 ft on either side of the reel, based on an estimation of length-width relationships among nine vessels of lengths similar to those in the analysis.

Another assumption is that the gear depreciates to zero over a three year period. We have assessed salvage values based on our best guess of the depreciation rate on all other pieces of equipment. These are shown in Table 6.

Results

The following discussion outlines the percentage success rates, measured as percent of vessels that show a positive NPV out of the 62 vessels analyzed. The entire range of ex vessel price and catch rate combinations are shown for each scale size.

Net present value refers to future income minus costs, discounted to the present, using an appropriate interest rate. This is because money received in the future is not the same as money received today. That's because money in hand can be loaned at interest. That interest can be used as a means of comparing the value of money at different points in time.

Each variable (NPV___) indicates a certain ex vessel price, catch per hour, and reel size. NPV stands for net present value. The following digit indicates pounds per pot per week and will be a 1, 2, or 7, standing for 2.1, 5.6 or 10.5 lbs, respectively. The second digit stands for ex vessel price, and will be a 1, 2, or 3, standing for $.5, $.75, or $1.10 per pound, respectively. The final letter stands for the reel size and will be A, B, C, or D, indicating the different sizes used in this analysis. The percentages on the chart indicate the number of vessels which at least would breakeven in the fishery over three years. NPV23A would be a figure for 5.6 lbs per pot per week, receiving $1.10 per pound with a 48 x 36 x 62 in. reel. A description of how the net present value was calculated and instructions on how to use the case tables are included in Appendix D.

For Reel Size 48 x 36 x 62 inches (Scale A)

The following matrix of percentage success was generated for this scale size:

Table 6. Estimated three year salvage value on the fixed costs of entering the octopus fishery[1]

Reel size (in.)	Reel and level wind[2]	Fairlead and other retrieval gear[3]	Anchoring shackles and chains[4]	Total three year salvage value
48x36x62	$2,244.40	$1,157.44	$ 555.59	$3,957.40
48x48x73	2,411.43	1,446.76	773.63	4,631.82
60x48x85.5	2,536.12	1,736.11	1,436.51	5,708.74
60x60x107.1	2,743.15	2,025.46	1,878.81	6,647.42

[1]Depending on the type of information obtained either straight line or declining balance methods were used to calculate depreciations.
[2]Seven year capital life; annual depreciation rate = .2847 (Source: Kem Equipment 1980).
[3]Ten year capital life; annual depreciation rate = .2.
[4]Twenty year capital life; annual depreciation rate = .1.

Table 7. Scale A percentage of success in octopus fishing by average catch per pot per week and average ex vessel price

	Pounds caught per pot per week		
	2.1	5.6	10.5
	(NPV11A)	(NPV21A)	(NPV71A)
$ .50	3.23%	8.06%	37.10%
	(NPV12A)	(NPV22A)	(NPV72A)
$ .75	3.23%	24.19%	69.35%
	(NPV13A)	(NPV23A)	(NPV73A)
$1.10	3.23%	53.23%	83.87%

It appears that because of the small size of the reel, most of the larger vessels had a difficult time making money. The two vessels that were able to make money at a catch rate of 2.1 lbs per week per pot and at $.50 per lb (cases 51 and 57) were in the 60 to 70 ft range.

Both of these vessels had higher than normal trip averages. Case 57 had a relatively high total crew cost. Both vessels had fuel and galley costs that were on the low end of the range. Our adjusted variables indicate a similar breakdown of costs for these two money-making vessels at the low end of the catch rates and ex vessel prices used in this analysis.

For Reel Size 48 x 48 x 73 inches (Scale B)

The following matrix of percentage success after three years in the octopus fishery was generated for this scale size:

Table 8. Scale B percentage of success in octopus fishing by average catch per pot per week and average ex vessel price

	Pounds caught per pot per week		
	2.1	5.6	10.5
	(NPV11B)	(NPV21B)	(NPV72B)
$ .50	3.23%	19.35%	66.13%
	(NPV12B)	(NPV22B)	(NPV72B)
$ .75	3.23%	50.00%	80.65%
	(NPV13B)	(NPV23B)	(NPV73B)
$1.10	9.68%	75.81%	93.55%

In this scale size, more large vessels were able to show a positive NPV. A few of these cases were just barely above zero, and do not look likely for any venture except one with very well defined catch rates and ex vessel prices over the three year venture.

For Reel Size 60 x 48 x 85.5 inches (Scale C)

The following matrix of percentages of successful boats after three years in the octopus fishery was generated for this scale size of operation:

Table 9. Scale C percentage of success in octopus fishing by average catch per pot per week and average ex vessel price

	Pounds caught per pot per week		
	2.1	5.6	10.5
	(NPV11C)	(NPV21C)	(NPV71C)
$ .50	3.23%	49.68%	85.48%
	(NPV12C)	(NPV22C)	(NPV72C)
$ .75	3.06%	80.65%	98.39%
	(NPV13C)	(NPV23C)	(NPV73C)
$1.10	33.87%	90.32%	100.00%

Again, it appears that the smaller vessels, below 80 ft, show positive NPVs much sooner, over lower ranges of catch rates and ex vessel prices than larger boats. However, using this scale size, all vessels showed a positive NPV at the highest combination of catch rate and ex vessel price.

For Reel Size 60 x 60 x 107.1 inches (Scale D)

The following matrix of the percentage of successful boats (those with positive NPV's) was generated for this scale size of operation.

