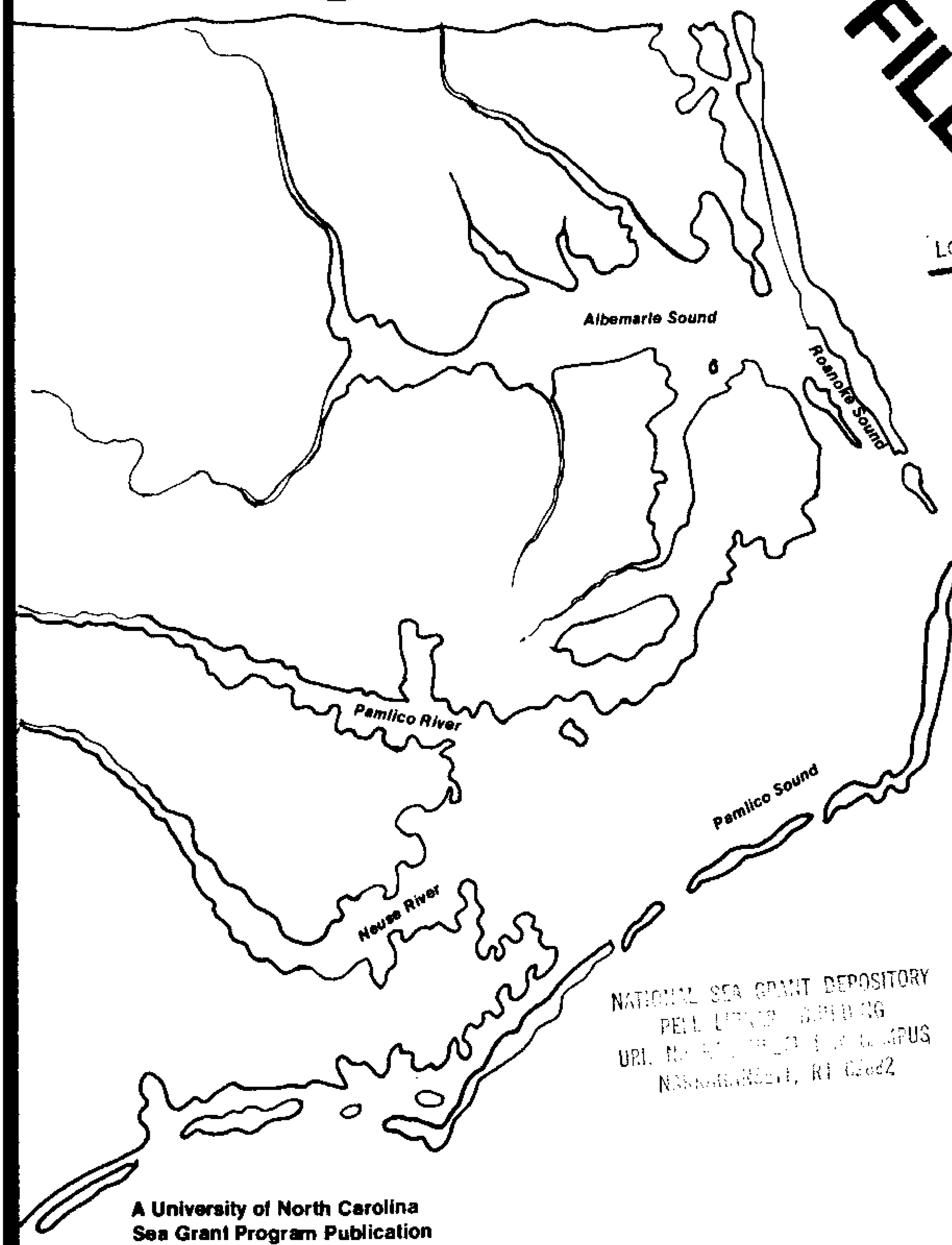
Nekton Population Dynamics in the Albemarle Sound and Neuse River Estuaries



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A University of North Carolina
Sea Grant Program Publication
UNC-SG-75-02

January, 1975

NEKTON POPULATION DYNAMICS IN THE ALBEMARLE SOUND AND NEUSE RIVER ESTUARIES

by

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This work was sponsored by the Office of Sea Grant, NOAA, U.S. Dept. of Commerce, under Grant No. 04-3-158-40, and the State of North Carolina, Dept. of Administration. The North Carolina Department of Natural and Economic Resources, Division of Commercial and Sports Fisheries provided the boats and facilities used for field work in the Albemarle Sound. The U.S. Government is authorized to produce and distribute reprints for governmental purposes notwithstanding any copyright that may appear hereon.

SEA GRANT PUBLICATION UNC-SG-75-02 JANUARY, 1975

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INTRODUCTION

North Carolina is endowed with an extensive network of coastal wetlands. Within this network are located several large estuaries which may be among some of North Carolina's richest resources. The true value of these estuarine systems, however, has not been fully appreciated and often has been overlooked. Heretofore, most research concerning estuaries as a whole has been conducted in response to public reaction over construction and operation of big industry such as the Brunswick Nuclear Power Plant on the Cape Fear River estuary and the Texas Gulf phosphate mine on the Pamlico River estuary.

The above scheme is not altogether satisfactory since encroachments on other estuaries can be much more subtle, albeit potentially disasterous to estuarine life. A seemingly ceaseless flood of people and the externalities related thereto threatens to inundate coastal areas. Nutrients from farmland runoff, sewage effluent, and industry may contribute to phytoplankton growth to bloom proportions during the summer months, resulting in low oxygen conditions intolerable to many organisms. Organic material entering the estuary from the pulp industry, seafood industry, and construction sites may cause reduced conditions during the times of low river flow prevalent in summer months. Dredge and fill operations destroy "edges" thus removing valuable spawning areas and destroying marsh plants responsible for the input of detritus into the estuarine ecosystem. Any of these perturbations may initiate complex sinergistic changes within the estuary. In each case the effect of one, or even a few, could be too small to detect but the aggregate effect could be damaging to the system.

Consequently, estuarine research is vitally needed to inject basic data into the decision-making process. Overt decisions, or conversely, the lack thereof, will dictate the future state of our estuarine systems. If our natural resources are not to be managed by default, a value judgment must be made concerning the relative worth of estuaries and other coastal areas to all North Carolinians.

Development and industralization have yet to make any major changes in the Albemarle Sound and Neuse River estuaries. Ironically, it is precisely this relatively pristine condition which makes these two bodies of water and adjacent shoreline attractive to development. In addition, low wages and few taxes make these areas attractive to industry, which is actively being sought by local leaders, ostensibly to stimulate the depressed economy of the region. The potential for a serious confrontation is evident here. Are the established local industries, principally commercial fishing, sport fishing, and farming, compatible with extensive development and industrialization in the region involved? If not, can the two be reconciled?

A significant part of the economy of the surrounding areas is directly or indirectly tied to these two estuaries. Commercial fishermen depend on the estuarine life for their livelihood and, in turn, support the seafood industry, boat construction industry, etc. Sport fishermen and recreational boaters contribute to the success of local merchants which cater to their interests. Tourists, many of whom come to enjoy the pastoral panorama of the area, also provide input into the economy.

Even so, relatively little information is available on each estuary which can be utilized to evaluate the importance of the estuarine ecosystem to North Carolinians as a natural resource. This combination of circumstances provides a unique opportunity to study an oligohaline (Albemarle Sound) and mesohaline (Neuse River) estuary in a relatively natural state in order to supply baseline data prior to major changes.

One can effectively evaluate an estuarine system with respect to the value of its productivity in terms of the population dynamics of the nekton present. Nekton represent the highest trophic level within the estuary and the final integrater of available energy plus any stresses which may be involved. Nekton, then, may be considered the net productivity for the system. It is also the point in the energy cycle at which man chooses to intervene and harvest the energy for his benefit. To correctly measure the value of the estuary to man requires more data than merely the total commercial and sport fishing catch, the economic benefits resulting therefrom, and speculation. Data are also needed to identify the species which utilize the estuary and to answer questions concerning their life cycle within the estuary, their seasonal patterns, their spatial distribution, and their energy assimilation or growth. In short, an understanding of the nekton population dynamics is needed to evaluate the estuarine system.

Available data about the nekton of the Albemarle Sound and Neuse River estuaries have been compiled on a relatively few commercial species, primarily *Morone saxatilis*, *Alsoa aestivalis*, *Alosa psuedoharengus*, *Alosa mediocris*, and *Alosa sapidissima*. All of these species are anadromous, emigrating through the estuary to freshwater tributaries in spring. Spawning occurs in these tributaries and larvae and newly transformed juveniles move downstream to the estuary. Apparently these young-of-the-year fish utilize the energy available due to the spring pulse in primary productivity observed in temperate estuaries (Copeland, 1966; Hoese and Jones, 1963). The young remain in the estuary until fall when they emigrate into the ocean.

Of the above species, M. saxatilis, the striped bass, has received the most comprehensive study. Dr. William W. Hassler of North Carolina State University, his students, and others have compiled a wealth of information on various aspects of growth and reproduction of M. saxatilis in the Roanoke River and Albemarle Sound (Hassler, 1958; Trent, 1962; Cheek, 1961; Monooch, 1972; Trent and Hassler, 1966; Davies, 1970). Tag studies have also been done to determine population size and migration (Chapoton and Sykes, 1961; Nichols, 1964a,b, 1965, 1966). In addition, Ictalurus punctatus was studied in its Chowan River habitat (Mauney, 1969) and Conover (1958) examined Morone americana in the Roanoke River and Albemarle Sound.

Investigations of Alosa sp., the shads, have been concentrated in the Neuse River with emphasis on Alosa sapidissima (LaPointe, 1958; Davis, 1957; Walburg, 1957; Baker, 1968). The hickory shad in the Neuse River has received extensive study by Pate (1972).

Very little information is available regarding the other species indigenous to these two estuaries. Only a single study dealing with the occurrence of fresh water and marine fish at various salinities within the Neuse River has been published (Keup and Bayless, 1964).

More generalized studies have been completed elsewhere on the east and gulf coasts by utilizing a trawl sampling method (June and Reintjes, 1957; Jerome et al., 1965; Gunter, 1938; Arnold et al., 1960; Reid, 1954; Kilby, 1955; Springer and Woodburn, 1960). Although biased toward slow moving, demersal species and juveniles, nonetheless, trawl studies provide information on most estuarine species and provide data of relative abundance, seasonal patterns, spawning, growth, and spatial distribution.

Trawl studies conducted in nearby estuaries in Virginia, Georgia, and North Carolina (McErlean _et al._, 1973; Dahlberg and Odum, 1970; Turner and Johnson, 1973) indicate seasonal fluctuations within the estuary. A spring influx of migratory and anadromous species was noted in all three systems increasing catch values. Fall and winter population values were relatively low, reflecting nekton emigration. "Species richness" was shown to coincide with the population peaks in the Patuxent River estuary (McErlean _et al._, 1973). Replacement by resident species in the Georgia estuary, however, masked the "species richness" effect (Dahlberg and Odum, 1970). Other diversity indices calculated for the Virginia and Georgia studies fluctuated with season in response to nekton migrations into and out of the estuary.

MATERIALS AND METHODS

Nekton samples were collected monthly over a 13-month period in each estuary (June 1972 through June 1973 in the Albemarle Sound and August 1972 through August 1973 in the Neuse River estuary). Thirteen stations were sampled in the latter; 15 were sampled in the former (Figure 1).

Albemarle sampling was accomplished using a modified cob trawl which fished an area 10 ft wide by approximately 6 ft deep. Mesh size of the net measured 5/8 inch bar except in the cod end which was 1/4 inch bar. A conventional otter trawl was utilized in the Neuse River. It too fished approximately a 10-ft wide area of the bottom, but was only 1.5 ft deep. Mesh size measured 3/4 inch bar with 1/4 inch tail bag. In each case the trawls were towed for 5 minutes at two knots covering approximately 10,126.8 square feet (Figure 2).

Nekton were preserved in 10 percent formalin and returned to the laboratory for analysis. Samples containing a single species with greater than 50 individuals were subsampled. Fifty individuals or 10 percent of the species total, whichever was greater, were randomly selected for analysis. Collections were washed in fresh water, dried on a paper towel, and processed. Samples were sorted, identified to species, counted, weighed to the nearest tenth of a gram, and length taken to the nearest millimeter. Fork length was measured for those fish with forked caudal fins; total length was measured for those without. Total length of shrimp was measured from the tip of the rostrum to the end of the telson, and crabs were measured across the width of the carapace.

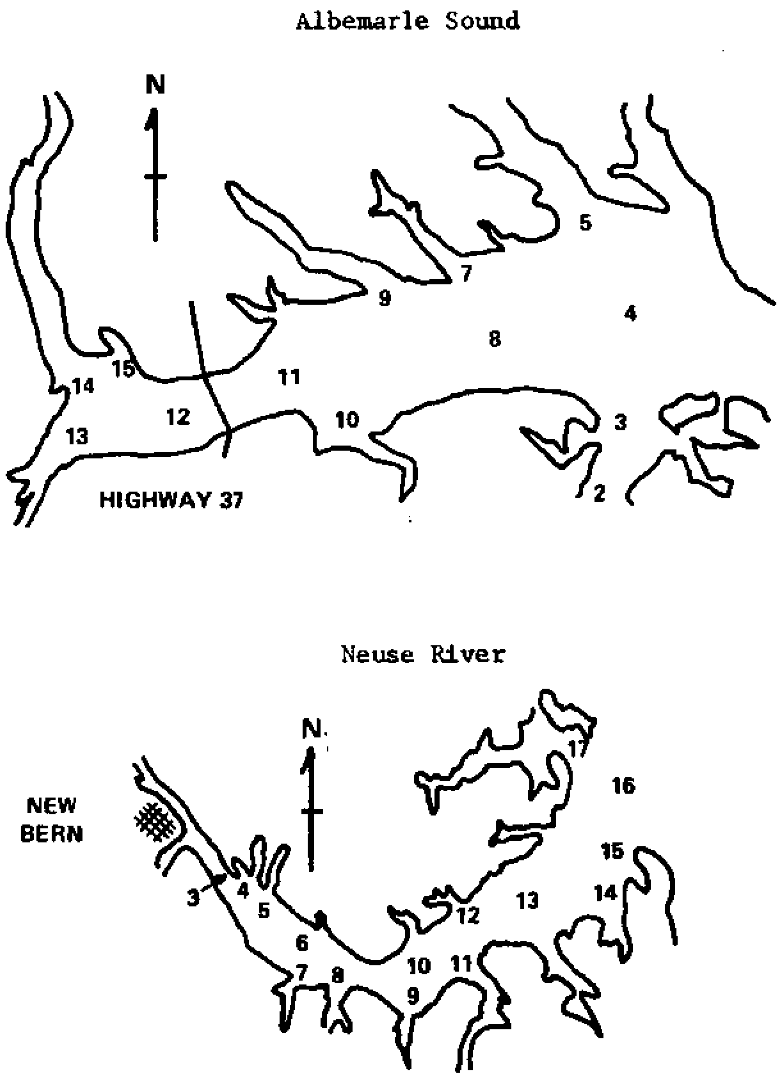


Figure 1. Albemarle Sound and Neuse River estuaries with station locations.

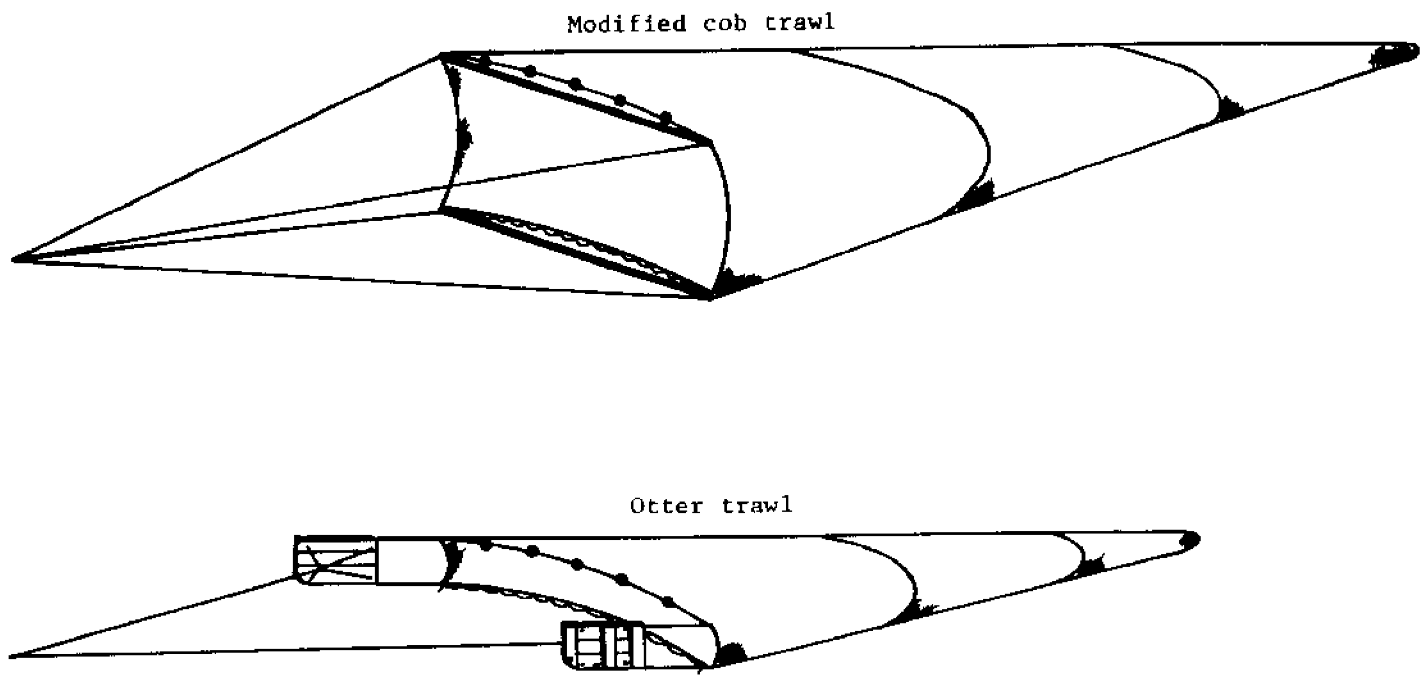


Figure 2. Diagrams showing the modified cob trawl and otter trawl.

A concomitant series of hydrographic measurements were taken including surface and bottom temperatures and salinities, chlorophyll a, nitrogen, phosphorus, and dissolved oxygen. Bottom temperature and salinity tables can be found in Appendix A.

Length-weight regressions were calculated for most of the dominant species and are shown in Appendix B.

The original data are shown in Appendix C.

Species Diversity Indices

Four species diversity indices were calculated to help analyze the data.

1. Shannon-Weaver (1963) Index

$$H' = -\Sigma p_i \log_e p_i$$

where p_i = the proportion of the number of individuals in the i-th species to the total number of individuals.

H' can only be used when the entire population is known, therefore, H'' is used as the "maximum likelihood estimator of the unknown population diversity H'" (Pielou, 1966a).

$$H'' = -\Sigma n_i/n \log_e n_i/n$$

where n_i = the number of individuals in the i-th species and n = the total number of individuals in the sample.

Biomass units were also used with the above index by substituting biomass units for numbers (Wilhm, 1968).

Maximum values are calculated when distribution among several species is even. Few species with a very skewed distribution produce minimum values.

2. Pielou (1966b) Index of "evenness"

$$J = H''/\log_e S$$

where H'' is the Shannon-Weaver Index cited above using numbers of individuals. S = the number of species or maximum value of H''.

J relates the observed diversity with its potential maximum. A value of one is equal to the most even population and a value of zero is equal to the most skewed distribution.