Table 10. Scale D percentage of success in octopus fishing by average catch per pot per week and average ex vessel price

	Pounds caught per pot per week		
	2.1	5.6	10.5
$ .50	(NPV11D) 3.23%	(NPV21D) 69.35%	(NPV71D) 90.32%
$ .75	(NPV12D) 16.13%	(NPV22D) 83.875%	(NPV72D) 98.39%
$1.10	(NPV13D) 54.84%	(NPV23D) 98.39%	(NPV73D) 100.00%

We again see that for all NPV's up to case number 30, the proportion of successful vessels is much lower than those cases numbering 30 and up. We attribute this to two factors:

1. The variable costs of vessels above 80 ft reflect vigorous offshore long trip fishing that imposes extra costs on the operation.

2. The scale sizes of reels and costs we used in this analysis did not use the resources these vessels normally use to their fullest capacity: for example, the reels are not big enough to support the activities of some of these boats.

Conclusions

The scale sizes that we have used here cover the range of operation that we could expect to see in a limited market octopus fishery. We therefore think that it would be unwise for vessels longer than 80 ft to consider octopus fishing using the methods we have defined for the market we have determined through questionnaire responses.

Vessels below 80 ft may want to start test fishing to see if catch rates described here can be met. We suspect a reasonable catch rate lies between 2.1 and 5.6 lbs per pot per week. However, since this is most critical, we suggest that Alaska Department of Fish and Game be included in the formation of this fishery and that careful records of catch rate be kept to monitor the health of this fishery.

LONGLINE HARVESTING

This analysis was to determine if smaller vessels of the salmon and herring fleet could be reasonably successful longlining octopus, using the same basic investment cost data generated for the analysis on larger boats. Detailed results of this analysis, a full description of variables used, and instructions on how individual boat owners can determine their probable success are shown in Appendix E.

This analysis of summarized responses from representative members of the salmon and herring fleet can be a powerful tool. It will enable a fisherman contemplating an off-season octopus fishery to see beforehand what his chances might be if he were to enter the fishery, given his own cost structure and crew payment set-up. A feasibility analysis, however, is nothing more than a set of realistic assumptions about a new fishery, arranged to allow one to see probable success or failure based on the assumptions.

One implicit assumption is that the catch rates between 2.1 lbs per pot per week and 10.5 lbs per pot per week can be maintained over three years. Each fisherman must realistically assess whether or not he can actually catch the amounts described consistently over three years, and preferably longer. Success will largely depend on the number of entrants into this fishery. We cannot begin to address what the results could be if a large number of fishermen simultaneously launched serious harvesting/processing/marketing ventures. As stated earlier, it is strongly suggested that each fisherman carefully monitor the interest generated by this report and base his decisions accordingly.

It would also be wise to work closely with the Alaska Department of Fish and Game to develop an adequate biological data base to assure a safe and equitable harvest. We do not believe that the motive for entering this fishery can be one of "fast bucks". If so, it is likely that the fishery will collapse early.

For this analysis, we have assumed a five month season. A one week (72 hour) soak time, and a three year involvement. The skate equipment set-up is the same as in the previous analysis. We have divided the boat sizes up into those up to 30 ft, those from 31 to 45 ft, and those from 46 to 65 ft. We did not perform the analysis by fishery type (the fishery the boat was originally involved in), although we do have a variable that allows the reader to refer to this. For the boats up to 30 ft, we assumed gear to be five skates plus a set of endlines. We assumed that five skates could be pulled by hand or available equipment. For vessels 31 to 45 ft and 46 to 65 ft, we assumed gear costs to be Scales B and C respectively, taken from the previous analysis. In this analysis, as with the one before, we have tried to maintain the integrity of the original data for food and fuel costs, crew and skipper shares, where they were not missing or misleading. We performed the necessary calculations when the skipper specified that he subtracted food, fuel or food and fuel costs from the total revenue before applying the crew and skipper shares.

We made three major adjustments for each size group before running the analysis. First we substituted average values for variables that were missing. We also adjusted crew and skipper shares so that they were not missing or misleading. Finally we provided for a 20 percent payment to the boat if the combined shares on the vessel were equal to 100 percent. Many skippers do precisely the same thing in their internal accounting, although they may bankroll varying amounts for their boat. The skipper shares reflect this and we wanted this analysis to show how much would go to the boat after all costs were subtracted.

We have gone into more detail in Appendix E on how these total revenues and NPVs were actually calculated. You can also check for yourself to see how you would come out if you decided to get into the octopus fishery.

Results

The following discussion outlines the percentage of successful vessels, measured as percent of vessels in a size class, that show a positive net present value. The entire range of ex vessel and catch rate combinations are shown for each scale size.

Vessels up to 30 ft

These vessels used a five skate, two end line set-up that costs $4,787.10 (Table 3). Salvage value was fixed at zero. Although this is not entirely accurate, we decided it was better to overestimate costs where we could, rather than underestimate them. This size class had the boats which fished 180 octopus pots.

Table 11. Percentage of success in octopus fishing by average catch per pot per week and average ex vessel price for vessels to 30 ft

	Pounds caught per pot per week		
	2.1	5.6	10.5
	(NPV11)	(NPV21)	(NPV31)
$ .50	0	15.38%	57.69%
	(NPV12)	(NPV22)	(NPV32)
$ .75	0	42.31%	76.92%
	(NPV13)	(NPV23)	(NPV33)
$1.10	11.54%	61.54%	80.77%

Vessels 31 to 45 ft

These vessels were given a 48 x 48 x 73 in. reel, with a 22 skate capacity. The total cost of this set-up is $28,461.76. The salvage value was fixed at $4,631.82. For vessels on the low end of this size class, the reel may be

slightly larger than optimum size. The number of pots fished by this set-up is 792. There are 62 observations in this size range of vessels.