3. "Species richness" Index used by Margalef (1969)

$$D = (S-1)/\log_e N$$

where S = the number of species and N = the number of individuals.

This index weights species number more than total abundance (N) and does not consider the distribution of numbers among species.

Descriptions of the Study Areas

The Albemarle Sound is an oligohaline estuary located in the northeast section of North Carolina. It is 55 miles long by eight miles wide and covers an area of 278,850 acres (Fish, 1968). Eight major rivers—the Roanoke, Chowan, Perquimans, Pasquotank, Little, North, Alligator, and Scupernong—empty into the Albemarle. It also joins the Roanoke and Croatan Sounds which flow into the Atlantic via Oregon Inlet. Although not measured to date, the flushing time is considerable. Tidal amplitude is all but negligible in the western part and greatest in the east closest to the ocean. Winds, however, are the dominant tide-producing factor.

The Neuse River estuary is located in the east-central Coastal Plain of the state in the counties of Craven, Pamlico, and Carteret. The major freshwater source is the Neuse River which drains a watershed of 6,192 square miles, the headwaters of which reach into the Piedmont (Bayless and Smith, 1962). The river estuary officially ends where the Bay River intersects it from the northwest and both flow into the Pamlico Sound.

Water movement into the Pamlico Sound is very sluggish, even imperceptible. The flushing time during the summer months for the 59 kilometers from New Bern to the sound is 26 to 27 days. Being relatively shallow, having a 3-m average near New Bern increasing to a 6-m average at the mouth, the estuary is largely dependent on the winds for its circulation patterns (Woods, 1969).

RESULTS AND DISCUSSION

Albemarle Sound

Dominant Species

Twenty-nine species were collected during 13 months in the estuary (Table 1). Of these three were considered abundant (>1000 individuals collected), five were considered common (>400), two were considered occasional (>100), and 19 were considered rare (<100). The former eight species were classified as dominant within the sound in terms of their contribution to total numbers and/or total biomass.

Anchoa mitchilli, the bay anchovy represented the most numerous species collected in the Albemarle Sound. It is a small fish, rarely more than 100 mm in length, which feeds primarily by straining the water with its numerous, long gill rakers to capture plankters. Anchovies, in turn, provide energy to higher trophic levels via consumption by predatory fish.

Bimodal peaks of abundance are associated with this species (Figure 3). The first occurs in August-September and the second in April-May. Low numbers occur during the late fall and winter months with a trough also occurring through the early summer. Since anchovies are, in fact, planktivores, one would expect their total abundance to closely follow the primary productivity peaks within the estuary. A plot of chlorophyll *a* and anchovy abundance over time does indeed show this to be the case (Figure 3).

Larval and young-of-the-year fish entered the collections in July. Peak juvenile abundance was not reached until September, however, indicative of spawning activity beginning in late May and June and

Table 1. Species collected within the Albemarle Sound.

Species	Number	% of total	Biomass	% of total
Anchoa mitchilli	2094	23.7	1014.4	0.7
Micropogon undulatus	1890	21.4	6821.1	4.7
Morone americana	1320	14.9	54134.0	37.2
Alosa aestivalis	726	8.2	248.6	0.2
Trinectes maculatus	610	7.0	10565.7	7.3
Ictalurus catus	612	6.9	26191.1	18.7
Callinectes sapidus	610	6.9	20008.3	13.8
Leisotomus xanthurus	419	4.7	3456.4	2.4
Anguilla rostrata	156	1.8	7135.7	4.9
Brevoortia tyrannus	142	1.6	278.6	0.2
Alosa psuedoharengus	57	--	--	--
Paralichthys lethostigma	49	--	--	--
Dorosoma cepedianum	21	--	--	--
Ictalurus punctatus	16	--	3863.5	2.7
Etheostoma olhmsteadi	16	--	--	--
Ictalurus nebulosus	13	--	1552.3	1.1
Perca flavescens	13	--	--	--
Lepomis gibbosus	8	--	--	--
Opisthonema oglinum	3	--	--	--
Penaeus aztecus	4	--	--	--
Rithropanopeus harrissi	4	--	--	--
Cynoscion regalis	2	--	--	--
Palaemonetes pugio	2	--	--	--
Bairdella chrysura	1	--	--	--
Amia calva	1	--	--	--
Symphurus plagiusa	1	--	--	--
Notropis sp.	1	--	--	--
Paralichthys dentatus	1	--	--	--
Lepisosteus osseus	1	--	--	--

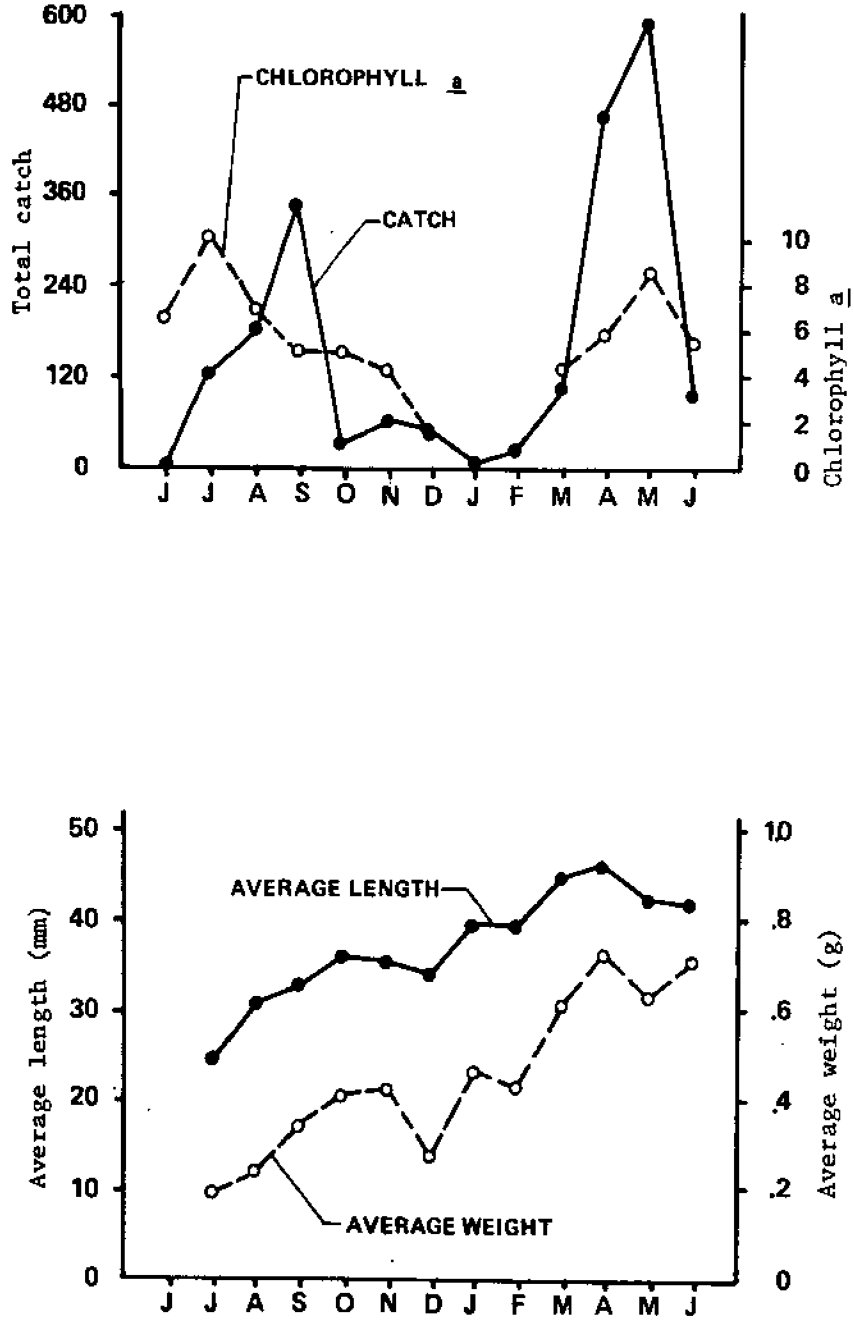


Figure 3. *Anchoa mitchilli*. Total catch and chlorophyll a. Average length and weight.

extending through August with a midsummer maximum intensity. This cycle is quite similar to the one found in the Newport River, North Carolina, by Turner and Johnson (1973).

Average length and average weight were lowest in July due to the increased catch of young-of-the-year fish (Figure 3). Both parameters increase from the low point in July through the following June. This trend is directly attributable to the growth of the 1972 year class over time. It is also indicative of the utilization of, and dependence upon, the estuary as a food source by this species.

Although absent from collections in June 1972, A. mitchilli is considered a year-round resident of the estuary since it was collected in June of the following year. At some point in time anchovies were taken at every sampling station. From December through March, however, anchovies entered into only the east sound collections in low numbers. This seasonal pattern is characteristic of a winter migration into more saline waters, probably into the Roanoke and Croatan Sounds. Emigration also coincides with decreased primary productivity in the sound.

A distinct seasonal pattern is also clearly illustrated by the catch of Micropogon undulatus, the Atlantic croaker (Figure 4). This species exhibited peak populations in August and again in May-June. The June 1973 peak is considered to be more illustrative than the previous June's collection since data for the months prior to June 1973 are available. Peak abundance in 1972 may have occurred in May and, therefore, would not have been recorded. Although croakers were taken during all months of the year, very low numbers were recorded from September through April.

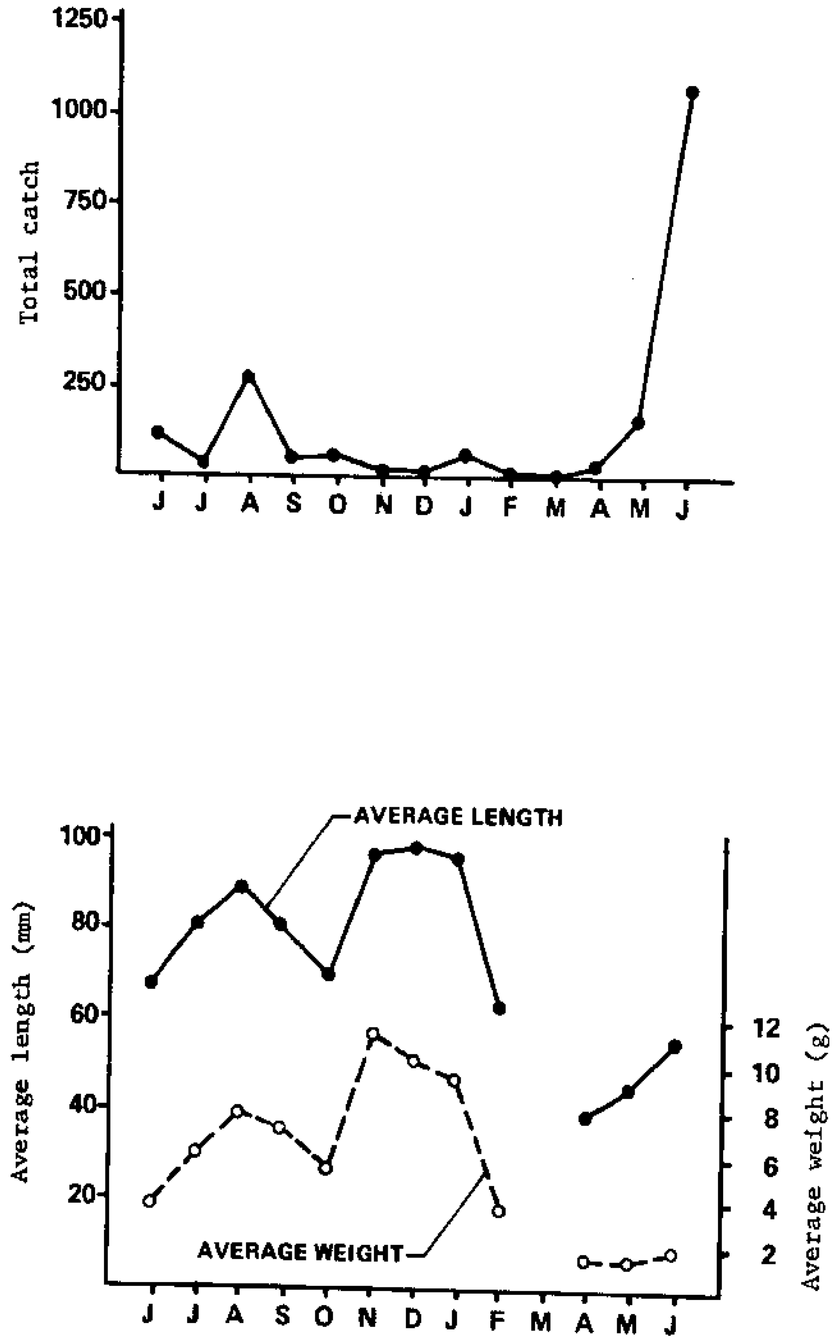


Figure 4. Micropogon undulatus. Total catch and average length and weight of juveniles (<126 mm).

Juveniles (<126 mm, length chosen by the author from field observations) were present in collections every month but March, corroborative of an extended spawning season as recognized in the literature (Welsh and Breder, 1923; Massmann and Pacheco, 1960). The extended spawning season for this species is also reflected in Figure 4, which depicts juvenile growth. Considerable fluctuation in average length and average weight was noted, probably a response of juvenile influx throughout the year. The very low averages recorded in April, May, and June are, nevertheless, predictive of a peak spawning season during February and March. Evidence suggests croakers spawn as late as January off the South Carolina coast (Bearden, 1964) lending credence to these estimates. Further examination of these data reveal an increasing growth trend from April through January which translates into an energy transfer to the juvenile fish from the estuary and also points to the dependence of the former on the latter.

Croakers were collected at every station. Over the winter months, however, they were predominantly east sound organisms reflecting emigration out of the sound into the more saline waters farther east.

Morone americana, the white perch, may be considered the dominant nekton species sampled in the western part, if not the entire Albemarle Sound, in terms of both numbers and biomass. It is a serranid of moderate size reaching a length of 200 mm in some samples.

White perch population fluctuations produce bimodal peaks of both numbers and biomass which occur in August and January-February (Figure 5). These peaks do not represent an influx of young-of-the-year fish but seem to reflect a migratory pattern. If one omits September, a trend of increasing numbers and biomass is evident, beginning in August

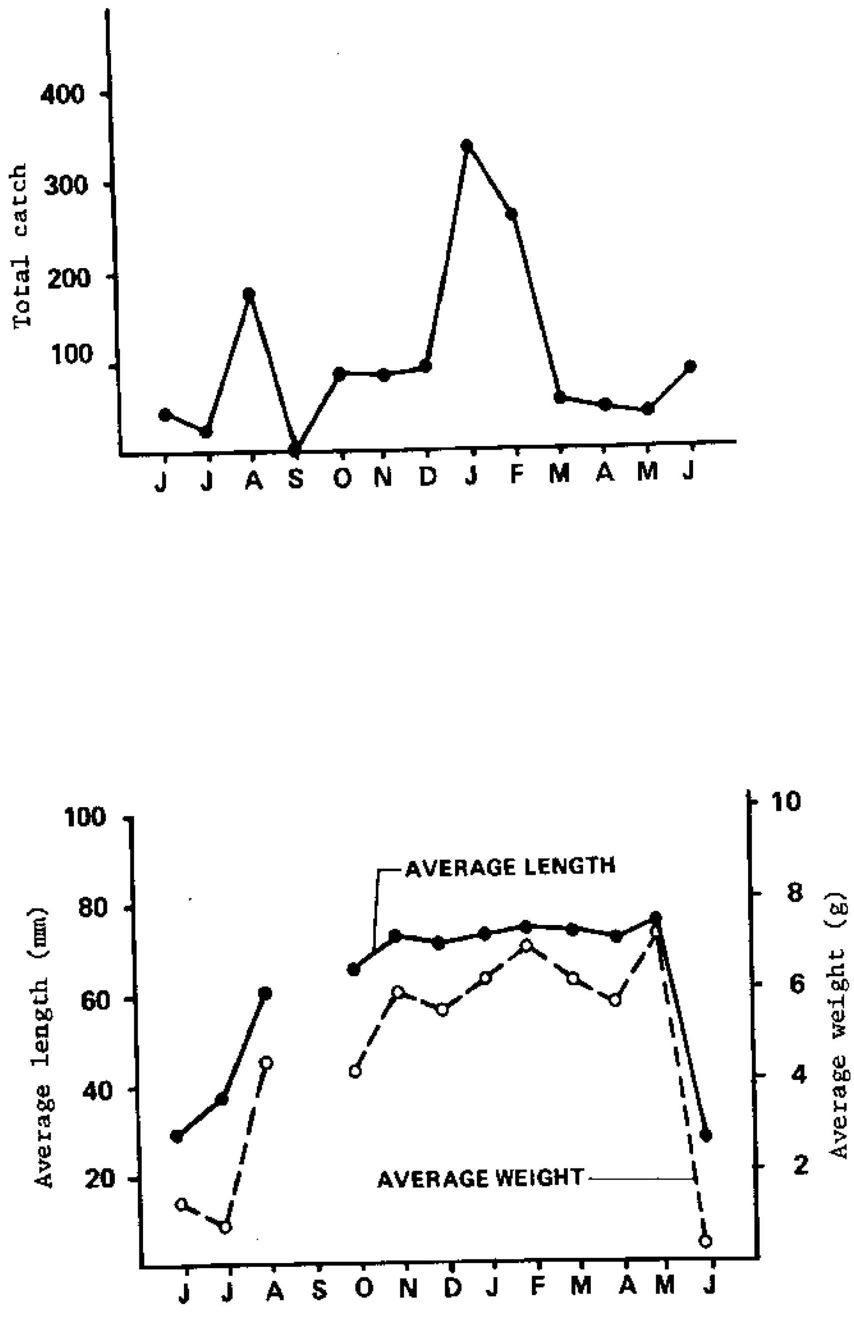


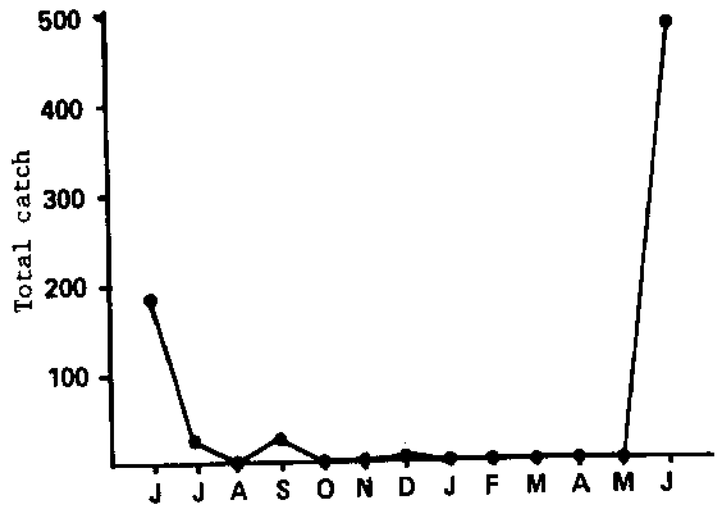
Figure 5. Morone americana. Total catch and average length and weight of juveniles (<101 mm).

and extending through February. Young-of-the-year fish enter into the collections in June, July, and August with a June peak. It seems reasonable, therefore, to hypothesize that white perch migrate into the rivers to spawn during spring and summer. According to water temperatures at time of spawning (Conover, 1958), spawning probably began in March and extended into May 1973. Eggs were collected by Street and Pate (1974) from 10 April through 7 May. Post-spawning migration down the rivers and into the sound accounts for the increasing trend through the winter.

Although a year-round resident of the Albemarle Sound and found throughout the estuary during population peaks, the white perch inhabits predominantly the western sound, particularly the northwest. From December through April, white perch were taken throughout the sound, while over the remainder of the year only rarely were fish taken in the east.