Table 12. Percentage of success in octopus fishing by average catch per pot per week and average ex vessel price for vessels 31 to 45 ft

	Pounds caught per pot per week		
	2.1	5.6	10.5
	(NPV11)	(NPV21)	(NPV31)
$ .50	0	30.65%	80.65%
	(NPV12)	(NPV22)	(NPV32)
$ .75	3.23%	77.42%	85.48%
	(NPV13)	(NPV23)	(NPV33)
$1.10	19.35%	82.26%	90.32%

Vessels 46 to 65 ft

These vessels were given a 60 x 48 x 86.6 in. reel, with a 40 skate capacity. The total cost of all gear was $45,931.86. The salvage value was fixed at $5,708.74. For vessels at the low end of this size range, the size of the reel may be slightly larger than optimum size. There were three cases in this size range.

Table 13. Percentage of success in octopus fishing by average catch per pot per week and average ex vessel price for vessels 46 to 65 ft

	Pounds caught per pot per week		
	2.1	5.6	10.5
	(NPV11)	(NPV21)	(NPV31)
$ .50	0	33.33%	66.66%
	(NPV12)	(NPV22)	(NPV32)
$ .75	0	66.66%	100.00%
	(NPV13)	(NPV23)	(NPV33)
$1.10	33.33%	100.00%	100.00%

Conclusions

The results indicate that larger, mechanized vessels are likely to do better than the smaller vessels with hand rigged skates. In the middle ranges of catch rates and ex vessel prices, the success rates of the vessels below 30 ft were less than 50 percent. This indicates that considerable caution should be exercised to assure that adequate catch rates and ex vessel prices can be obtained. Again, the most obvious feature of all successful examples is the daily variable costs. They are on the average lower than the mean costs for that vessel group. The reader should now consult Appendix E to estimate for himself the success he is likely to have if he were to go into octopus fishing.

WORLD TRADE OF OCTOPUS

Our summary of octopus world trade is based on responses we received to a questionnaire. Countries that might be interested in the octopus trade were determined by consulting United Nations statistics in the FAO's Yearbook of Fishery Statistics. Using data for 1976 and 1977, and an elimination process described in Appendix F, we selected a number of countries to contact. The questionnaire went not only to government agencies, but also to companies interested in octopus.

Details on how the questionnaire was developed and a copy of it are contained in Appendix F. Essentially, it asked for two types of information:

1. General and topical data including descriptions of the fishing industry, which octopus species they preferred, and descriptions of harvesting and processing techniques.

2. Marketing data, including import and export information, used to construct a model showing every relevant dealer on the world market.

Fisheries ministers in each country were contacted and asked to supply the following information:

1. Production and value of harvest (defined or landed catch) from 1974 to 1977

2. Import value for 1977 (or 1976, if 1977 not available)

3. Export value for 1977 (or 1976, if 1977 not available)

4. Trade barriers against the U.S. (tariff and non-tariff)

5. Names and addresses of importers that might be interested in U.S. trade.

This information is more fully detailed in Appendix F.

Processors, wholesalers and brokers were then sent a questionnaire to determine:

1. Interest in species offered by U.S. catches

2. Desired harvesting techniques

3. Desired processing techniques

4. If they could be contacted by English-speaking businessmen

5. Specific quality control requirements

6. Price quotes, buyer terms.

This is more detailed in Appendices G and H.

1977 WORLD TRADE PICTURE FOR OCTOPUS

The information in Appendix G (Import and Export Statistics for Countries Reporting Trade in Octopus) has been summarized in Figure 12. In this trade diagram, an arrow pointing to a country indicates that it imports from the country where the arrow originates. A double arrow indicates cross trade between two countries. Consult Appendix H to determine net trade flows.

The major importers are Japan, France, Canada, Greece, Italy, Spain, Hong Kong, and the United States. Major exporters are Japan, France, Italy, Morocco, Thailand, the Republic of Korea, Spain, Mauritania, and Tunisia, based on their 1977 trade statistics.

The most probable export targets, based on this information, are Japan, France, Greece, Italy, Spain, Hong Kong, and the United States.

COMPANIES THAT GAVE POSITIVE RESPONSES TO THE QUESTIONNAIRE

The extent of replies we received to the questionnaire varied. Some only answered the yes and no portion, others provided detailed information on processing and harvesting techniques. Because the form was rather complicated, we believe those who took the time to answer it were genuinely interested in possible U.S. trade.

For instance, the most widely traded and accepted octopus in the world is O. vulgaris, a smaller variety of O. dofleini. With the exception of the Japanese, who are familiar with O. dofleini, and find it inferior to O. vulgaris, most processors had a difficult time believing that an octopus as big as we described could actually be sold. However, many are willing to at least try.

The company names that follow are those which gave the most positive response to our inquiry. Each address is followed by a short synopsis of their responses.

West Germany

Anglo-Skandia
Gr. Elbestrasse 133
200 Hamburg 50
ATTN: I.A.W. Krommes
Tele: 040-38-18-12
Telex: 02 12 564 ASKA

This company was interested in octopus, fresh-frozen, without heads or cleaned with heads in blocks of 10 kg. The maximum weight of each octopus should be about 3 kg. They offer a CIF Hamburg price of about $2 per kg. They will conduct business in English and invite visits to their office.

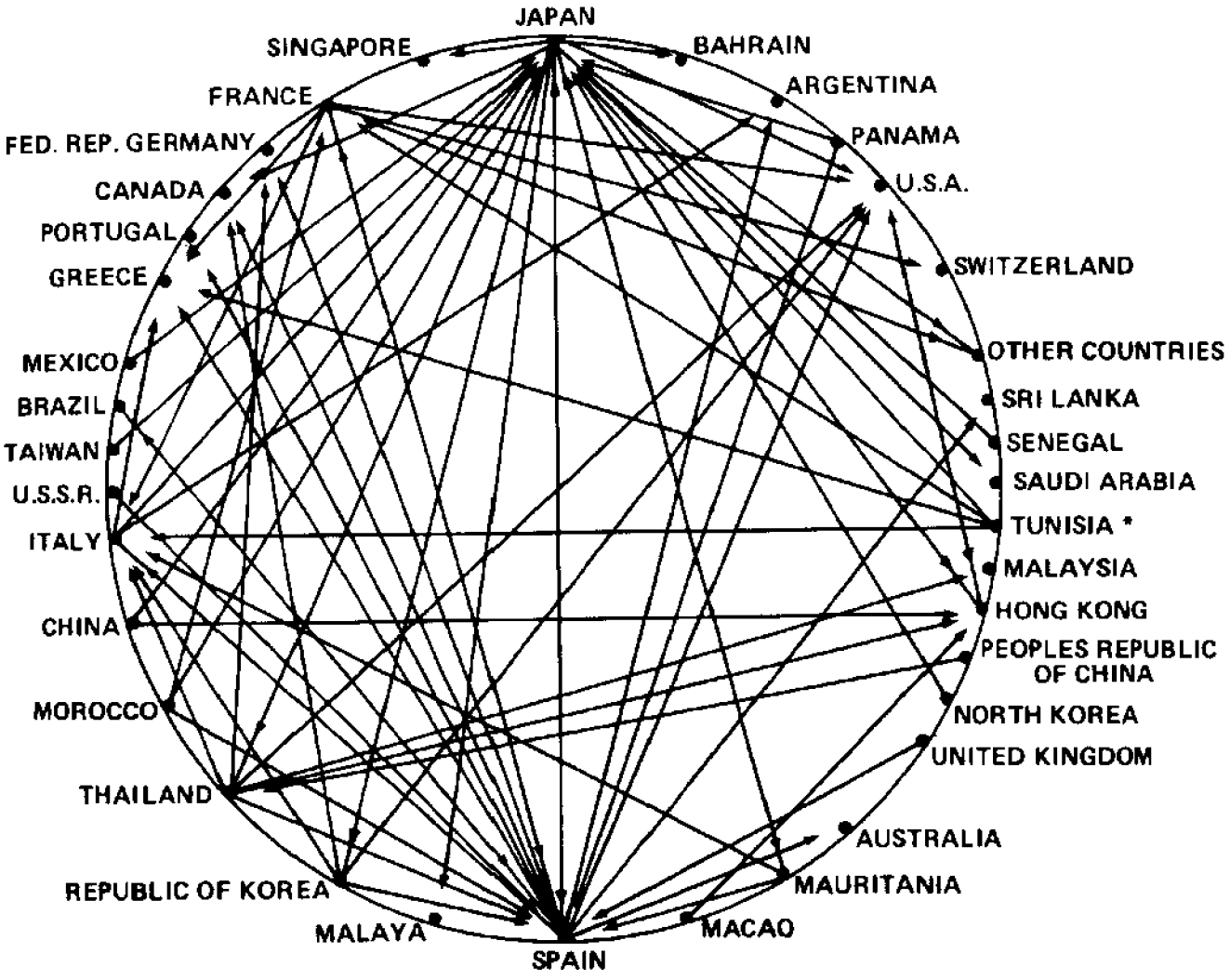

Figure 12. World trade of octopus 1979. (Federal Republic of Germany 1977, France 1977, Hong Kong 1977, Italy 1977, Japan 1977, Spain 1977, Thailand 1977, Tunisia 1977.

Standard Ubersee Handels GMBH
Rothenbaumchaussee 3
2000 Hamburg 13
ATTN: N.J. Ravenborg
Tele: 040-44-10-41
Telex: 02 11 596

This company expressed interest in octopus but gave no further specifications.

The processing methods described by German companies were very close to the Spanish and the Japanese methods. They indicate that these are the best methods to copy.

France

Paul Coutau-Begarie
P.O. Box 22
33029 Bourdeaux Cedex
France
Tele: (56) 48-55-17
Telex: 560853 AFTOM

This import/export agent is interested in importing octopus. Processing procedures and prices were not discussed. Will respond to inquiries in English, visitors are welcome.

Italy

P.A. Cornara
Rappresentanze
Via Giacomo Boni, 37
20144 Milano
Italy
ATTN: Mr. P.A. Cornara
Tele: 46-94-178
Telex: NORPES 333879

O. vulgaris was named as the species this import/export house favors. Products are to be frozen whole or on board in 15 to 25 kg blocks. It assumes an extended fishing trip, which will normally not occur in Alaska. If you want to know more, Cornara suggests that you send specific size and type of fish considered. Prices were not discussed and samples are required.

Commercial Services International
International SRC
Via Vincenzo Monti, 56
20123 Milano
Italy
ATTN: J.D. Maranelli, Director
Tele: 469-1464
Telex: 332078

This is an American owned firm. They presently represent Thomas Borthwick and Sons, Australia, as importers. They represent Conserviera Adriatica of Offida, Italy, as exporters. Specifications outside of frozen blocks were not given.

Etruria, S.P.A.
Piazza Bertarelli, 2
20122 Milano
Italy

This independent processor is interested in importing octopus headless, gutted, or gutted in 10 kg blocks. Poly wrapping with two blocks to a master carton is also required. Each block should contain homogenous specimen using the following grading system:

500 g to 100 g
1 kg to 2 kg
2 kg to 3 kg
4 kg to 5 kg

CIF Italy price was given as $3,000 per mt. They are willing to deal in English and visitors are welcome.

Giolfo and Calcagno, S.P.A.
Via Ovada, 1
16158-Casella Postale 98
Genova Voltri

This is an independent nationwide distributor. They have handled O. vulgaris. Processing specifications follow this type and size. They prefer trawled octopus frozen at sea. An Alaskan pot fishery, however, will give a product superior to this. Size sorting is as follows:

Up to 500 g, gutted
500 to 1,500 g, gutted
1,500 to 4,000 g, headless
Greater than 4 kg, not acceptable

The frozen blocks should be about 10 kg, poly wrapped and packed two blocks to a master carton. Prices were not discussed. Will conduct business in English, visitors are welcome.