Growth data indicate that the estuary provides nursery grounds for juveniles [<101 mm, length chosen to conservatively include the first-year class according to Conover (1958)]. Average weight and average length increase over time beginning in June as energy is assimilated by the young fish (Figure 5). Low temperatures may cause the slower growth observed over winter.

Only juveniles of the blueback herring, *Alosa aestivalis*, were collected during the study. These young planktivores and favorite prey of the striped bass (Manooch, 1972) migrate from the freshwater spawning streams and enter the Albemarle Sound estuary in June (Figure 6). Marked seasonality is apparent in the catch data reflecting the anadromous behavior of the species. Peak abundance seems to have occurred in June of 1972 and 1973 pointing to a May or earlier spawning



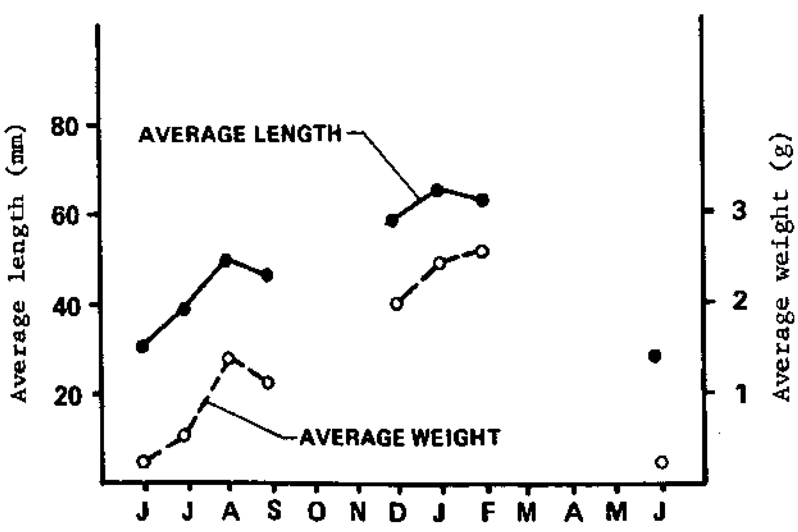


Figure 6. Alosa aestivalis. Total catch and average length and weight.

peak. Blueback spawning began the week of March 11-17 and continued through May 19 with an April peak (Street and Pate, 1974). By October most bluebacks have migrated out of the sound, although very low numbers were collected through February indicating that some part of the population over-winters in the estuary, emigrating the following spring.

The average length and average weight data substantiate growth occurring throughout this early period of life spent within the estuary and once more point out the vital nursery function of the Albemarle Sound (Figure 6).

Alosa aestivalis were collected throughout the sound as a result of juvenile migration down the rivers, through the estuary, and finally into the ocean.

The hogchoker, Trinectes maculatus, a small flatfish, is indigenous to the Albemarle Sound. It was collected during all months of the year and was taken at each sampling station. Relatively high numbers occurred throughout the year except during the late fall and winter months (Figure 7).

Growth data are inconclusive although an increase in average length from September through February may be due to the growth of juveniles or possibly to the migration of juveniles up the various rivers to fresher waters (Figure 7).

The spatial distribution pattern shows no particular movement within the sound itself. This is not inconsistent with the above hypothesis since major rivers empty into the Albemarle in all parts of the sound.

Ictalurus catus, the white catfish, was collected during all months sampled. Although caught throughout the estuary, its spatial distribution pattern shows it to be primarily a western sound species.

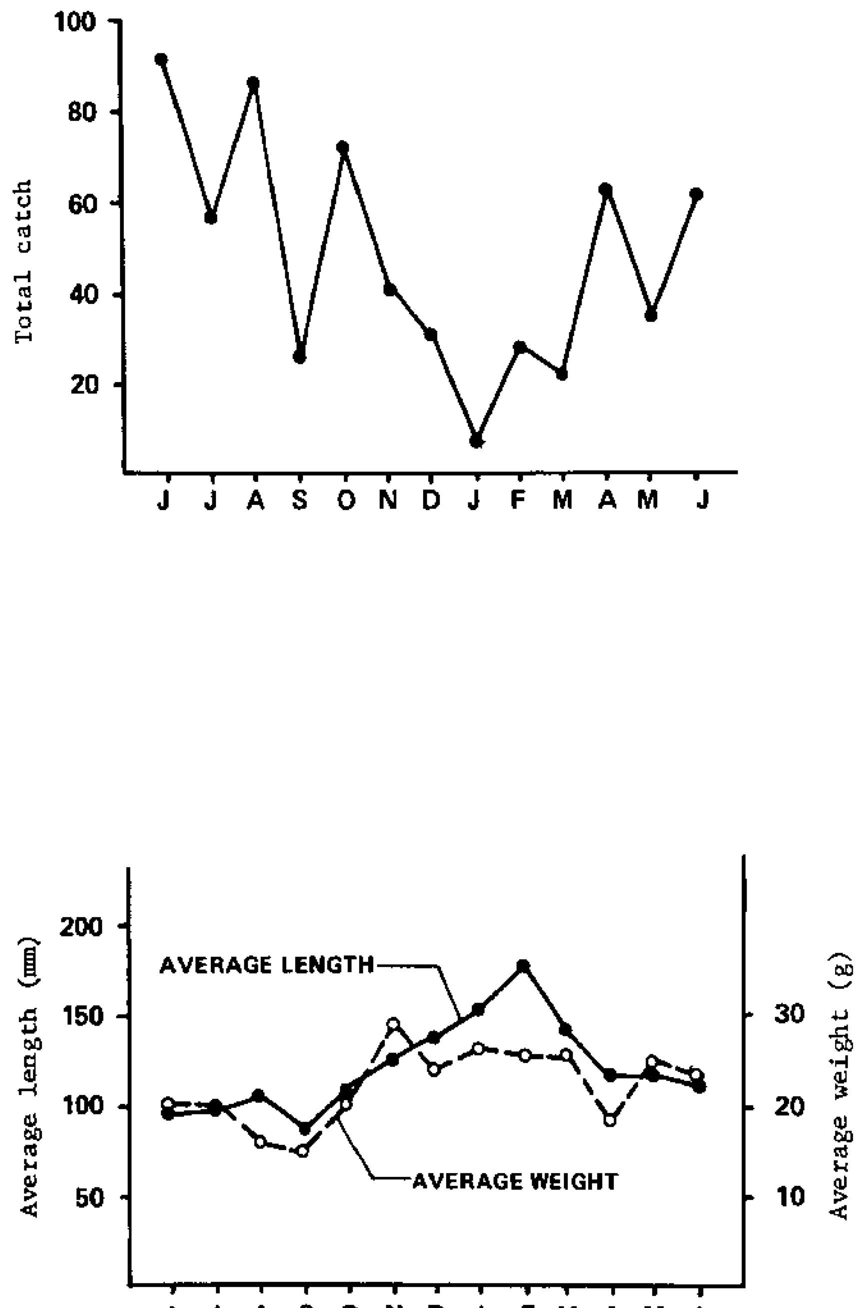
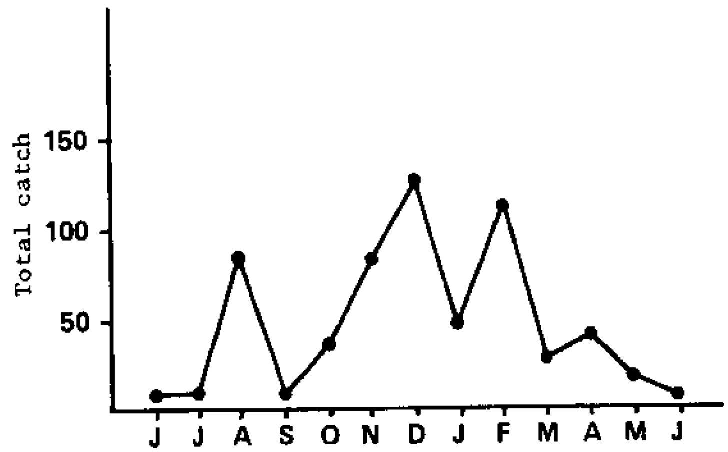


Figure 7. *Trinectes maculatus*. Total catch and average length and weight.

A trend of increasing numbers and biomass was observed from August through December, then decreasing to June (Figure 8). Juvenile (<151 mm, length chosen by author) fish are found in the sound during all seasons. Average length and average weight data for juveniles (Figure 8) show no apparent trends.

The above data concerning juvenile fish may indicate either an extended spawning season or a prolonged growth period spent in the rivers prior to moving into the sound. Since larger fish apparently leave the estuary in early spring and do not return until August, migration to spawn seems to be the logical explanation. A related species, Ictalurus punctatus, has been shown to migrate from the Chowan River into the Albemarle Sound (Mauney, 1969). If one considers that late juveniles (spawned in late July or August) would have only a few months of rapid growth prior to cold temperatures, and that juveniles remain for a period of time in the rivers, a logical sequence may be deduced. Adults migrate up river in late winter and early spring to spawn. Spawning activity continues through the summer. Juveniles remain in the rivers for a time and then move into the sound proper. The year-round presence of juveniles is due to late hatchers over-wintering in the rivers and entering the estuaries the following spring.

Abundance data show Callinectes sapidus, the blue crab, exhibits distinct seasonal fluctuations (Figure 9). A winter minimum recorded in January is followed by increasing numbers peaking in late summer and early fall. Winter minimums correspond with migration toward more saline waters, particularly inlets, to spawn in the early spring (Turner and Johnson, 1973). Following the spawning run, the adults and juveniles immigrate into the Albemarle Sound causing the population increase evident through October.



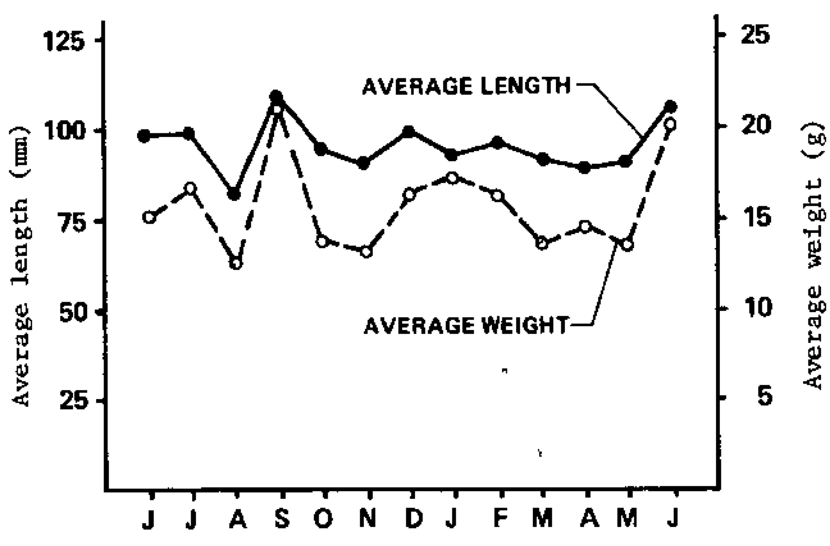


Figure 8. Ictalurus catus. Total catch and average length and weight of juveniles (<151 mm).

Spatial distribution also tends to corroborate the above migratory pattern. During the winter and early spring months, blue crabs are generally found in the eastern sound, rarely beyond Station 10, coincidental with eastward emigration. In late spring, summer, and fall, crabs move throughout the entire sound, even to Stations 14 and 15 in July, as the westward immigration is in progress.

The seasonal pattern of Leiostomus xanthurus, the spot, is equally as evident. Present only during spring and summer, spots enter the estuary in May and remain in collections through October. Abundance peaks (Figure 10) occur in August and again in May-June.

The vast majority of these fish are juveniles (<126 mm, length chosen by author) which utilize available energy within the sound to grow. Examination of the average length and average weight data over time is illustrative of a clear increase in both while the species is present in the Albemarle Sound (Figure 10). These data also point to a spawning peak occurring in April or earlier. After October, spots apparently emigrate offshore to spawn (Turner and Johnson, 1973).

Numbers and Biomass

Seasonal fluctuations of both numbers and biomass are quite evident (Figure 11). These fluctuations are more easily visualized when one recognizes that three nekton populations within two locations exist in the Albemarle Sound. The estuary can be conveniently divided into east and west locations in terms of salinity. West of the Highway 37 bridge salinity is 0.0 ppt. Only once was anything other than freshwater recorded. East of the bridge salinities ranged from 0.0 ppt to 2.9 ppt. Qualitative data show that the fish populations

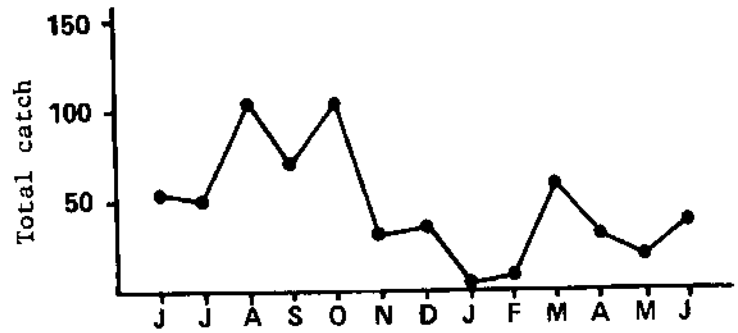


Figure 9. Callinectes sapidus. Total catch.

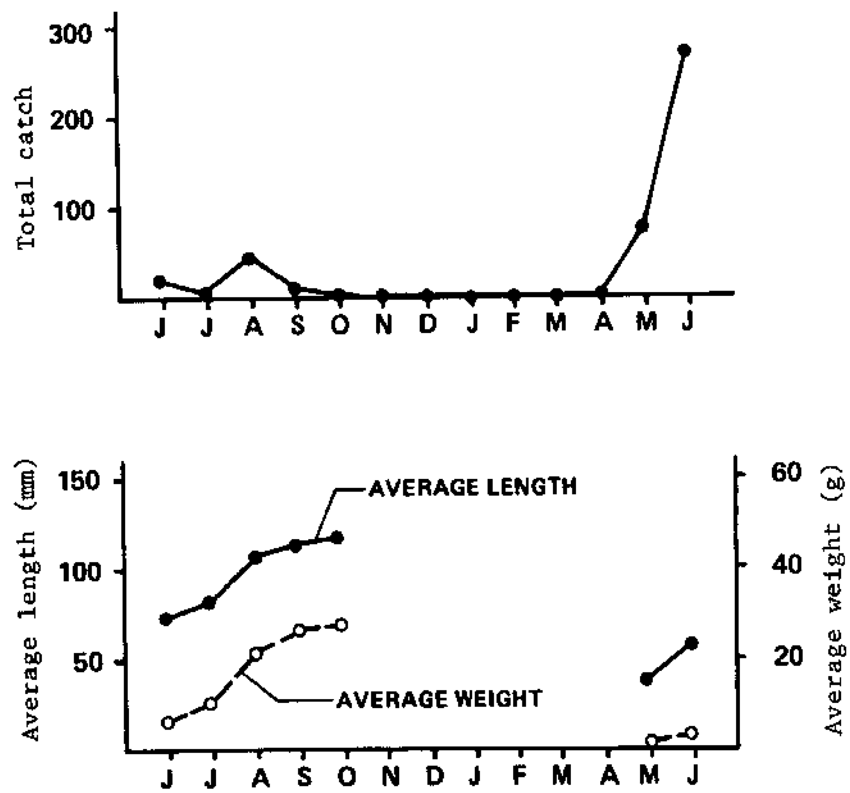
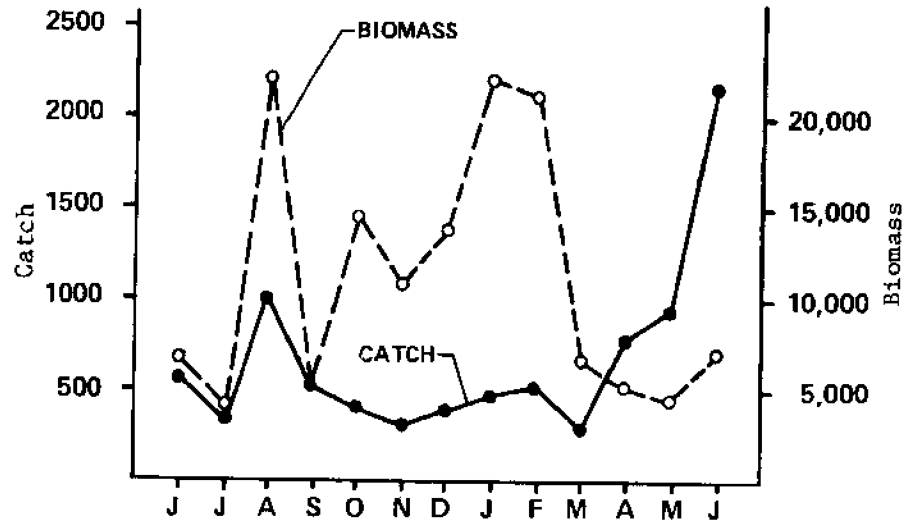


Figure 10. Leiostomus xanthurus. Total catch and average length and weight of juveniles (<126 mm).



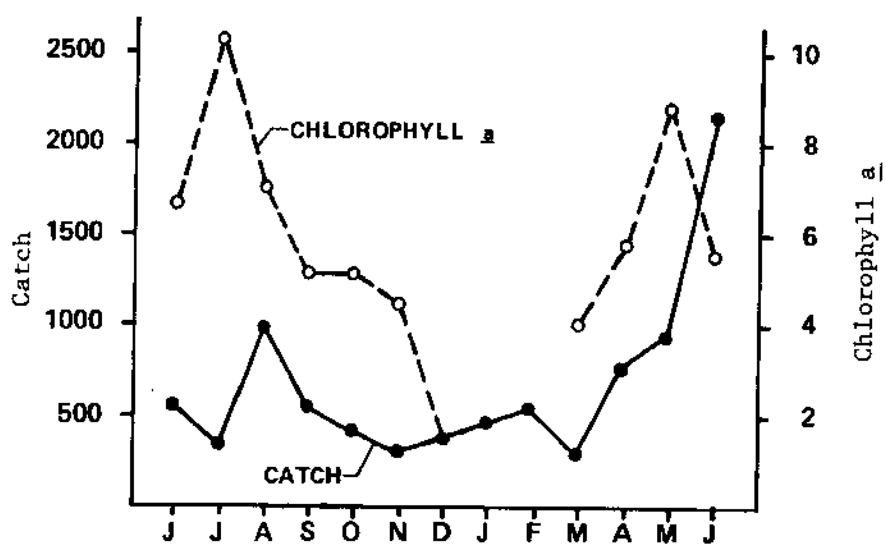


Figure 11. Albemarle Sound. Catch and biomass. Catch and chlorophyll a.

which inhabit each location are distinguishable. Only one quantitative measurement (biomass), however, was significant between locations.

The three nekton populations must first be characterized to understand the qualitative differences involved. The first one is the indigenous population. It is located primarily in the western sound and rivers; is found throughout the year; and moves between the sound and river to reproduce. This population is composed of relatively large fish which are identified as freshwater or oligohaline species including M. americana, I. catus, I. nebulosus, I. punctatus, and Dorosoma cepedianum. Population peaks are reached during the winter months and it is only during this time that a few individuals are collected in the east. These eastern sound collections are due to the random movement of individuals into the more saline waters of the east as a result of the high numbers in the west or possibly due to movement out of the freshwater tributaries which empty into the eastern Albemarle. Generally, these species prefer freshwater (Figure 12).

Second, the migratory population inhabits the eastern sound on a seasonal basis. In general, juveniles immigrate into the estuary in spring and early summer, remain through the summer months, and exit in the fall. Juveniles are found within the estuary when primary productivity is highest and exit during poorer times, leading one to conclude that the migratory population utilizes the sound primarily as a nursery area. Members of this population are more often associated with salt water than with an oligohaline system. The major migratory species include L. xanthurus, M. undulatus, A. mitchilli, T. maculatus, C. sapidus, and B. tyrannus.

The third recognizable population is, of course, the anadromous population composed of A. aestivalis, A. psuedoharengus, and M.

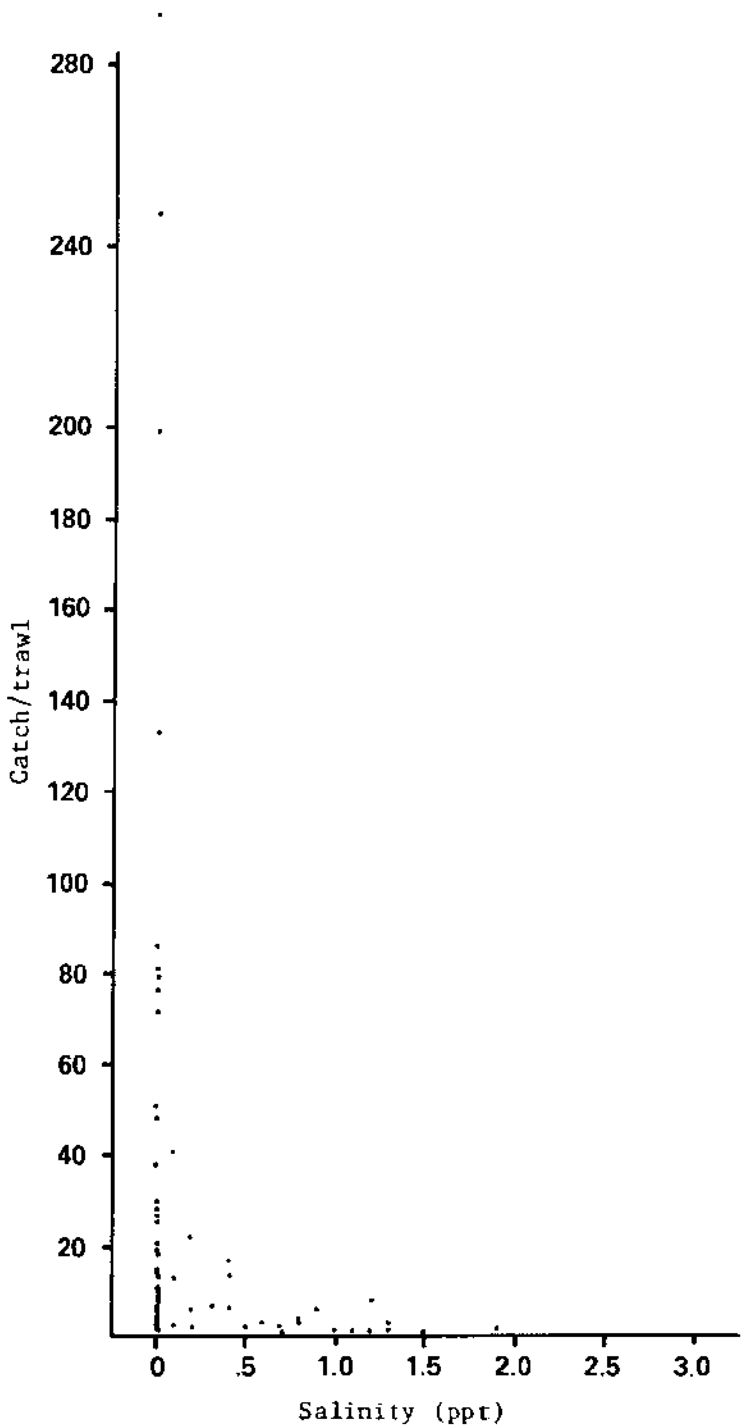


Figure 12. Indigenous catch versus salinity in the Albemarle Sound.

saxatilis. This population can be identified in that it migrates through the estuary into freshwater streams to spawn. Juveniles move down the rivers and into the estuary in June, remain through the summer, and emigrate in the fall, once again pointing to the nursery role of the sound. Because of their anadromous nature, they are associated neither with the eastern nor western part of the sound and are collected throughout.

Biomass peaks were recorded in August and January-February while numbers peak in August and March-April-May. The coincidental August maxima resulted from simultaneous processes occurring in two locations within the Albemarle Sound. The western part, Stations 12-15, was primarily responsible for the increase in biomass and numbers of the sound as a whole as a direct result of August peaks of M. americana and I. catus. These two fish dominated the indigenous population. Concomitantly, increases in several migratory species also took place in the east including A. mitchilli, M. undulatus, L. xanthurus, T. maculatus. This eastern population increase, however, accounted for a relatively small percentage of the total.

The winter biomass maximum was tied directly to the reproductive and migratory behavior of the western sound dominants, M. americana and I. catus. Population peaks of both occurred during winter months just prior to moving up the rivers to spawn. Being relatively large species, a biomass peak was reached without a parallel peak in numbers This phenomena was also a result of the emigration of most anadromous and migratory fish during late fall, decreasing total numbers throughout the sound. The size differences inherent in the three population discussed also accounts for the significant difference in biomass between the two locations mentioned previously (Figure 13).

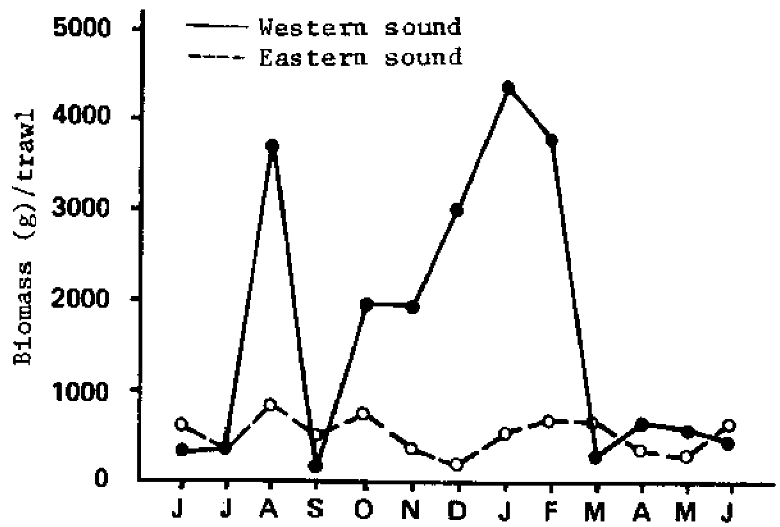


Figure 13. Biomass/trawl in two areas within the Albemarle Sound.

The large population increases noted in April, May, and June are immediately preceded by primary productivity increases in March, April, and May indicative of migratory and reproductive patterns which are keyed to the primary productivity pulse in the estuary (Figure 11). The population increase actually began in the eastern sound in February as juveniles of the migratory species C. sapidus, B. tyrannus, M. undulatus, and L. xanthurus, along with some adults, entered the estuary from the east. By April-May, large numbers of migratory organisms had entered the eastern sound. Coincidentally in June, juveniles of A. mitchilli entered the eastern sound catch while juveniles of the anadromous species A. aestivalis and A. psuedoharengus entered into the catch, primarily in the western sound.

The numbers maximum, then, was mostly the result of juvenile fish entering the estuary in spring and early summer in association with a primary productivity peak. Juveniles accounted for little biomass and, therefore, biomass remained low during this period. While fluctuations within the eastern sound were due primarily to anadromous and migratory species whose reproductive cycle seems keyed to the spring and late summer energy peaks within the sound, the pattern in the western sound was due primarily to indigenous species and was tied to the reproductive cycle. Adults of these local species, however, were unable to move eastward out of the estuary into more saline water during periods of low productivity. Movement, therefore, had to take place between river and sound. Migration into the rivers to spawn during the spring and summer has its adaptive advantages. Salinity within the river remains constant and is not subject to the fluctuation which can occur within the sound. Eggs and juveniles, then, are able to begin life in a relatively constant environment without having to overcome salinity stress. Also, by hatching in the rivers and spending at least the first few days there, juveniles do not have to compete with the other sound organisms during the first critical period of life. The late fall, winter population increases noted within the sound may be due to migration from the rivers to a relatively more productive Albemarle Sound.

The discussion above has demonstrated the existence of three populations interacting within one body of water. Upon further analysis it seems clear that the life cycles of the populations in terms of their reproductive and migratory patterns are coordinated so as to maximize habitat exploitation. Spawning occurs in different areas at different times. Some species may spawn in the river tributaries, others in adjacent mesohaline estuaries, others at the mouths of inlets, and still others at sea. Nevertheless, subsequent migrations introduce the various populations into the Albemarle Sound (Figure 14). Juveniles of the migratory population enter collections in early spring from more saline waters. Anadromous species enter the sound in June from the freshwater tributaries. As these two populations emigrate during the fall, the indigenous population begins its immigration peaking over winter.

A closer examination of the eastern and western parts of the sound helps to further explain this phenomena. The hydrographic features which characterize the Albemarle Sound make it unique among estuaries. The combined freshwater input of eight major river systems together with only limited access to the sea via an inlet through barrier islands produce an extensive oligohaline estuary whose flushing time is considerable. Productivity is high as a result of the "nutrient trap"

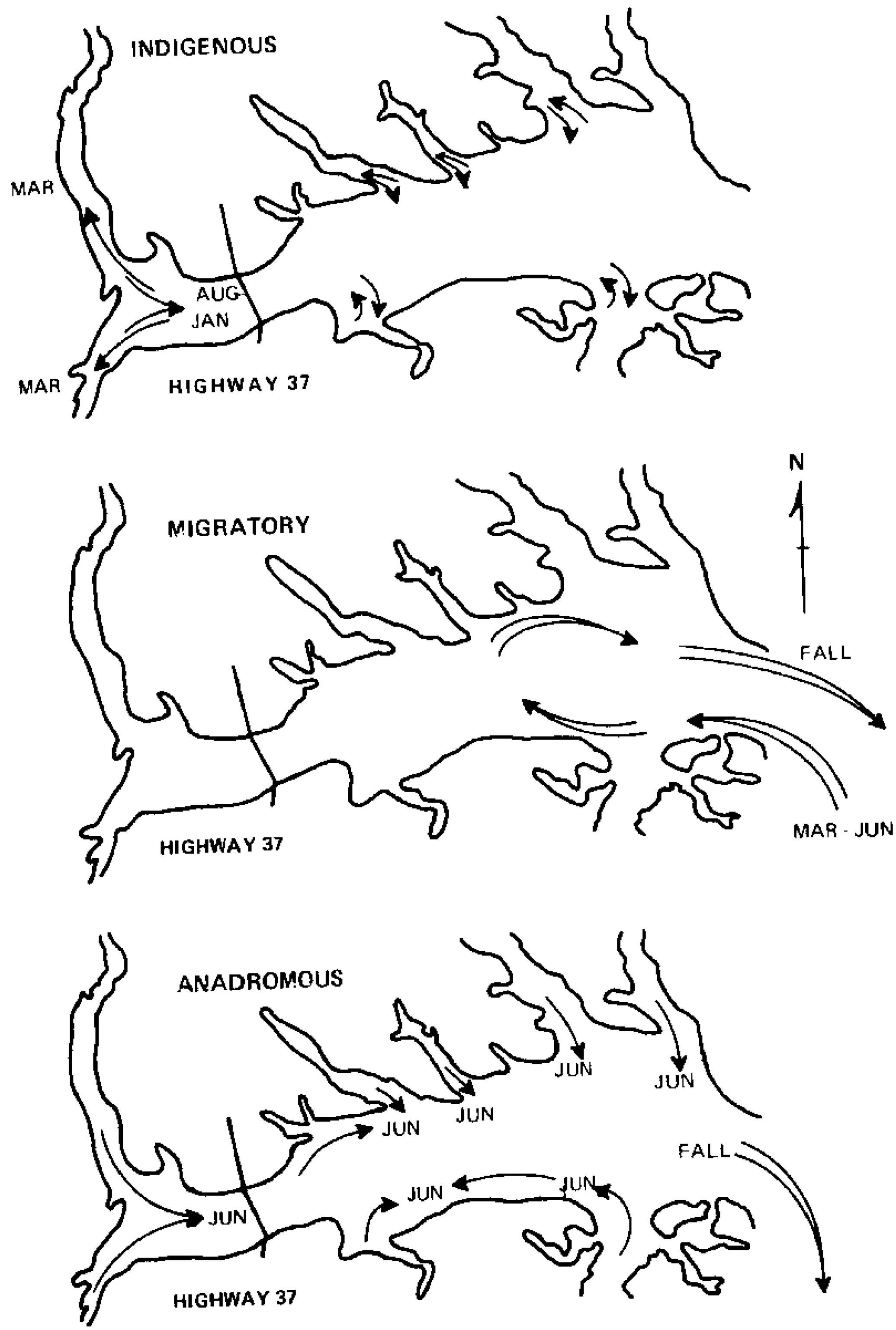


Figure 14. Diagrams showing seasonal movement of three populations within the Albemarle Sound.

created. Importantly, salinity fluctuations are considerably dampened because of the limited oceanic interchange, maintaining the salinity regime in a relatively constant state not found in other estuaries. Therefore, the indigenous population, which otherwise would be unable to utilize the estuary because of violent salinity fluctuations, has been able to successfully exploit the western Albemarle Sound. The eastern sound retains the typical oligohaline features. The effect is two systems within one body of water.

A further breakdown of numbers and biomass into eastern and western collections demonstrates the division more clearly (Figures 15 and 16) (extremely low values indistinguishable from zero were considered to be zero to improve clarity). A single population dominates each region with very little contribution by other populations with the exception of June in both years when the anadromous population entered into the collections.

Biomass follows a like pattern with the exception of January, February, and March in the eastern Albemarle when the larger size of the indigenous population overshadows the otherwise dominant migratory population during a period when it is represented by only a few young-of-the-year fish. The anadromous population is hardly detectable in terms of its biomass.

These biomass data represent the change in the three populations per trawl haul over time. As such they are the best estimate of productivity I am able to show. However, productivity estimates are extremely hazardous given the limitations involved: Trawl bias toward small, demersal, slow moving nekton; inherent heterogeneity in nekton populations over an area; only the open water habitat was sampled; habitat variation throughout the sound; and the relatively small number

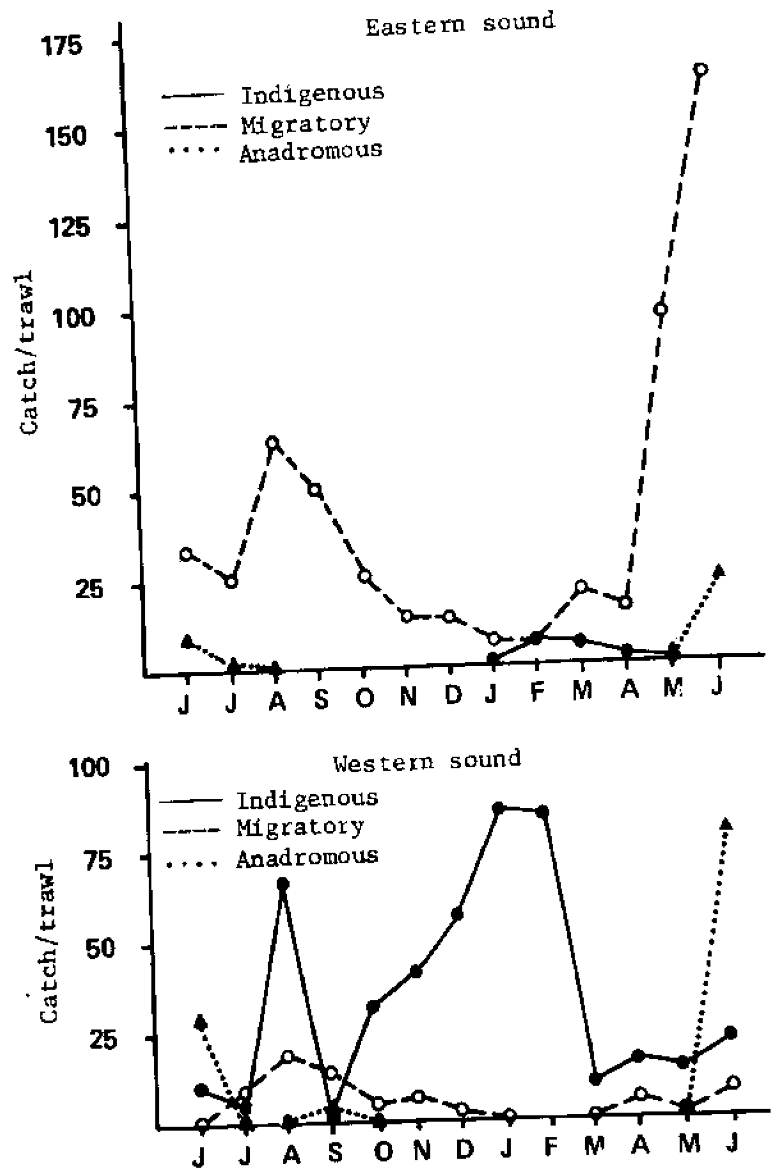


Figure 15. Catch/trawl for each population in two areas within the Albemarle Sound.

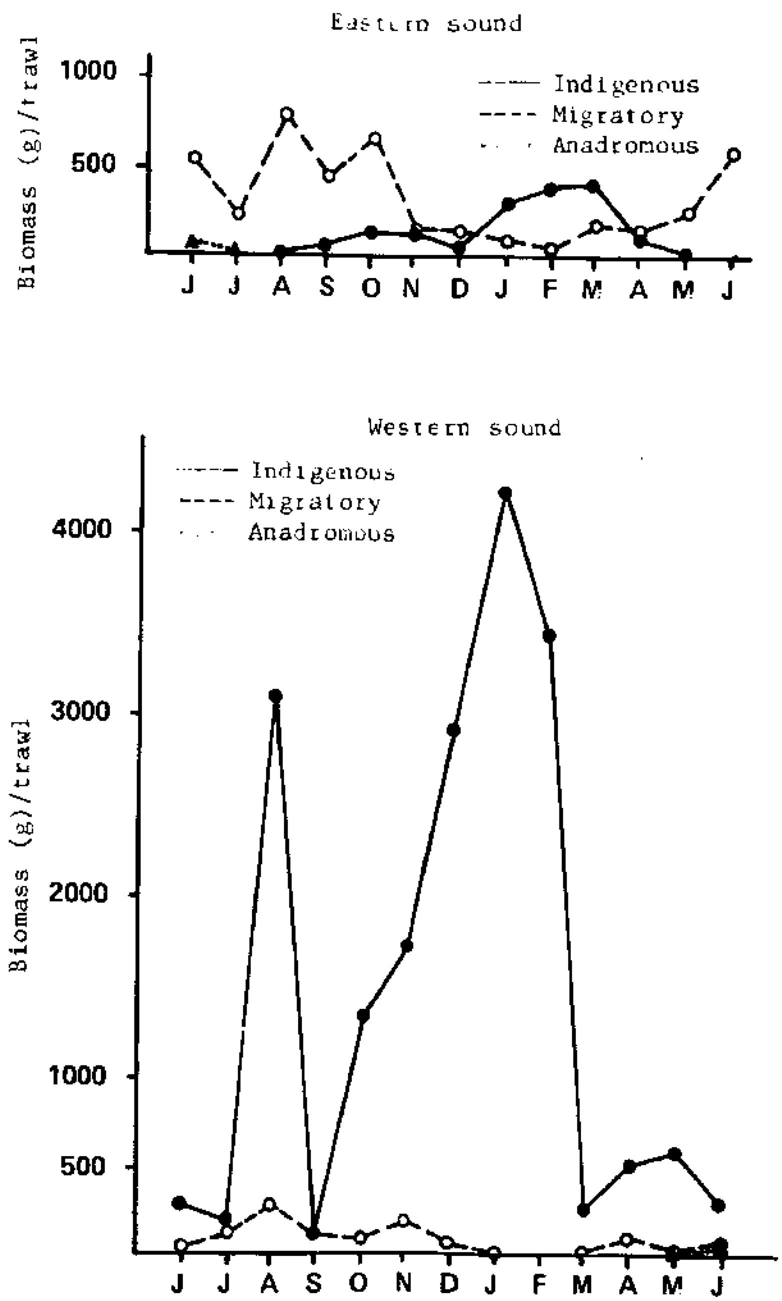


Figure 16. Biomass/trawl for each population in two areas within the Albemarle Sound.

of sites sampled given the size of the estuary. Productivity estimates calculated from these data might best be thought of as a relative index to the total productivity of the system.