Japan

Co-Optrade Japan, Ltd.
Seikyo Kaikan 1-13
4-Chome
Sendagaya
Shibuya-ku
Tokyo
Japan
ATTN: K. Miyasaka
Tele: 03-404-3251
Telex: J23393 COOPTR

This company has handled O. vulgaris. They will respond to inquiries in English and visitors are welcome.

Ito Yokado Co., Ltd.
5 Sanbancho
Chiyodaku
Tokyo
Japan
ATTN: S. Yoshimura, Trading Department (FOOD)
Tele: 03-264-2111
Telex: 23841

This company expressed interest in importing octopus without further comment. It is an independent processor as well as an import/export broker.

Kabushiki Kaisha Washington Fish
(Washington Fish, Inc.)
4th Floor, Ikeda Bldg.
4-5-5 Tsukiji Chuo-ku
Tokyo, 104
Japan
ATTN: Mr. Masataka Sueyoshi, Vice President
Tele: (03) 542-9301
Telex: J24234

This is the import/export brokerage house for Washington Fish in Japan. They have traded in what they call O. bardii which may be vulgaris. Specimen are divided into three size classes, but no weight specific were given. The octopus should be block frozen in 7.5, 10, or 15 kg units, with two blocks per master carton. Poly wrapping is assumed. Avoid holding the octopus until the skin turns reddish or pink. This is a sign of poor quality. CIF Tokyo prices of $.50 per pound were quoted.

Kanematsu Gosho, Ltd.
Central P.O. Box 141
Tokyo, 100-91
Japan
TG55

This independent processor uses a variety of products. Detailed information on everything but price was given. The response was in excellent English and visitors are welcome to the main office. They indicate pot harvested octopus have a higher quality than those taken by trawl, because the skin is seldom broken. The octopus should have the ink sac tied off, be clean packed and frozen as soon as possible. The following grades are common throughout Japan:

T1: 4 kg and heavier per animal
T2: 2 to 4 kg per animal
T3: 1.5 to 2 kg per animal
T4: 1 to 1.5 kg per animal
T5: 0.5 to 1 kg per animal
T6: .3 to .5 kg per animal

They should be frozen in 10, 20 or 30 kg blocks, poly wrapped and packed in a master carton. The main quality consideration is taste.

Nichiryo, Ltd.
No. 2-1, 2-Chome
Azabudai, Minato-ku
Tokyo
Japan
ATTN: K. Tanaka, Marine Products Section
Tele: (03) 584-0151
Telex: 242-2136 NICRYOJ

This company is primarily interested in crab, salmon and herring producers, but is also interested in octopus. Business can be conducted in English and they welcome visitors.

Tokyo Commercial Co., Ltd.
Playguide Bldg.
6-4 Ginza, 2-Chome Chuo-ku
Tokyo, 104
Japan
ATTN: Seiichi Takeuchi, Import Section

This company prefers pot trapping or trawling. The octopus are gutted, sized and quick frozen on board in 20 kg blocks. The blocks are covered with a poly bag and put in 20 or 60 kg master cartons. The opening bid is $800 per mt, Tokyo or Yokohama.

Portugal

Gama and Gomes, LDA
Rua Formosa, 345
Porto
Portugal
Tele: 27462
Telex: 22419 -AGOMES P

This is a processing, import and export business. They will conduct business in English and visitors are welcome. They require immediate freezing in 10 kg blocks. Port of entry is Leixoes.

Sociedade de Fomento Da Pesca, LDA (SOFOPEL)
Avenida Duque de Loule, 86-1° Esq.
Lisboa, 1
Portugal
Tele: 56-08-43
Telex: 13446-SOFOPE P

SOFOPEL is a diversified company which has its own vessels fishing off Portugal, the Azores and the Newfoundland Bank. They indicated interest in octopus but provided no details. They will conduct business in English and appear to have American contacts for fish products.

Spain

Armour, S.A.E.
Importacion-Exportacion
Plaza Urquinaona, 6
Planta 15b
Barcelona, 10
Spain
Tele: 318-56-16
Telex: DELFO-E54749

This company indicated an interest in octopus without further comment.

Carreras S/A
Consignaciones de Pescados Y Mariscos
Wellington, 52-70
Locales 3-4-5
Barcelona
Spain
ATTN: Sr. A. Moreno
Tele: 300-00-66-1654-1658
Telex: 54.122 RAPE-E

This is a processing firm. They responded in Spanish but indicated they would also communicate in English. Interest in octopus was indicated without further detail.

CIEISA
Compania Internacional De
Exportacion E Importacion S.A.
Alcala, 30-32
Madrid 14
Spain

This is a processing, import and export business. Specific harvesting and processing details were not discussed.

Commercial Vemora, S.A.
Importacion-Exportacion
Acalde Sainz de Barada, 29
Madrid, 9
Spain
Tele: 274-60-99

This company buys octopus frozen in sea water, headless, in blocks of 5 kg, plastic wrapped and placed in a master carton of larger capacity (10 to 15 kg). The emphasis is on "sea fresh" product with no additives. The only meaningful quality control factor is immediate freezing.

Compesca, S.A.
Calvo Sotelo, 19
Santander
Spain
ATTN: Sr. J. Yllera, Managing Director, Import/Export Tele: 212362
Telex: 35867 FOOD-E

This processing, import and export company answered the questionnaire in excellent English. They are extremely interested in octopus, but gave no further details.