Species Diversity Indices

Whereas seasonal fluctuation is characteristic of the Albemarle Sound, only one diversity index appears to reflect this phenomena (Table 2). However, examination of each index reveals complex interactions which occur simultaneously and account for these results.

Table 2. Analysis of variance of effects of location, month, and season on seven parameters calculated from data collected in the Albemarle Sound.

Parameters	F values		
	Location	Month	Season
Numbers	0.01276	5.31185**	5.98962**
Biomass	19.06452**	1.49519	3.03798*
Number of species	0.20499	2.86978**	2.88525*
H'' numbers	0.65482	1.42186	1.39260
H'' biomass	0.21668	2.82931**	5.46573**
D	0.09694	1.14400	0.61200
J	0.30278	0.92756	0.81054

*Significant 95% level; **significant 99% level.

The Shannon-Weaver Index, "H''", was calculated to examine the relative abundance among species (H'' numbers) and the relative distribution of biomass among species (H'' biomass). No seasonal fluctuation in "H'' numbers" is evident within the Albemarle (Figure 17). Although nekton populations certainly change, the coincidental immigration and emigration of species merely shifts the relative distribution among various species. Western sound species, eastern sound species, and anadromous species, in turn, dominate the nekton during different seasons of the year. When one group of species moves out of the estuary, they are replaced by others maintaining a relatively constant "H'' numbers" value.

The actual values of "H'' numbers" are quite low reflecting a skewed distribution where a few species contribute most of the numbers in response to the stresses characteristic of the estuarine environment. Rapid fluctuations of temperature, salinity, dissolved oxygen, available food, and turbidity limit the species of nekton able to use the estuary. Since few species are able to tolerate the entire gambit of seasonal changes, seasonal immigration during periods of more favorable conditions are evident.

The relative distribution of biomass among species (H'' biomass) fluctuates with season. Low values are recorded in fall and winter in response to the immigration of the relatively larger western sound species. Most of the biomass is contributed by only two species, M. americana and I. catus, and diversity values are very low. Emigration of these species by spring coupled with the immigration of eastern sound and anadromous species in spring and summer provides for a more equitable biomass distribution and higher diversity values (Figure 17).

No trend is discernible using the relative species abundance or "evenness" index, "J". While species certainly move in and out of the estuary, it was not detectable with this index due to a readjustment by other species. Therefore, the distribution over species remained unchanged.

Further evidence suggesting replacement of species is provided by the "species richness" index, "D". "D" relates the total number of species to the total catch and weighs each species equally. This index did not produce any recognizable seasonal trend either. Since seasonal activity is known to occur within the Albemarle Sound, this result clearly shows species replacement taking place. Various species utilize the estuary during different seasons depending on each species' niche adaptation. Consistent with this analysis, the average number of species over three seasons remained approximately the same (Figure 18). Only the summer months showed a higher number of species, but this was coupled with very high numbers maintaining a constant "D" value.

Species replacement and the response of the nekton community to the changing conditions within the Albemarle Sound produce a "stable" population as reflected by the diversity indices calculated. This "stable" population, however, is a function of dynamic processes occurring throughout the estuary over time involving numerous species. Therefore, populations remain high throughout the year and energy utilization is optimized.

Neuse River Estuary

Dominant Species

Thirty-three species were collected in the Neuse River estuary. Of these, three species were considered abundant, none were considered common, one species was considered occasional, and the remainder were considered rare (Table 3). The three most numerous species were classified as dominants in terms of numbers. The single occasional species was also considered dominant. While certainly not numerous, its contribution to total biomass necessitated its inclusion.

Populations of *L. xanthurus*, the spot, within the Neuse River exhibit a marked seasonality (Figure 19). Only in spring and early

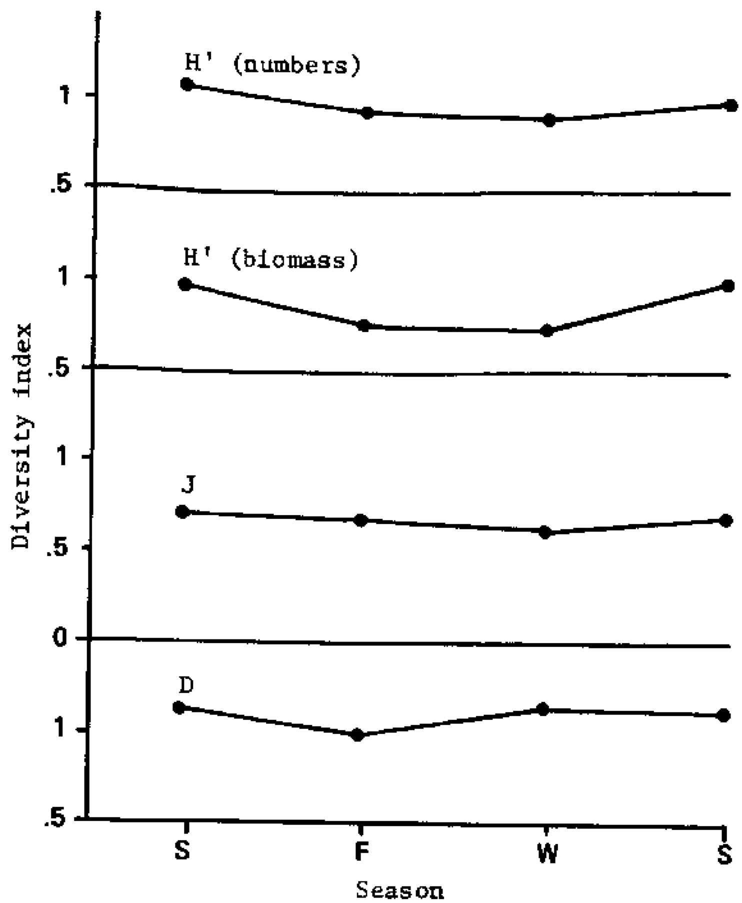


Figure 17. Species diversity indices over season in the Albemarle Sound.

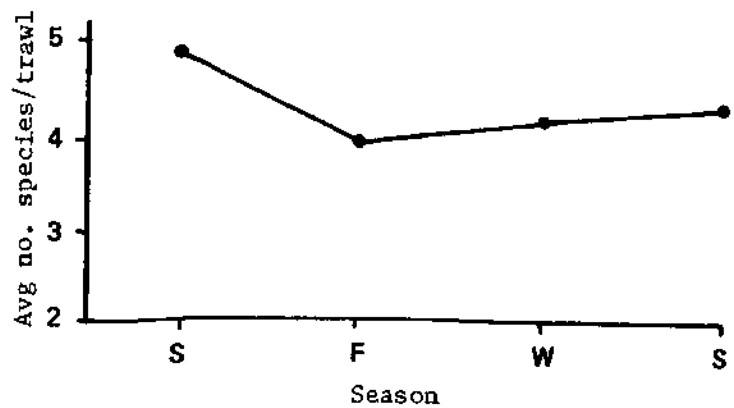
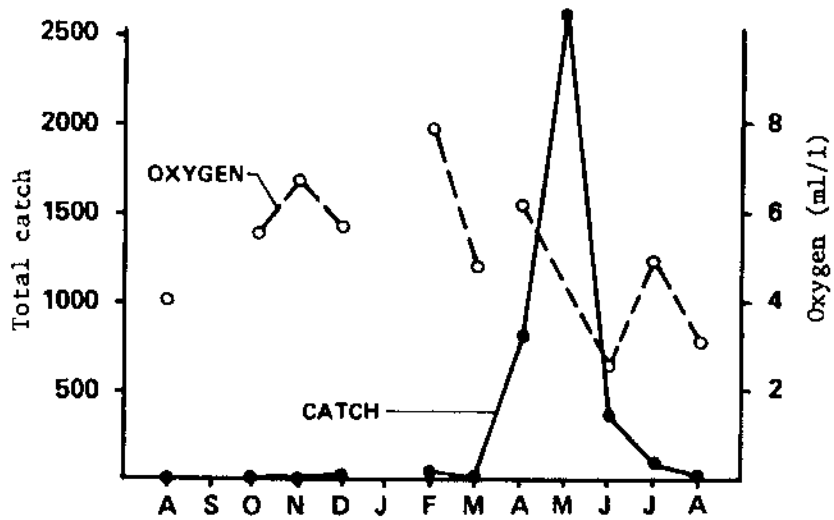


Figure 18. Average number of species/trawl over season in the Albemarle Sound.

Table 3. Species collected within the Neuse River estuary.

Species	Number	% of total	Biomass	% of total
Micropogon undulatus	4128	37.1	23319.6	41.6
Leisotomus xanthurus	3938	35.4	10652.5	19.0
Anchoa mitchilli	2349	21.1	1970.9	3.5
Callinectes sapidus	249	2.2	14147.9	25.2
Panaeus aztecus	74	--	865.8	1.5
Palaemonetes pugio	74	--	16.7	--
Penaeus duorarum	72	--	491.6	--
Trinectes maculatus	45	--	502.4	--
Cynoscion regalis	44	--	697.4	1.2
Brevoortia tyrannus	44	--	585.9	1.0
Alosa psuedoharengus	18	--	115.7	--
Panaeus setiferus	18	--	86.1	--
Paralichthys lethostigma	13	--	768.7	1.4
Opisthonema oglinum	8	--	76.5	--
Mugil cephalus	6	--	240.4	--
Callinectes similis	6	--	45.6	--
Symphurus plagiusa	5	--	79.4	--
Lagodon rhomboides	4	--	66.0	--
Peprilus alepidotus	4	--	19.2	--
Anguilla rostrata	4	--	630.4	1.1
Palaemonetes vulgaris	4	--	--	--
Rithropanopeus harrisii	4	--	--	--
Bairdella chrysura	3	--	50.2	--
Pomatomas saltatrix	2	--	392.8	--
Eucinostomus argenteus	2	--	--	--
Sygnathus fuscus	2	--	--	--
Sciaenops ocellata	2	--	--	--
Urophycis chuss	2	--	110.9	--
Urophycis regius	1	--	--	--
Monocanthus hispidus	2	--	96.3	--
Morone americana	1	--	--	--
Lepomis gibbosus	1	--	--	--



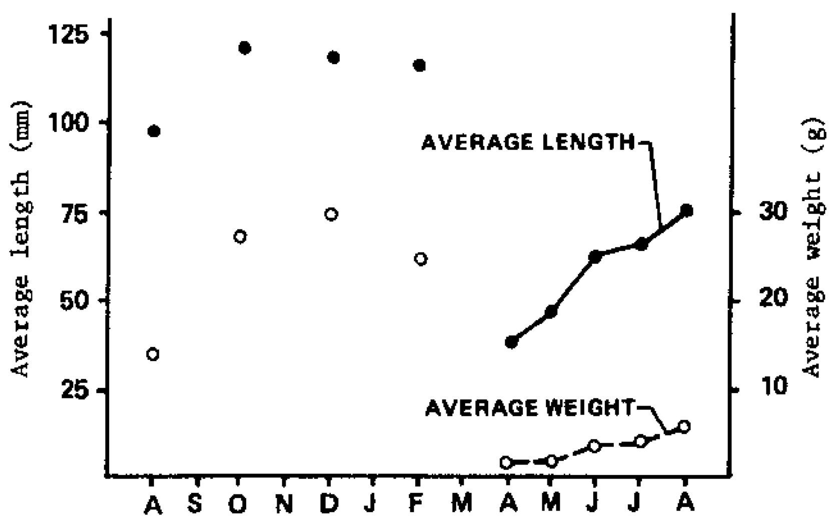


Figure 19. *Leiostomus xanthurus*. Total catch and dissolved oxygen. Average length and weight.

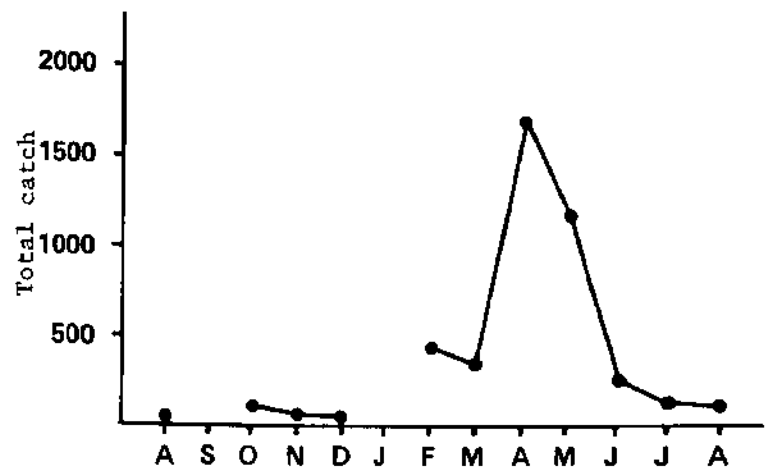
summer are spots collected in large numbers. The population maximum is reached in May. The observed seasonal pattern is a result of the influx of young-of-the-year spots beginning in April and indicative of a March or earlier spawning peak. By July, however, most spots have left the estuary and do not return, possibly as a result of low oxygen conditions in June (Figure 19) which may have initiated movement into the Pamlico Sound.

While in the estuary, energy is being assimilated within the spot population. Both the average length and average weight for juveniles (<126 mm) from April through August increase, indicating increasing size of individual fish (Figure 19). It is also suggestive of the important relationship between juvenile spots and the estuary.

The spatial distribution pattern suggests that spots avoid freshwater. Only during May and June were spots taken at Stations 3, 4, and 5. Salinities over this time period, however, were abnormally high for this area of the Neuse River. Spots were regularly taken at all other stations.

Micropogon undulatus, the Atlantic croaker, also exhibits distinct seasonal fluctuations. Probably because of an extended spawning season, croakers immigrate into the estuary earlier than spots and remain longer. Peak abundance occurs in April, one month prior to the spot maximum (Figure 20). This peak is a direct result of juveniles entering the estuary as very few adult fish were collected. Low numbers during the summer and the absence of a fall peak may be due, in part, to the low oxygen conditions within the estuary noted earlier.

The juvenile immigration into the estuary during late spring is coincidental with increasing primary productivity. Increasing average length and average weight from May through August is indicative of



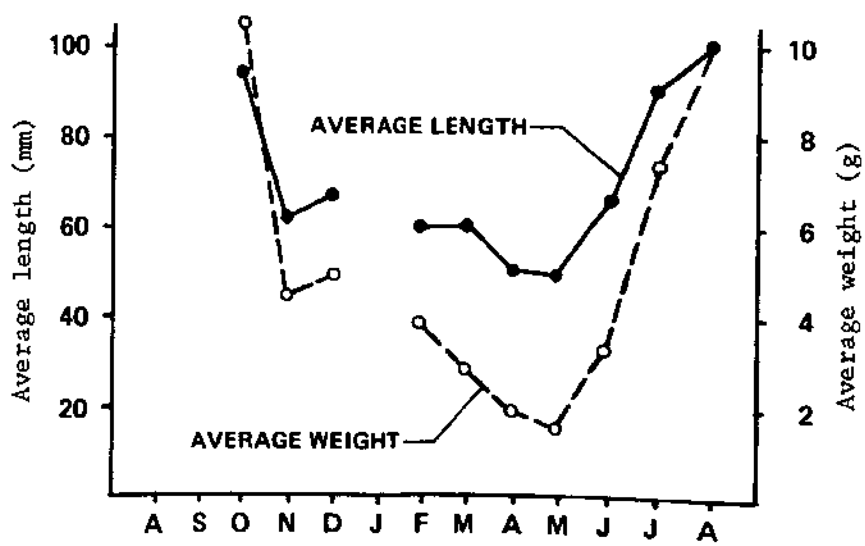


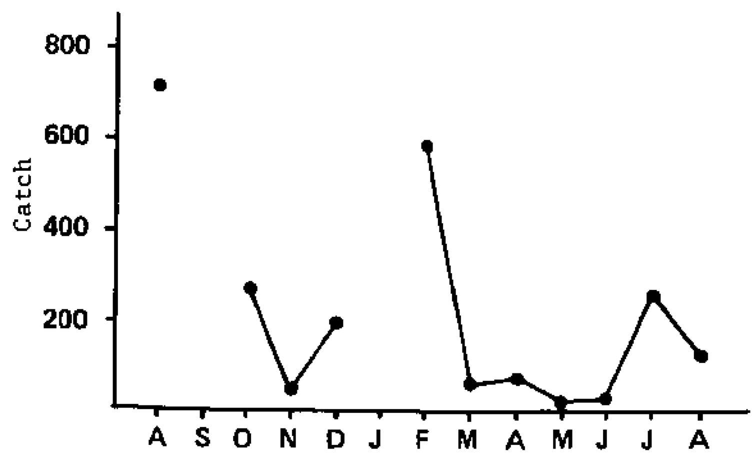
Figure 20. *Micropogon undulatus*. Total catch and average length and weight of juveniles.

estuarine energy being assimilated into croaker biomass (Figure 20). The February to May decrease is attributable to the influx of young-of-the-year fish which decreases the average.

Croakers are euryhaline organisms. Micropogon undulatus was taken at Stations 3, 4, and 5 in seven of the 11 months sampled. Salinities at these stations dropped as low as 0.1 ppt. This species was also regularly taken throughout the rest of the estuary, where salinities reached 22.7 ppt. Croakers, therefore, may be better able to tolerate the oligohaline estuary than spots. The result is niche differentiation and more efficient utilization of available energy.

The bay anchovy, A. mitchilli, remained in the estuary throughout the year. The numbers fluctuations indicate that considerable migration within the estuary and probably into the Pamlico Sound does take place (Figure 21). The population maximum in August 1972 is associated with the lowest average weight and average length as a result of the immigration of recently transformed young-of-the-year fish. An increasing trend in the growth data is seen through May (Figure 21). At this point, the 1973 year class begins to enter the estuary and a decrease in average weight is the result. These data show that spawning occurs in spring and summer with a midsummer peak and that the estuary is utilized by the young anchovies as a nursery area.

The spatial distribution pattern suggests that anchovies migrate into more saline water in spring and summer to spawn. From April through August, no anchovies were collected west of Station 7. It follows that young-of-the-year fish would be moving into the estuary from the northeast and, therefore, reach the western stations near New Bern last, accounting for the pattern described.