Consaja, S.A.
P.O. Box 12
San Vincente de la Barquera
Santander
Spain
ATTN: Sr. Angel AJA M.
Tele: 71-01-00
Telex: 35.884 AJA E

This company responded in Spanish, but will communicate in English. Visitors are welcome. The octopus are usually frozen on board after thorough cleaning and evisceration. The blocks (weight not specified) are then packed in 10 kg cartons. Dark color is preferred. A CIF price of $.78 per pound at Santander was quoted.

Eurofrio
Alimentos Congelados S.A.
de la Sardineina 35
Auda.
La Coruna
Spain
Tele: 23-09-67

This company expressed interest in octopus without further comment. Will conduct business in English and welcome visitors.

Frigorificos Berbes, S.A.
P.O. Box 1,004
Vigo
Spain
ATTN: Sr. Alberto Martin Valera, Comercio Exterior
Tele: (986) 29-77-00
Telex: 83020 BERB E

This company responded in Spanish. They are not sure if O. dofleini is marketable in Spain, primarily because size, color and flesh consistency is different from that of O. vulgaris. They consider weights of 10 to 15 kg "excessive" for octopus. They are however, interested in exploring the market possibilities. The second step would be to send samples. O. vulgaris is marketed in Spain with the head and without viscera.

Frigorificos Troulo, S.A.
Apartado, 1001
Vigo
Spain
ATTN: Sr. Manuel Fernandez Rodriquez
Tele: (986) 23-25-72
Telex: 83089 TROU E

This is a secondary processing and distribution company interested primarily in O. vulgaris. After the octopus are eviscerated and washed, they are classified by the following sizes: to .5 kg, .5 to 1 kg, 1 to 3 kg, and larger than 3 kg. They are then frozen on trays of undetermined size. The blocks are plastic wrapped and placed in cardboard boxes, one to two blocks per box. Quality control is strict with freshness, color and odor as tests. Correct weight classification is important as are the washing and evisceration. No prices were quoted.

Robert Gordon Maple
Apartado 596
Seville
Spain
ATTN: R.G. Maple
Tele: 61-41-47

This is an American business. Maple is interested in obtaining supplies and suppliers from Alaska in all types of seafood. He suggests that he could act as an intermediary for Alaskan sellers both in the United States and Spain. He is interested in octopus, if potential sellers will send samples and photos of processing equipment and techniques.

Mayorista Pesca del Sur S.A.
Av. Garcia Morato, 6-8
2º2ª Barcelona, 1
Spain
ATTN: Sr. L.D. Navarra

This company has handled both O. vulgaris and E. cirrosa. English is used and visitors are welcome.

Pescanova, S.A.
Apartado 424,
Vigo
Spain
ATTN: Juan A. Gallastequi, Manager Foreign Dep't.
Tele: 21-57-91
Telex: 83072 Pesva E

Techniques for processing O. vulgaris were discussed. Octopus are washed and immediately frozen in 5 kg blocks right after capture. These should be plastic wrapped and placed in master cartons of 15 kg.

SHIPPING THE PRODUCT

Surface Shipping

Surface shipping companies in Alaska indicate that there are only two specific routes that operate continuously: Alaska to Seattle and Alaska to Tokyo. This makes it difficult to estimate freight rates and routes without specific product weight, destination and frequency of shipment. Those interested in shipping information should contact shipping companies with specific information for estimates. The two major surface shippers in Alaska are American President Lines and Sea-Land, Inc. Some specific information on freight rates and packaging is included in Appendix H.

Neither of these companies has much experience shipping to foreign countries other than Japan and Korea. Surface shipment to Europe has offered little incentive in the past because customer interest has been small. If shipping through an Alaskan company is possible, there are three things to consider:

1. Almost all frozen products going to Europe will go through Seattle. Another alternative is to ship by rail to the East Coast from Prince Rupert.

2. Companies which ship from the West Coast to Europe are almost exclusively California based.

3. Truck and rail shipping routes to the east coast are well established. From eastern ports, products can be placed on ships for travel to Europe.

Air Freight

Air freighting perishable foods is more expensive but may be the best way to insure product quality. Before deciding on how to send products, the following questions should be considered.[1]

1. How perishable is the commodity?

2. How valuable, by weight, is the commodity? Air freight rates are often quite high per pound, especially for small non-containerized shipments. If the CIF (customs, insurance, freight) quote agreed on by the buyer and seller is not substantial, the shipper may lose money on the margin to shipping costs.

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[1]The section on air freighting was developed after contacting representatives from Western Airlines, Japan Airlines, Northwest Orient Airlines, Flying Tigers, Air France and Scandinavian Airlines. Publications by Western Airlines, the Air Transport Association of America (1971) and the International Chamber of Commerce (1974) also proved useful.

3. What are the holding costs of the product? Because seafood is highly perishable and because finance charges on money lent to cover the cost of a transaction is often high in Alaska, the cost of handling and storage can be prohibitive.

4. How predictable is demand for the product? Successful trade with foreign countries requires assurance of a steady demand in large volume for a product. With a new or volatile consumer market, air freight may be a good alternative to surface transportation.

5. What is the total cost of distribution? The Air Transport Association of America (1971) suggests the following elements be considered:

    a. Transportation charges
    b. Cost of capital tied up in inventory
    c. Warehousing expense
    d. Packaging
    e. Insurance (considerably higher for perishable items, estimated at two times the cost for nonperishables)
    f. Spoilage losses
    g. Theft losses
    h. Inventory taxes.

In addition, the backhaul charges must be considered, especially if one's own containers are being used. Most airlines will help a shipper determine the cheapest, most efficient way to send items. In most cases, they will also tell a shipper when air freight is too expensive.

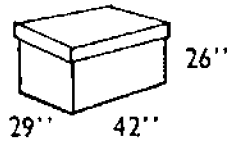
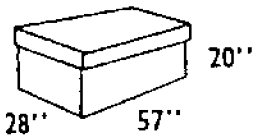
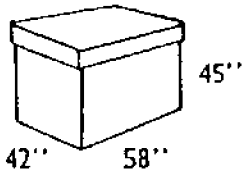
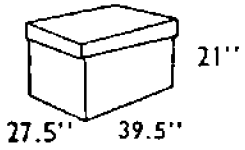
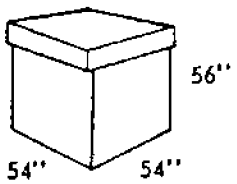
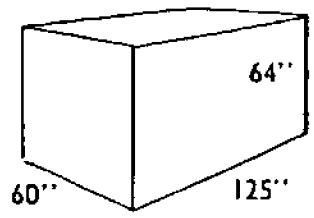
Packaging

Once method of transportation is determined, packaging should be considered. There are three general categories:

1. Unit packaging, no container
2. Unit packaging, shipper owned containers
3. Unit packaging, carrier owned containers.

Unit packaging with no container is the highest priced shipping. Only large quantities get a price break, so only large volume orders can be sent this way without considerable expense.

Price breaks are available for shipper owned containers that meet domestic and international air freight container regulations. Figure 13 shows the most commonly used containers. Types E, E-2, D, Q, and LN are corrugated cardboard and reusable. The D, E, E-2, and Q containers are collapsible, and entail backhaul charges. LN boxes are made of Fiberglas and also carry a backhaul charge. The L5 container is so large it is used only by the airlines for the return trip. The original shipper is not charged backhaul fees. Varying discounts are given for packing large weights in the D, E, E-2, and Q boxes, for palleting small boxes and for loading or unloading at points other than the airport.

CONTAINERS	AIRCRAFT	INTERNAL CAPACITY and DIMENSIONS	MAX. GROSS WT.	CONTAINER WEIGHT
TYPE E 	All aircraft	17 cu. ft. 40" X 27.5" X 25"	500 lbs.	18 lbs.
TYPE E-2 	All aircraft	17 cu. ft. varies	500 lbs.	18 lbs.
TYPE D 	DC-10	60 cu. ft. 56" X 40" X 41"	1200/2000 lbs.*	63 lbs.
TYPE Q 	All aircraft	12 cu. ft. 37.5" X 26" X 20"	400 lbs.	13 lbs.
TYPE LN 	DC-10 only	90 cu. ft. 51.5" X 52" X 52"	3100 lbs.	100 lbs.
TYPE L5 	DC-10 only	277 cu. ft. 121" X 58" X 60"	5000 lbs..	Actual Empty Wt.

* The maximum gross wt. for the Type D container on a 707 or 720 aircraft is 1200 lbs.; 2,000 lbs. on DC-10 aircraft.

Figure 13. Containers available to air shippers. (Western Airlines 1977)

Using carrier owned containers can lead to some savings. These are usually rented at a flat fee for both the container and the load. Each type (Figure 14) has a maximum weight for the fee charged, called a pivot weight. If this weight is exceeded, a surcharge is assessed by the pound, kilo or centiweight.

Generally, airlines provide night and day rates for containers, pick-up and delivery, and free time for loading and unloading freight. Container rates are also regulated by the Air Freight Container Tariff.

Airlines and some freight forwarders also have containers which can keep products cold with dry ice or refrigerator compresses. Self-contained refrigeration reduces the risk of loss if flight connections are delayed, but there are also a substantial premium payment involved when using dry ice. Delays often occur because freight packed in dry ice is sometimes not compatible with other cargo.

It may be best to consider a super-insulated container. This avoids the refrigeration problems of hookups and carbon dioxide build up. These containers are available through independent container dealers in Anchorage.

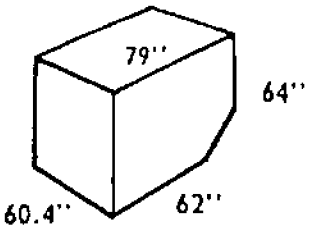
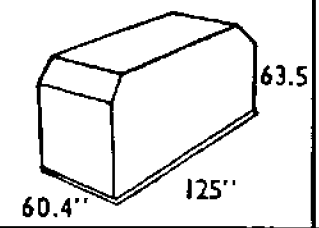
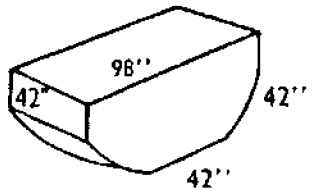
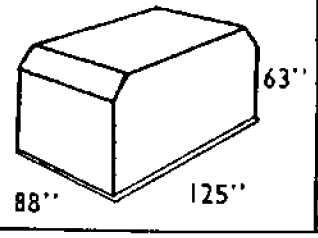
Freight Rates

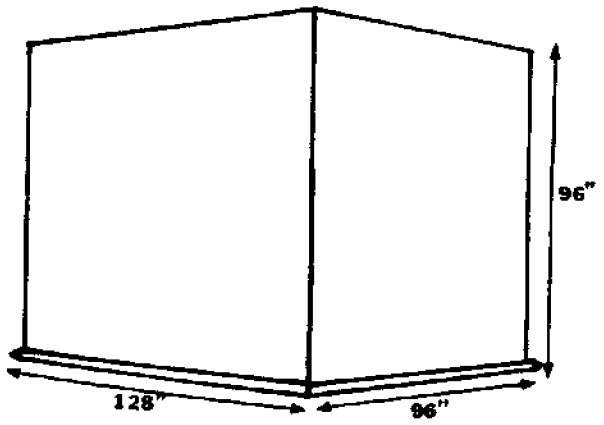
Freight rates, like container rates, are controlled by both regional and international tariffs. Comparing freight charges might not be a good way to choose among airlines, but the following considerations may help with the decision:

1. Directness of flight
2. Pick-up, delivery and loading services offered
3. Storage space and conditions at layover points
4. Airline policy on lost, damaged or misdelivered freight
5. Allowing shipper to travel with order
6. Ability of airline to plan logistics for handling and delivery
7. Accurate tariff interpretation for weight and type of shipment
8. Favorable terms of payment and cities served.