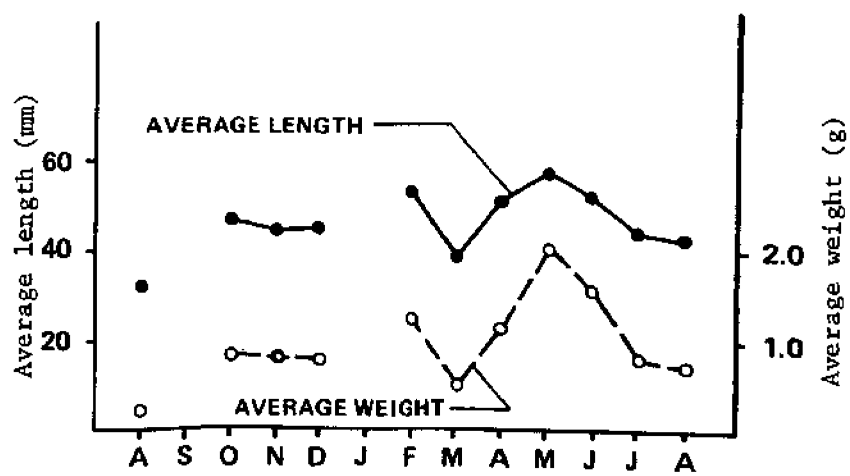


Figure 21. Anchoa mitchilli. Total catch and average length and weight.

Blue crabs, C. sapidus, exhibit a migratory pattern similar to that described for the Albemarle Sound, but without a fall peak. Immigration is evident in March reaching a peak in April, then declining through the summer. The difference between August 1972 and August 1973 is inherent in the season-to-season fluctuation of the blue crab population (Figure 22). Winter populations are relatively small compared to the August 1972 peak indicating that winter population for 1973-1974 would be all but nonexistant. The summer decrease may be related to the oxygen decrease in June or to the commercial fishing effort.

Numbers and Biomass

Only the migratory population is of major importance within the Neuse River estuary. Spring immigration of migratory species, especially young-of-the-year M. undulatus and L. xanthurus, produce the largest numbers of organisms and greatest biomass during the spring months of April and May (Figure 23). Other immigrants such as C. sapidus, Penaeus aztecus, P. duorarum, T. maculatus, B. tyrannus, and Cynoscion regalis also were taken in late spring but contribute relatively little compared to the dominants. All these species constitute the major immigration into the Neuse estuary and coincide with primary productivity increases in March, April, and May. Chlorophyll a values continue to increase to a summer maximum in July (Figure 23). It is precisely during the summer months, however, when secondary productivity of nekton is very low. The seasonal pattern seems tied to primary productivity, nevertheless. Low oxygen conditions during the summer months (Figure 23), especially in the river channel, may force nekton out of the river into the nearby Pamlico Sound.

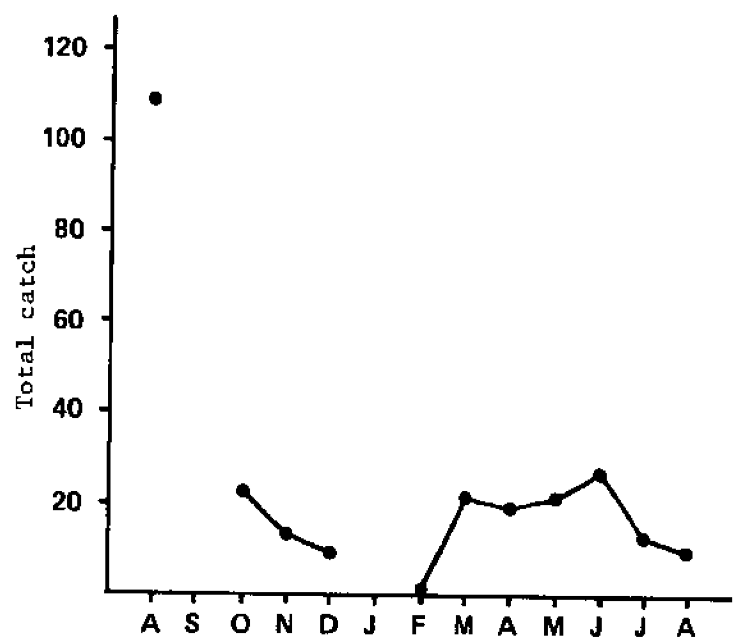
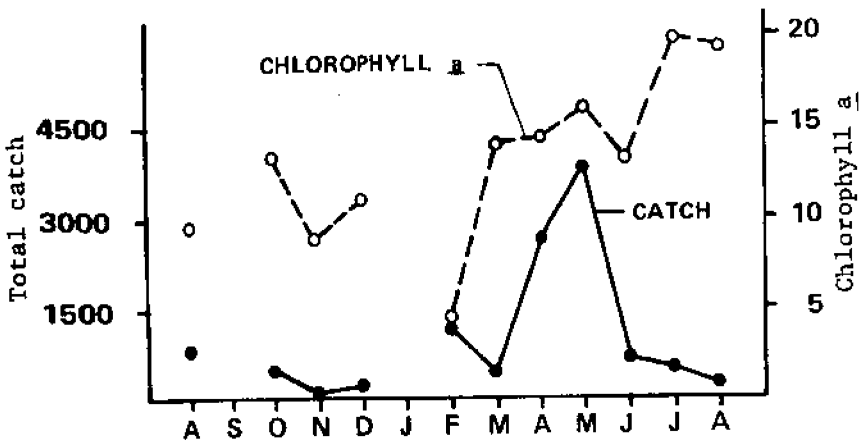


Figure 22. Callinectes sapidus. Total catch.



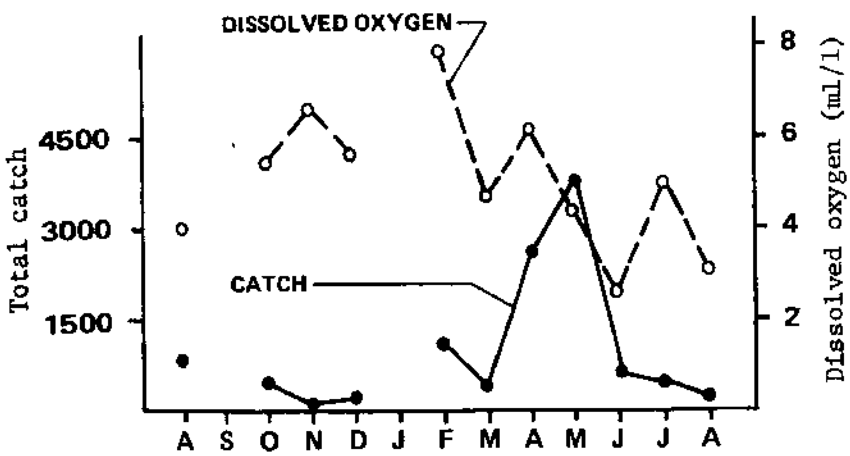


Figure 23. Neuse River estuary. Total catch and chlorophyll a. Total catch and dissolved oxygen.

Periods of very low flow rates are often prevalent in North Carolina estuaries during the summer months (Tenor, 1970). Under these circumstances, the normal organic load from urban and industrial wastes, farmland runoff, etc. may create excessive demands on the supply of oxygen. In addition, this organic material may act as a source of nutrients stimulating the growth of phytoplankton. Nutrient concentrations would be high in response to the low flow rates resulting in rapid algal growth. This algal productivity itself may contribute to the lack of available oxygen. Nighttime respiration and the reducing conditions created by decaying algae of bloom proportions could cause oxygen levels to drop quite low.

Oxygen levels dropped precariously low during the summer of 1973. During June, all stations had bottom oxygen readings of below 5.00 ml/l, nine stations had less than 3.00 ml/l, and six stations had less than 2.0 ml/l. Few, if any, nekton were collected at these stations. Consequently, nekton within the estuary began to emigrate to less stressful conditions. While oxygen conditions improved somewhat in July, August oxygen levels were once again intolerably low.

The critical dissolved oxygen level seems to be 4 ml/l (Figure 24). Above the critical level, 22 collections contained 100 or more individuals. Below this level, only two collections contained more than 100 individuals. The mobility inherent in nekton populations, resulting in individuals moving into less favorable conditions for brief periods could explain these two fluctuations. So could the fact that the dissolved oxygen reading was taken at the starting point of each trawl. Conditions along the trawl's sweep may have improved resulting in the larger catches.

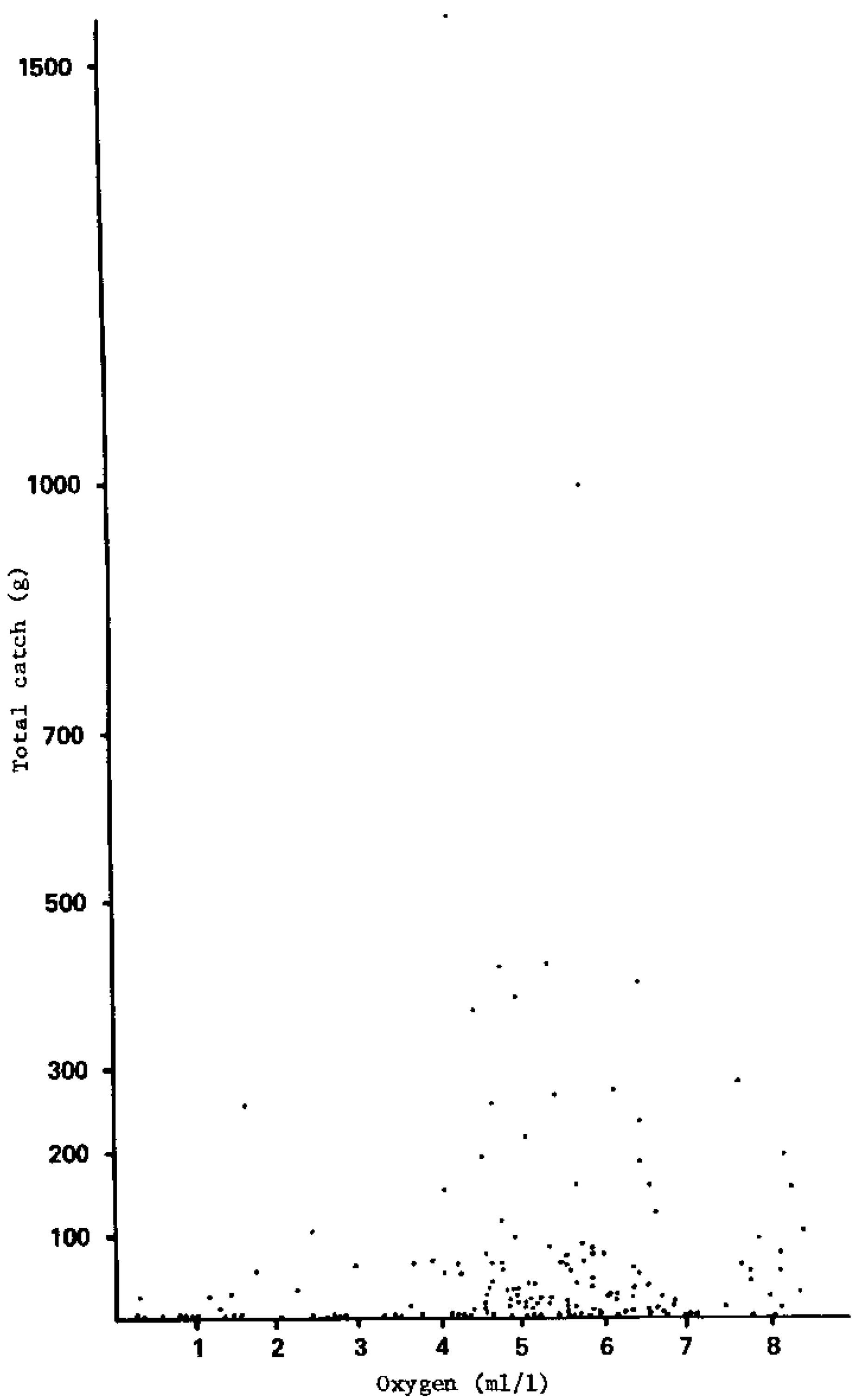


Figure 24. Total Neuse catch versus oxygen.

Low numbers and biomass were recorded during the fall and winter months. With the emigration of most of the migratory population, relatively few nekton remain in the estuary during this period. Salinities are too high to allow the immigration of freshwater species.

Species Diversity Indices

The Neuse River estuary is dominated by the seasonal influence of warm water migratory species. This seasonal fluctuation is reflected in the four diversity indices calculated (Table 4).

Table 4. Analysis of variance of effects of month and season on seven parameters calculated from data collected in the Neuse River estuary.

Parameters	F values	
	Month	Season
Numbers	5.29791**	8.24809**
Biomass	6.43500**	7.10827**
Number of species	9.59632**	8.71049**
H'' numbers	4.33800**	6.44227**
H'' biomass	3.85023**	1.37621
D	6.06054**	11.39475**
J	2.60555**	4.96260*

*Significant 95% level; **significant 99% level.

Highly significant seasonal fluctuations occur in the Shannon-Weaver Index, "H'' numbers," the distribution of numbers among species. Low values overall are characteristic of the stressful conditions found in the estuary. However, spring and summer seasons showed values even lower than fall and winter (Figure 25). The spring low is the result of the immigration of thousands of *M. undulatus* and *L. xanthurus* juveniles. With most numbers attributable to only two species, a skewed distribution and low diversity values result. The summer low may reflect the deteriorating oxygen conditions within the estuary. Population levels drop but remain skewed as nekton are forced out of the estuary.

Only "H'' biomass" does not show seasonal changes. The small size of the juveniles which enter the estuary each spring apparently does not sufficiently increase the biomass of the two dominants relative to other species.

The "evenness" index, "J", fluctuates seasonally with low values occurring in spring and summer, also. This condition is to be expected since the spring dominants do indeed make the distribution less "even." Intolerable oxygen conditions during the summer would have the same effect by forcing out of the estuary all but the hardiest of species.

The decrease in "species richness," "D", which occurs likewise in spring and summer is due, in part, to the spring population increase and the summer decrease in the number of species. While the average number of species drops only slightly (Figure 26) from winter to spring, "D" decreases significantly since catch increases sharply over this same time period. A concomitant decrease in number of species and catch produces the summer minimum, probably a result of low oxygen levels.

The Neuse River estuary proved to be productive for a relatively short period of time during the spring. Therefore, seasonal fluctuations are clearly apparent from analysis of diversity indices. However, similar changes in the diversity index may result from very different processes and must be studied in conjunction with other data.

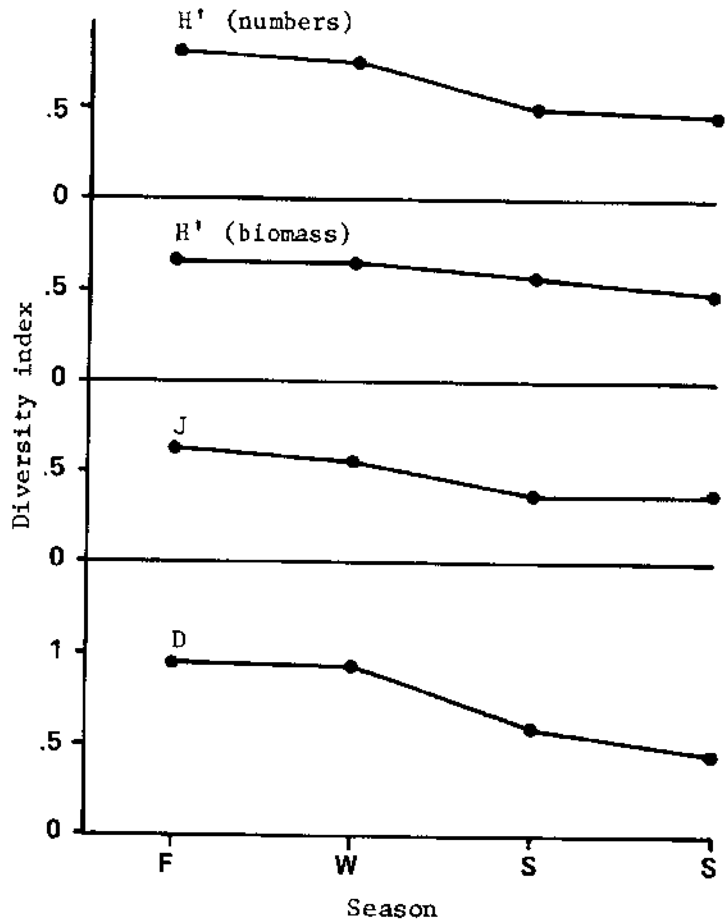


Figure 25. Species diversity indices over season in the Neuse River estuary.

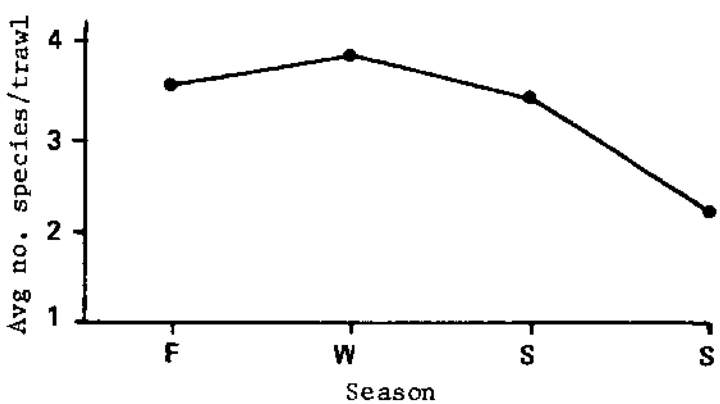


Figure 26. Average number of species/trawl over season in the Neuse River estuary.

SYSTEMS COMPARISONS

Recently, studies similar to the present one utilizing bottom trawls have been completed in other nearby estuarine areas. Two studies were conducted in river estuaries (McErlean et al., 1973; Turner and Johnson, 1973). A third was conducted in a sound, river complex (Dahlberg and Odum, 1970). The two estuaries under consideration here exhibit characteristics which are both typical of the other systems and unique unto themselves.

Each of the five estuaries supported a few dominant species which accounted for most of the catch. These species were represented primarily by juveniles utilizing the estuary on a seasonal basis. Many of the same species were represented in each of the estuaries. Anchoa mitchilli, L. xanthurus, and M. undulatus were dominant species in the Albemarle Sound, Neuse River, and Newport River, North Carolina estuaries. The seasonal migrations of these species, B. tyrannus and A. aestivalis, were very similar in the three systems.

The number of species collected, however, varied considerably. In every other study, many more habitats were sampled than in the present study resulting in a higher number of species taken. More species were collected in the mesohaline Neuse estuary than in the oligohaline Albemarle Sound probably due to the higher salinity of the Neuse River estuary. Many of the species not taken in the Albemarle, such as Penaeus duorarum, Sciaenops ocellata, M. cephalus, Lagodon rhomboides, and Pomotomus saltatrix, are associated with higher salinities.

Seasonal migrations are quite evident in all cases as catch increased during the warmer months of the year. Within the Albemarle

Sound and Neuse River estuaries, these seasonal migrations can be understood in terms of the nekton populations present in each.

Three major nekton populations are characteristic of the Albemarle Sound. Of these, two, the migratory and anadromous populations, are composed primarily of juveniles. The indigenous population includes both adult and juvenile organisms. The migratory population enters the eastern sound in spring with catch values remaining high until fall. Emigration to more saline waters occurs during the fall months. Juveniles of the anadromous population migrate from the rivers into the sound in June. Most emigrate from the estuary by late fall but some may overwinter. Population increases of the indigenous species begin in late fall and peak during the winter months. Peak populations include both juvenile and adult fish. As a result of the integrated migratory pattern of the three populations, secondary productivity is high throughout the year. This high secondary productivity is at least in part due to the large freshwater input combined with a restricted oceanic interchange which produces the uniquely stable estuary discussed earlier.

The Neuse River, however, supports only a migratory population. Juveniles enter the estuary in early spring but do not remain through the fall. Most individuals have emigrated from the estuary by June. Secondary productivity, therefore, is high during only one season of the year.