Freight rates are divided into four categories: general commodity shipments, exception rating, priority reserved flight, and specific commodity shipments. General commodity tariffs are based on net weight or weight and volume estimations. As the weight increases, the per pound rate decreases. Exception rates are percentage surcharges to the general commodity rate for shipments requiring special handling. Priority reserve flight is a special service that reserves space for a shipment that must be on a certain flight. Specific commodity rates are the most used rates for very high volumes of specific product between cities. There is, for example, a special rate for fish between Anchorage and Tokyo (Appendix I). These rates are nearly always lower than general commodity rates.

Appendix I gives an example of general commodity rates by division and weight from Anchorage to different destinations in Europe, Asia and South America. Five of nine airline contacts responded with discussions on rates. It is interesting to note the difference between special seafood rates offered by Northwest Airlines to Tokyo and Japan Airlines' general commodity rates

CONTAINERS	AIRCRAFT	INTERNAL CAPACITY and DIMENSIONS	MAX. GROSS WT.	APPROXIMATE CONTAINER WEIGHT
L3* 	DC-10	140 cu. ft. 75"–58" X 58" X 60"	3,500 lbs.	370 lbs.
L11* 	DC-10	265 cu.ft. 115" X 58" X 58" *Has a separate pallet base that may be used for transporting shipments.*	7,000 lbs	400 lbs.
LW 	Boeing 720, 727 707	65 cu. ft. 96" – 40" X 40" X 40"	1,200 lbs.	180 lbs.
L7** 	DC-10	355 cu.ft. 115" X 58" X 81" *Has a separate pallet base that may be used for transporting shipments.*	10,400 lbs.	500 lbs.



The M-1 container and pallet are loaded onto the main deck of the 747 combi. The internal volume measures 600 cubic feet. The maximum gross weight is 15,000 pounds. The weight without cargo is 1,119 pounds.

Figure 14. Carrier containers (Western Airlines 1977; Scandinavian Airline systems 1979).

for the same destination. It is also interesting to note the comparison between the general rates for container dimensions in the questionnaire and rates that apply to the carrier owned containers. This signifies a considerable savings over loose cargo.

OTHER CONSIDERATIONS

Dimensional Rate Rule. For high volume, low weight shipments, the following rates are used:

1. For most domestic shipments, 1 lb = 250 in^3
2. For international shipments, 1 lb = 194 in^3

If dimensional weight exceeds measured weight, then rates are charged according to the dimensional rate.

Surcharge For Dry Ice Use. Almost all airlines give a flat charge for handling shipments packed in dry ice. A restricted article certificate is also required.

Compliance With U.S. Fish and Game Laws. Seafood must have a declaration for importation or exportation of fish or wildlife. This is U.S. Fish and Wildlife Department form 3-177.

Compliance With U.S. Export Laws. Export shipments must have two copies of the shipper's export declaration of shipments from the United States (form 7525-V). This declaration describes export district, port, city, transportation, name of carrier, exporters, agents, consignees, and the foreign port.

Shipping Arrangements. Arrangements with a carrier should be made well in advance of shipping date. You should discuss preservation (brine, ice, dry ice, self-contained refrigeration, ground cold storage), length of transit, rates for loading and unloading, terms of payment and so forth. If shipping to a foreign country, considerable lead time is required to determine the procedure for getting things into the country. Most important is knowing the buyer or his agent. Losses are often caused by failure to have an agent available for the consignee, failure to give an agent power of attorney, or failure to notify the buyer that a shipment is on the way.

The buyer may also refuse shipment at the point of destination. As a foreign national, the seller has little legal recourse as the product spoils on site. It is a good idea to have an alternative plan for the product in case the buyer refuses shipment. For this reason it is also best for the seller or his agent to be with the shipment when it arrives until customers prove reliable.

Planning and confirming shipping logistics may prove profitable to many sellers, especially if they are able to use the plan many times. However, many sellers may find it is less expensive and more efficient to work through a broker, rather than setting up trade routes on their own.

Organizations. If you have more questions on the air freight industry, the following organizations should be able to help (Air Transport Association of America 1971):

International Air Transport Association of America (IAIA)
1155 Mansfield
Montreal, 2
P.Q. Canada

The Air Cargo Tariff (TACT) (international)
P.O. Box 7627
1118 ZJ Schipol Airport
The Netherlands

Airline Tariff Publishers, Inc. (domestic)
1825 K Street
Washington, D.C. 20006

Air Cargo, Inc. (ACI) (domestic and Canada)
1730 Rhode Island Ave., N.W.
Washington, D.C.

Official Airline Guide
P.O. Box 6710
Chicago, IL 60680

A Note About Financial Arrangements. There are quite a number of ways to arrange payment for the shipment which entail less risk to the seller than consignment (where payment is made shortly after arrival). One possibility is letters of credit, which are arrangements between the seller's and buyer's banks offering payment to the seller immediately upon presentation of evidence that the product has been shipped. This is often an agreement that must be filled even if the buyer rejects the shipment.

Other methods of receiving payment have been compiled and explained by the International Chamber of Commerce (1974) and the National Marine Fisheries Service and can be obtained by writing for the following publications:

Uniform Customs and Practice for Documenting Credit
ICC Publication No. 290
United States Council of the International Chamber of Commerce
121 Avenue of the Americas
New York, New York 10036

Export and Domestic Market Opportunities for Underutilized Fish and Shellfish: Study Report
Robert D. Nordstrom
International Trade Specialist
National Marine Fisheries Service
NOAA, U.S. Department of Commerce
Washington, D.C. 20235

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