Species diversity indices were calculated for the Georgia estuary and Patuxent River estuary. Seasonal cycles were evident in the Shannon-Weaver Index, and two relative species abundance indices, "J", and "S'/S", in Georgia. Only the "species richness" index, "D", was homogeneous (Dahlberg and Odum, 1970). All indices calculated showed cyclic seasonal patterns in the Patuxent River estuary including "J" and "D" (McErlean et al., 1973). Diversity values were higher in spring and summer in both estuaries as a result of the immigration of warm water migratory species.

Diversity values for the Neuse River estuary were generally lower than those in Virginia and Georgia. A seasonal pattern was clearly evident, although lower values occurred during the spring and summer months. The dominating influence of just two species in spring and low summer oxygen conditions cause these results.

Species diversity values are even lower in the Albemarle Sound than the Neuse and show no seasonal pattern at all. The integrated migrations of the three populations involved, together with species replacement, produce the homogeneous results.

The Albemarle Sound and Neuse River estuaries seem to be representative of temperate estuaries of this region. Species diversity values, however, are somewhat lower than those found elsewhere which could indicate more stressful conditions exist than might be expected. The effects of coastal development and industrialization may even now be taking their toll. Conditions within these two estuaries may not be as healthy as presently believed. Low summer oxygen conditions in the Neuse estuary may be a manifestation of more serious problems.

ECOLOGICAL IMPLICATIONS

That steadily increasing tides of people are flooding our coastal areas is a fact. That this human utilization will result in changes in North Carolina's coastal wetlands is inevitable. Increasing urbanization, timber harvesting, channelization, and dam and bridge construction may soon alter estuarine ecosystems. It is critical, then, that the effects of these man-made perturbations be understood so as to avoid any unwarranted disturbances to these and other coastal ecological systems.

Each of the above-mentioned developments creates recognized physical changes to the estuarine system. But beyond this, how are these physical changes integrated into the biotic component? Using the data presented in this thesis, this biological response can be predicted with a fair degree of certainty.

An increase in the amount of organic material carried by coastal tributaries will surely follow the increase in population in coastal areas. Increased organic input causes two primary consequences. The biological oxygen demand is increased resulting in a net loss of oxygen to the biological community. Organic material also acts as a source of nutrients, especially nitrate and orthophosphate. Secondarily, phytoplankton growth is stimulated by these nutrients. Algal growth can be either beneficial or harmful to the system. If the initial algal productivity is relatively low, the increased productivity may initiate increased secondary productivity. If algal productivity is already high, however, the increased productivity will likely result in phytoplankton blooms. Nighttime respiration and dying or dead algae associated with these blooms reduce even further available oxygen.

It seems clear that the Neuse River estuary would not benefit from an increased organic input, at least during the summer months. Algal productivity is high, water movement is sluggish, and oxygen levels are already dangerously low. A net loss of available oxygen to the biotic components would be detrimental to nekton populations which are unable to tolerate very low oxygen concentrations.

With the possible exception of the Chowan River mouth region in the northwest, the Albemarle Sound may be more able to tolerate the organic input. Algal productivity in terms of chlorophyll a averaged one-half that of the Neuse River estuary. Oxygen levels remained high throughout the study and there was no evidence of nekton avoidance of certain areas due to oxygen levels. It must be remembered, however, that secondary productivity in the sound is high at present. Additional algal productivity may not be beneficial in terms of increased secondary productivity. Also, the precise conditions which initiate blooms are not known, making the introduction of increasing amounts of organics into the system precarious.

As demand for freshwater climbs in growing coastal cities, reservoir dams may be proposed. The first problem associated with a dam is a lowered water volume reaching the estuary. The effect of less water is to increase the relative concentration of organics and nutrients. Therefore, the problem increases the severity of the effects discussed above. Secondly, seasonal pulses are dampened by a dam. Rainfall in North Carolina is not uniform. Therefore, more water flows down rivers during certain times of the year, especially early spring. Dams catch this water and release it at a more uniform rate.

It has been shown that the immigration of some migratory species is positively correlated with river flow (Gunter and Hildebrand, 1954; Copeland, 1966). Concomitantly, a more even flow resulting in less flooding in the freshwater tributaries, and therefore less spawning habitat available, may adversely affect spawning success of some anadromous species (Pate, 1972).

Here again the Neuse River estuary is more susceptible to stress in terms of organic load than the Albemarle for the reasons cited above. Also, the Neuse River estuary has only two freshwater tributaries of any importance, whereas the Albemarle Sound has many. The effect of daming one of these two tributaries would have a more pronounced effect on the Neuse estuary than daming a single river in the Albemarle system. Seasonal freshwater pulses into the Neuse River may be considerably dampened, possibly meaning smaller migratory nekton populations, especially the penaeid shrimps and menhaden. Also, fewer spawning areas would be available for _Alosa_ sp. due to less flooding of hardwood swamps.

Present circulation patterns may very well be influenced by new bridges or channels. In the first case, water movement is inhibited; in the second case, it is enhanced. Bridges placed between the estuary and the sea decrease the tidal influence on the estuary. Salinity fluctuations may be dampened and the estuary may actually shift seaward. The reverse is true for a bridge on the freshwater side. In either case, water movement in the vicinity of the bridge would be slowed causing deposition of sediment. Channels, especially deep ones, would come from the sea. Salt water could move more freely up the estuary causing greater salinity fluctuations and movement of the estuary away from the sea. Summer stagnation with depth would definitely become a problem. Winds would be less able to recirculate this bottom water.

The only foreseeable bridge site on the Neuse River estuary is somewhere across the more saline end of it. Under these conditions, estuarine habitat would be decreased since salt water would not penetrate as far toward New Bern. The migratory population would be denied use of a portion of the estuary which would be fresher than before. Concomitantly, resident freshwater species could move further down river. This study has shown a large immigration of migratory species in spring. It is not known whether a large resident population exists in fresher waters adjacent to the Neuse estuary. Therefore, it is unknown whether or not the deleterious effect to the migratory population would be offset by increases in the resident freshwater species.

Numerous bridges surround and cross the Albemarle Sound today. Tidal influence is very small and freshwater input vast. Yet another bridge would certainly change water circulation patterns but the effect should be smaller than in the Neuse. Should salinity patterns change within the sound, adjustment would take place among the species present.

A deep water channel into the estuaries under study seems unlikely. Nevertheless, such a channel might severely stress the Neuse River estuary. This would initially seem not to be the case. A landward shift and enlargement of the estuary would seem to benefit the dominant migratory population. However, creation of a deep channel would create additional demands on the already low oxygen supply. Sluggish water flows during summer months would likely produce anaerobic conditions in the channel. Wind alone would be unable to circulate the water sufficiently given the high biological oxygen demand. The end result might be a system unable to support but the very hardiest of species.

A channel into the Albemarle probably would not suffer the effects of stagnation due to the sound's large surface area. The long fetch provides for sufficient circulation. Salt water intrusion, however, could significantly reduce the indigenous population by destroying the unique environment of the western sound. Indigenous species might be unable to utilize the sound and would be forced into the rivers.

In both systems a sharper salt wedge would be produced by the channels creating additional local salinity stress.

The final major alteration foreseeable in the near future is the removal of many of the coastal timberlands. Timber harvesting and clearing increases runoff and introduces nutrients and silt (organics) into tributaries. Nutrients and organics have previously been dealt with. Increased runoff over large areas could become a major problem. Massive tracts of timber in the east are being cleared, drained, and put into cultivation. Water runoff will become much more rapid producing more severe floods of shorter duration.

Large corporate farms are becoming realities north and south of the Albemarle Sound. In the Alligator, Scupernong, and Perquimans River areas, rapid injection of runoff water into tributaries may flood large areas. These flood waters may recede more rapidly than before due to the lack of a sustained water input into the system as in the past. Will the shorter duration be noticed in the hardwood swamps? If so, will spawning of _Alosa_ sp. be affected? Will there be sufficient time for spawning and egg development before the waters subside?

Answers to these questions are not known. Corporate farms in eastern North Carolina promise to be quite extensive. Rates of water runoff will undoubtedly increase in surrounding areas. Time will tell whether or not detrimental effects to nekton will occur.

Given that North Carolina coastal areas will be developed, it appears that the Albemarle Sound region would be better able to sustain the effects of perturbations caused by the externalities related to man's population increase. The Neuse River, especially during the summer months, seems unable to tolerate any change which decreases the supply of oxygen.

CONCLUSIONS

The Albemarle Sound is an oligohaline estuary in northeastern North Carolina which is dominated by eight species of nekton. Two of these, *M. americana* and *I. catus*, are primarily western sound species. They are found in the eastern sound only rarely when population levels are high. *Alosa aestivalis* is the only dominant anadromous species. Juveniles were collected throughout the sound reflecting the migratory nature of the species. The remaining five species—*M. undulatus*, *L. xanthurus*, *C. sapidus*, *A. mitchilli*, and *I. maculatus*—constitute the major eastern sound organisms which migrate into other parts of the sound during population peaks or salinity increases in the west.

Salinities fluctuated within the Albemarle between 0.0 ppt and 2.9 ppt. The western sound is practically fresh, while the east is more saline. Partly due to this salinity regime, three distinct populations and two areas can be recognized in the sound. The indigenous population is associated with freshwater and inhabits the western sound. Population peaks are reached in the winter months coincidental with the emigration of the two other populations. The migratory population enters the sound from the east in early spring and remains in the estuary through the fall months. During this time, migratory species emigrate to more saline water. While in the estuary, the migratory population is found primarily in the eastern sound where salinities are slightly higher. The anadromous population migrates through the estuary to spawn in the freshwater tributaries which empty into the Albemarle Sound. Young-of-the-year fish enter the collections throughout the sound during the summer months. Most of this population emigrates from the estuary by late fall but some evidence suggests overwintering by a segment of the population.

Spring and early summer nekton population peaks occur within the Albemarle Sound, coincidental with chlorophyll a peaks. The immigration of the migratory and anadromous populations, then seems keyed to the increased primary productivity of the estuary during the spring and summer months.

All three populations found within the estuary utilize the sound extensively as a nursery area. Juveniles occupy a relatively low trophic position, feeding on zooplankton and organic debris, and are, therefore, able to efficiently exploit the productivity increase. Considerable growth took place while the juveniles remained in the estuary.

Species diversity indices calculated from data collected in the Albemarle Sound are quite low. Low diversity values are indicative of severe stress within the estuary. Three of four indices are homogeneous. This does not reflect a lack of seasonal change, but rather a coordinated integration of the three nekton populations throughout the year which maintains a relatively constant level of activity over time.

The Neuse River estuary is a mesohaline system dominated by only four nekton species–L. xanthurus, M. undulatus, A. mitchilli, and C. sapidus. Several parameters may affect this result. Salinities did not fall sufficiently low enough to support an active, freshwater indigenous population. Possibly because of the fewer number of freshwater streams in the Neuse watershed versus the Albemarle watershed, the anadromous population migration is less significant. Finally, the penaeid shrimp populations, which may be important in other years, were lower than might be expected due to natural species fluctuation patterns.

The only population of major importance within the Neuse River estuary is the migratory population. Therefore, catch values show a much more pronounced seasonal fluctuation. Catch values are high during the spring months reflecting migratory species immigration. Low catch values are recorded for the remainder of the year.

Chlorophyll a readings increase concomitantly with spring immigration indicative of migratory patterns timed to take advantage of the spring primary productivity pulse.

The Neuse River estuary functions as a nursery area during the spring months. The vast majority of the nekton collected at this time were juveniles. Average length and average weight data for juveniles of the dominant species increase over time pointing to juvenile utilization of available energy, assimilation, and growth.

Low oxygen conditions within the Neuse River estuary over the summer months may encourage emigration, probably into the Pamlico Sound, and prevent energy utilization by several species which would otherwise take place. Oxygen values in June fell quite low at most stations. Consequently, the migratory population within the estuary at the time may have been forced to emigrate to more favorable conditions. This migration probably took place between the estuary and Pamlico Sound since it is the adjacent body of water and is more saline. Nevertheless, primary productivity continued to rise through the summer months increasing the energy available for potential use. Relatively few nektonic organisms, however, remained in the estuary to take advantage of the energy available, resulting in grossly inefficient energy utilization by the nekton. Based on the Albemarle Sound data, one can assume that the migratory population would have remained in the estuary until fall given tolerable conditions.

Seasonal patterns are evident in three of the four species diversity indices calculated. Only "H'' biomass" is homogeneous indicating the juvenile nature of the spring immigration. The remaining three indices reflect a lower community diversity produced by the immigration of large numbers of only two species in the spring and a decrease in the total number of species and catch over the summer months.

The Albemarle Sound and Neuse River estuaries are similar to other nearby estuaries in that a few species dominate the nekton and marked seasonality is apparent. However, species diversity values are lower than other systems studied and do not fluctuate in a like manner.

Twenty-three species of economic importance were collected within the Albemarle Sound and/or Neuse River estuaries. All of these species apparently utilize the estuary as a nursery area during the first critical period of life. Adults of these same species constitute the basis for a large part of the coastal North Carolina economy, the commercial and sport fishing industries. The very livelihood of many residents of our coastal counties depends directly or indirectly on the continued presence of healthy nekton populations able to sustain annual harvests. In addition, many North Carolinians throughout the state derive benefits from these harvests in terms of food, recreation, and/or pecuniary gain.

The importance of this sector of our economy is obvious. In turn, it is equally important to carefully maintain our estuarine areas on which the very existence of many commercial and sport fishing species depend. Any perturbations which could adversely affect the estuarine ecosystem should be scrupulously avoided. The low species diversity values relative to other nearby estuaries previously discussed may indicate that the estuaries in question are already suffering.

The estuarine resources of North Carolina are valuable assets to this state and its people. Care should be taken to be certain they remain so in the future.

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APPENDICES

Appendix A. Temperature and Salinity Data

Appendix Table 1. Albemarle temperature data.

Month	Station												
	2	3	4	5	7	8	9	10	11	12	13	14	15
June 72	23.0	22.5	23.9	23.1	23.0	22.1	23.5	22.8	22.5	23.0	24.3	23.7	23.2
July 72	29.6	29.3	29.2	28.7	28.3	29.0	29.6	28.7	28.7	29.7	27.0	28.1	28.2
August 72	27.6	27.1	27.5	26.9	27.4	25.0	27.5	25.1	27.4	27.4	26.4	25.9	22.8
September 72				23.0	23.6	23.7	23.0	23.8	23.5	23.4	23.4	23.6	23.6
October 72	20.6	20.1	21.1	20.7	20.4	17.7	21.1	18.1	20.7	21.4	21.0	21.4	21.0
November 72	11.9	11.1	14.2	14.4	12.9	12.1	12.6	11.8	13.4	13.2	12.4	12.9	12.8
December 72	9.5	9.2	9.0	9.6	9.8	9.3	9.5	9.3	9.2	8.9	9.0	8.3	9.0
January 73	2.7	2.7	3.8	3.1	5.5	2.8	3.4	2.9	3.2	2.9	4.0	3.3	3.3
February 73	8.6	8.6	6.8	7.3	7.2	6.9	7.0	7.9	7.4	7.5	8.0	7.0	7.4
March 73	12.4	12.0	10.3	11.1	10.4	10.4	10.5	9.9	11.1	11.9	12.2	12.1	12.7
April 73	14.0	14.0	12.0	13.0	12.0	13.0	14.0	13.0	13.9	13.0	15.0	14.0	14.0
May 73	19.0	19.0	18.5	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
June 73		27.0	26.0		26.0	26.0	27.0	26.0	27.0	27.0	27.0		27.0

Appendix Table 2. Albemarle salinity data.

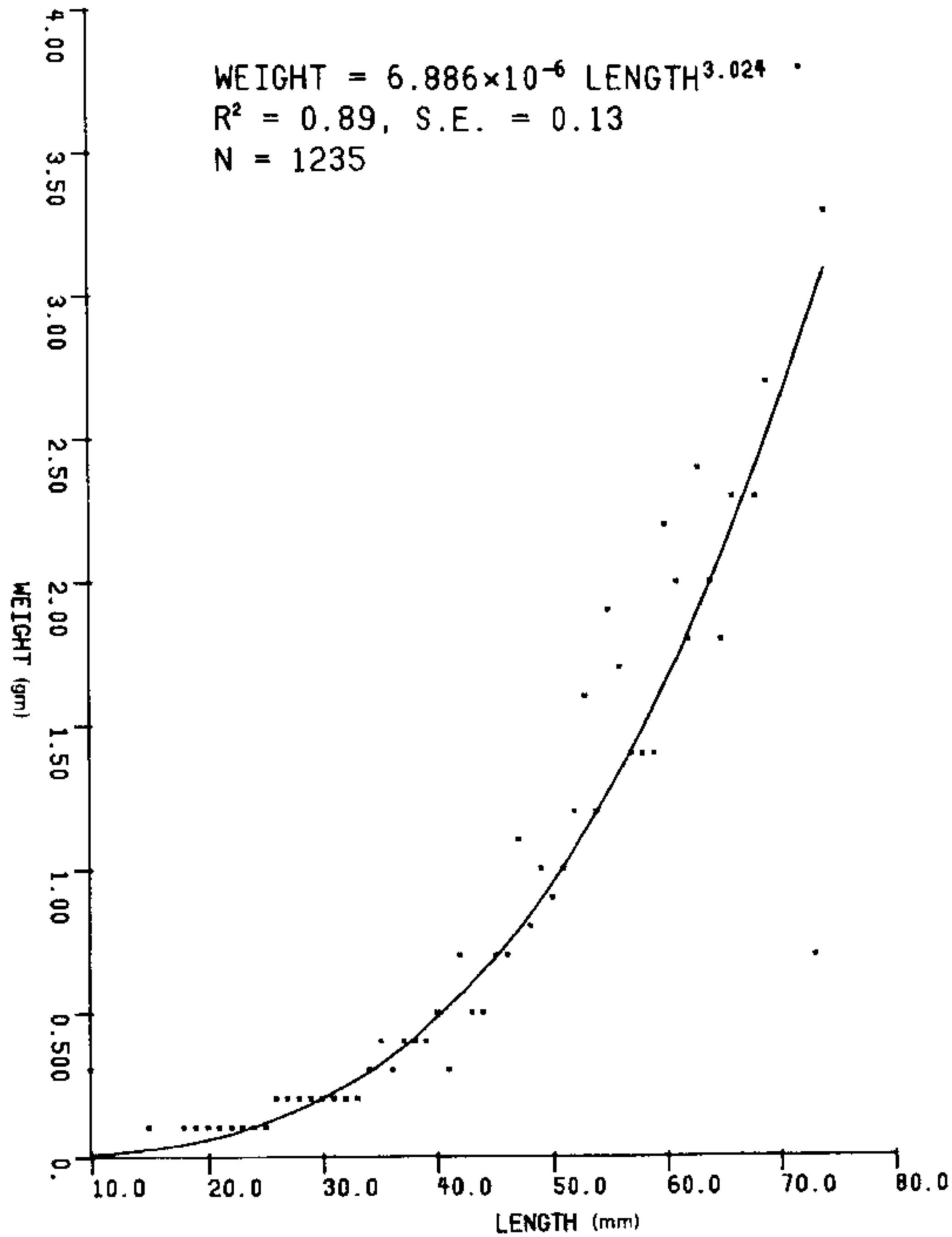
Month	Station											
	2	3	4	5	7	8	9	10	11	12	13	14	15
June 72	0.5	1.2	1.9	1.2	0.0	1.0	0.7	0.7	0.4	0.0	0.0	0.0	0.0
July 72	0.9	1.0	1.2	0.6	0.2	1.1	0.2	0.6	0.0	0.0	0.0	0.0	0.0
August 72	0.9	0.8	0.9	0.2	0.3	0.6	0.2	0.7	0.6	0.0	0.0	0.0	0.0
September 72				2.0	2.3	1.9	0.7	0.9	0.9	0.0	0.0	0.0	0.0
October 72	1.0	2.4	2.9	2.1	1.2	2.5	1.0	1.0	1.1	0.0	0.0	0.0	0.1
November 72	1.9	2.3	1.7	1.4	1.2	2.5	0.7	0.8	0.0	0.0	0.0	0.0	0.0
December 72	1.9	1.9	1.7	1.1	0.7	1.5	0.4	0.4	0.0	0.0	0.0	0.0	0.0
January 73	1.3	1.3	0.0	0.0	0.0	0.5	0.0	0.4	0.0	0.0	0.0	0.0	0.0
February 73	1.4	1.2	0.6	0.4	0.2	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0
March 73	0.9	1.2	1.2	0.8	0.5	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0
April 73	0.0	0.5	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
May 73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
June 73		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Appendix Table 3. Neuse temperature data.

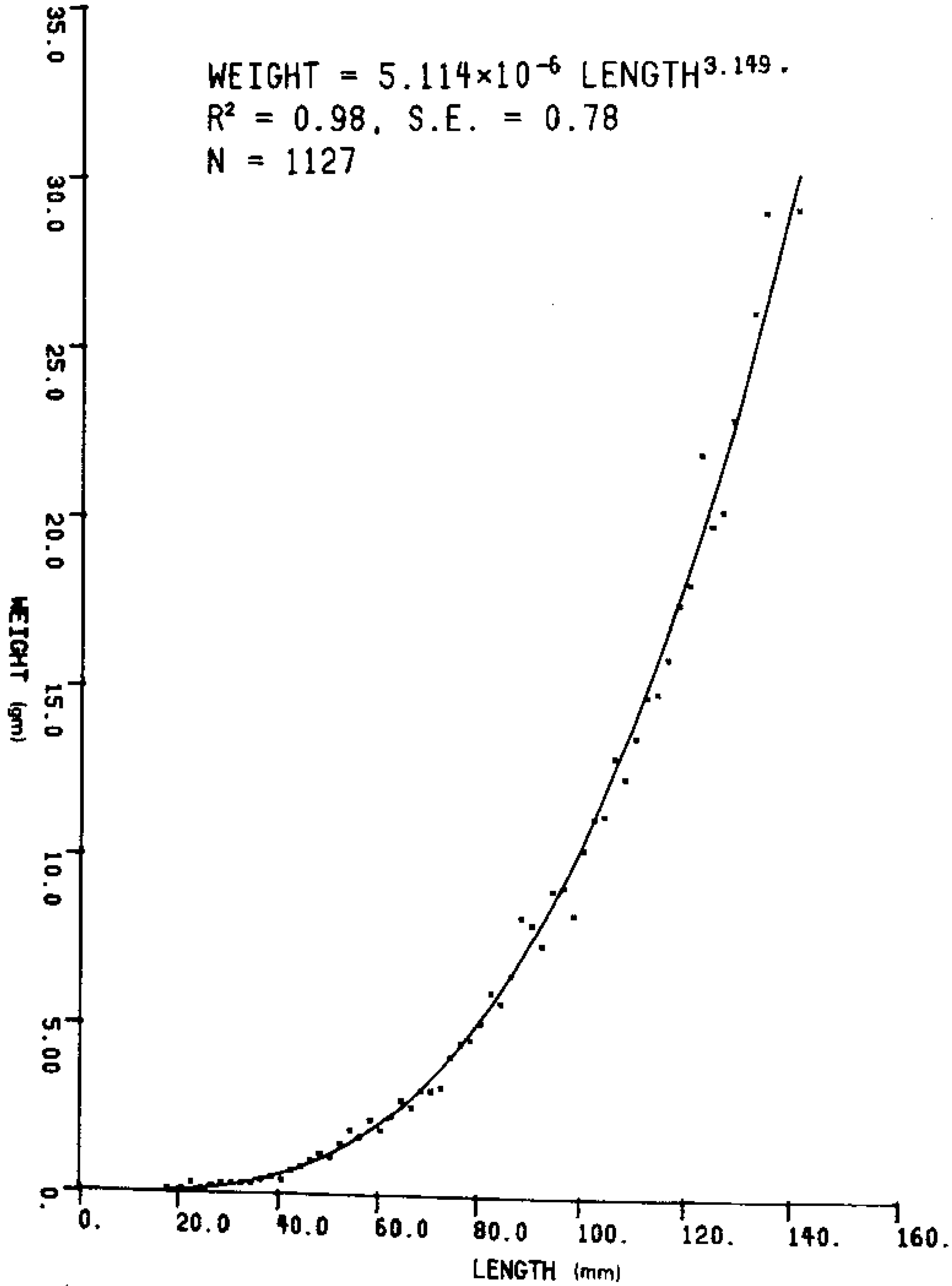
Month	Station														
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Aug. 72	27.7	26.8	27.0	27.4	27.8	27.9	28.1	28.0	28.7	27.6	27.6	27.6	27.7	27.7	27.8
Oct. 72	20.8	21.0	20.2	20.1	19.2	19.3	18.8	19.3	18.7	20.1	19.3	19.2	18.6	19.0	18.9
Nov. 72	12.6	13.2	12.5	13.2	11.9	12.8	11.9	12.7	12.8	12.8	12.8	12.8	12.7	12.3	12.0
Dec. 72	11.1	11.5	11.8	11.4	11.8	11.7	11.9	11.6	11.3	12.0	11.9	11.7	11.7	11.5	11.3
Feb. 73	5.4	5.0	5.0	4.5	4.8	5.0	5.0	4.3	4.7	4.9	4.2	4.3	4.6	3.5	4.2
March 73	18.0	18.7	18.4	17.7	17.0	17.1	13.0	9.8	16.6	13.6	9.6	15.6	15.6	11.0	9.2
April 73	14.3	14.9	13.6	14.2	13.9	13.7	13.5	13.7	13.7	14.3	13.4	13.8	13.8	13.6	13.2
May 73	21.2	21.3	21.0	21.1	21.1	22.4	23.6	22.0	21.9	22.4	21.3	21.0	20.6	21.5	20.0
June 73	26.4	28.0	28.1	25.0	26.7	25.4	25.0	25.2	28.4	26.5	24.5	24.1	26.3	26.7	26.1
July 73	27.5	27.5	28.0	28.0	28.0	27.0	26.5	26.0	26.0	28.5	26.5	26.0	25.0	25.0	25.0
Aug. 73	30.0	29.4	30.1	30.6	30.3	28.9	28.7	28.9	28.6	29.5	27.8	27.2	27.6	27.2	28.3

Appendix Table 4. Neuse salinity data.

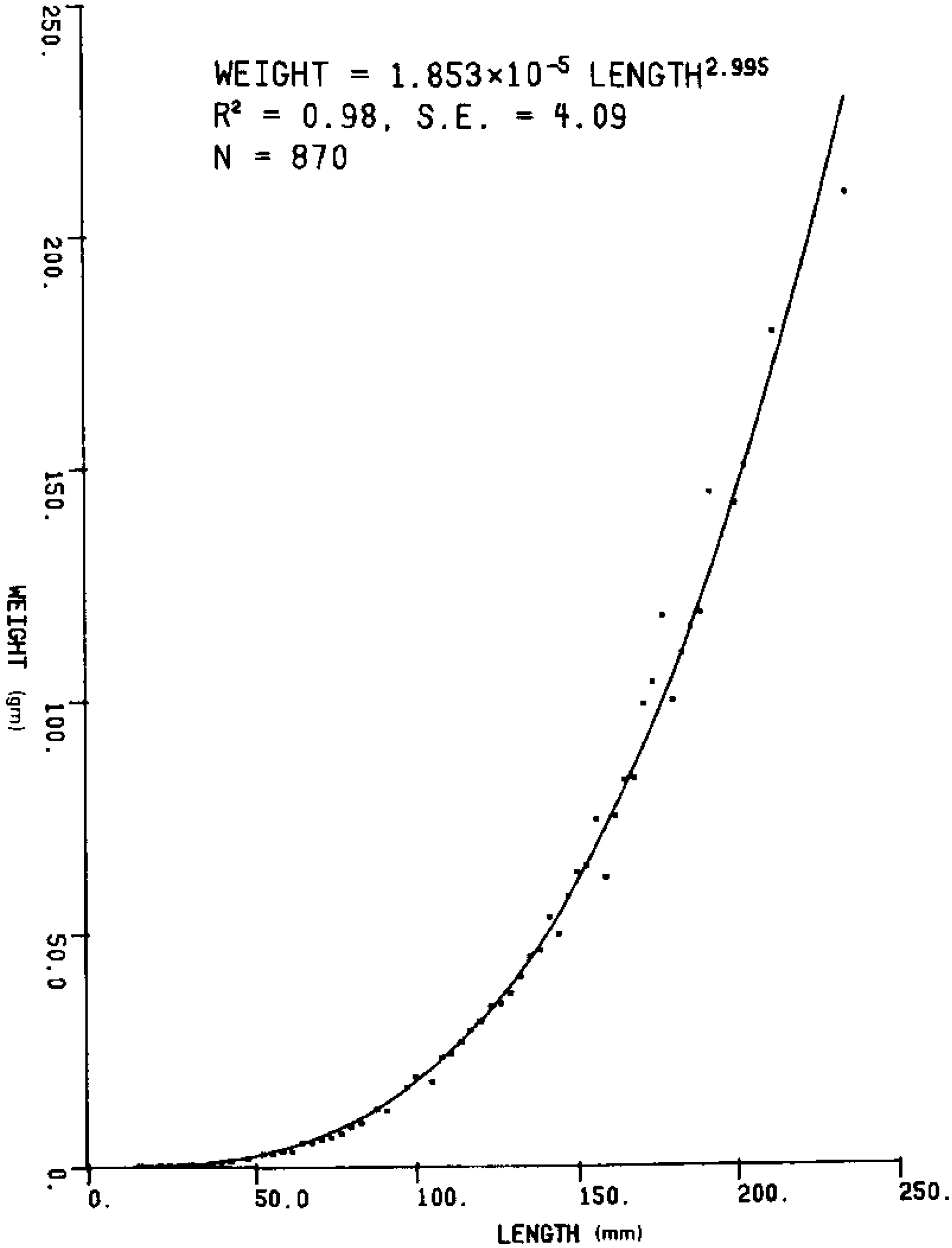
Month	Station														
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Aug. 72	2.6	6.6	7.0	8.8	16.0	15.2	11.8	17.8	18.1	13.4	13.3	13.6	14.2	16.4	16.5
Oct. 72	10.0	10.0	10.4	10.6	9.5	9.9	13.5	13.8	13.7	13.9	15.1	15.7	16.4	16.8	16.5
Nov. 72	3.2	6.4	3.3	6.0	3.9	6.7	8.7	8.8	10.0	11.9	13.0	14.4	14.5	14.9	15.0
Dec. 72	9.7	8.4	10.0	9.0	9.6	9.6	9.1	8.1	10.8	9.9	9.2	12.9	12.6	13.3	14.3
Feb. 73	0.0	0.0	0.0	1.6	1.5	2.6	4.1	2.2	1.6	8.9	11.2	10.4	10.9	10.3	10.5
March 73	0.1	0.3	0.4	0.4	0.9	1.2	5.0	7.7	3.6	5.2	9.5	4.0	4.0	10.8	10.8
April 73	0.1	0.0	0.1	0.1	0.2	0.2	0.5	1.0	3.4	4.2	5.7	6.4	9.9	11.0	9.0
May 73	6.1	7.0	6.6	7.6	4.6	4.6	5.9	8.7	6.8	5.0	12.5	13.2	14.0	13.7	9.9
June 73	8.2	2.1	2.4	13.5	8.6	15.0	16.9	18.0	22.7	11.8	21.1	22.7	16.9	12.5	17.0
July 73	3.9	5.0	6.1	7.8	8.9	10.0	11.7	12.2	14.4	15.0	15.0	16.7	16.7	17.2	17.8
Aug. 73	11.0	11.1	9.4	12.0	7.4	14.3	15.7	16.0	14.0	11.5	16.2	16.5	19.0	16.9	17.9



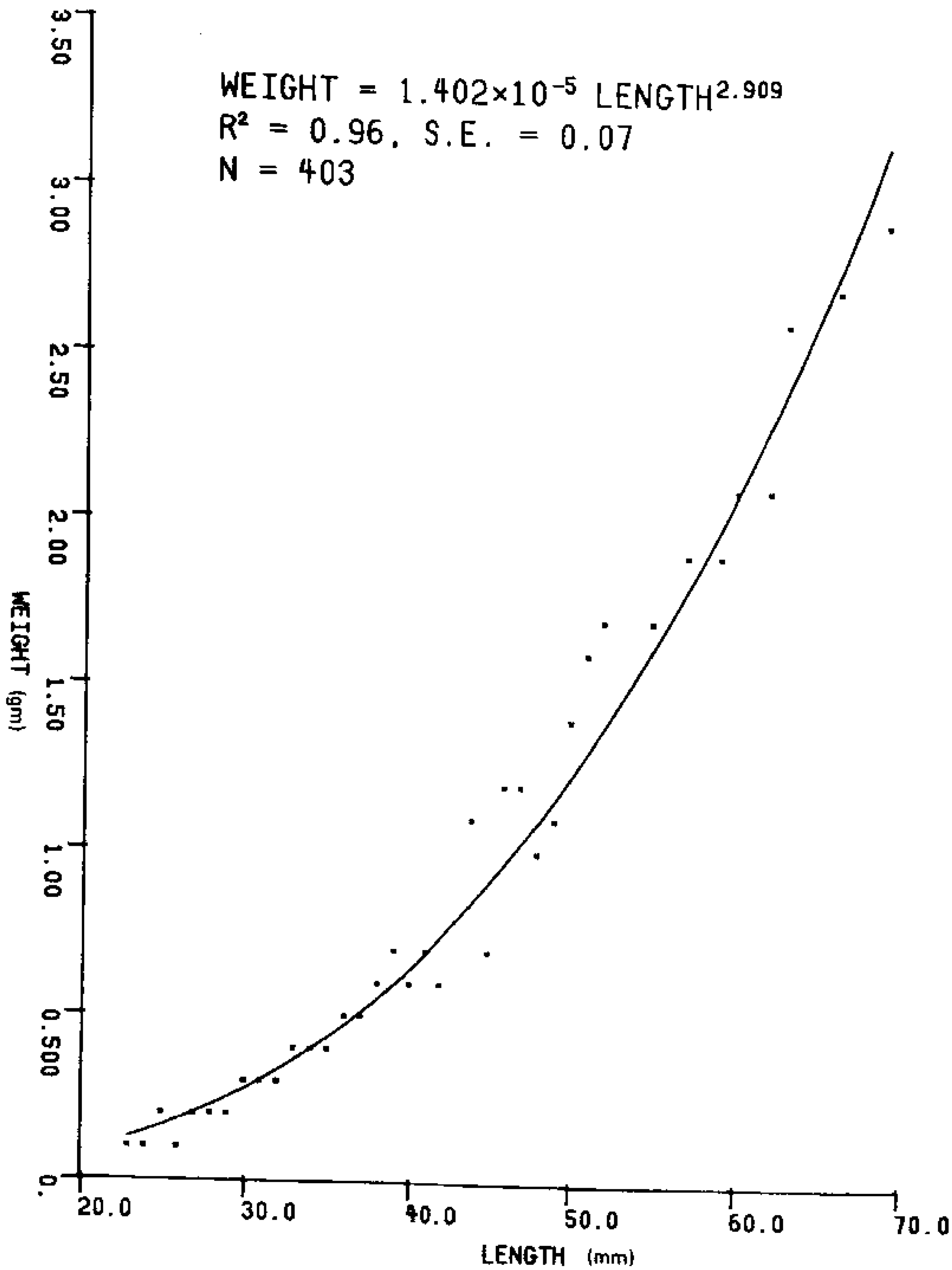
Appendix Figure 1. Length-weight regression for *Anchoa mitchilli* from the Albemarle Sound.



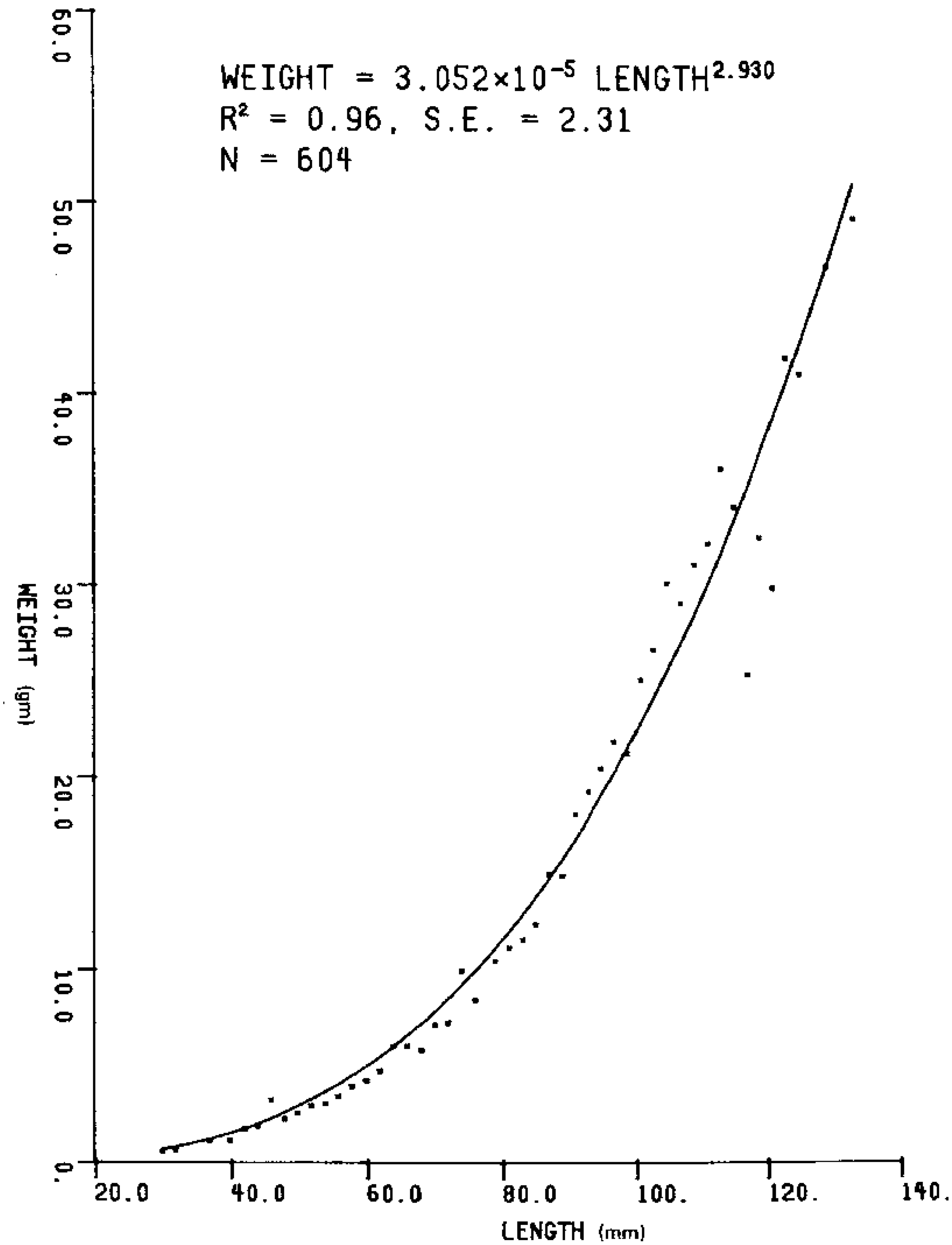
Appendix Figure 2. Length-weight regression for *Micropogon undulatus* from the Albemarle Sound.



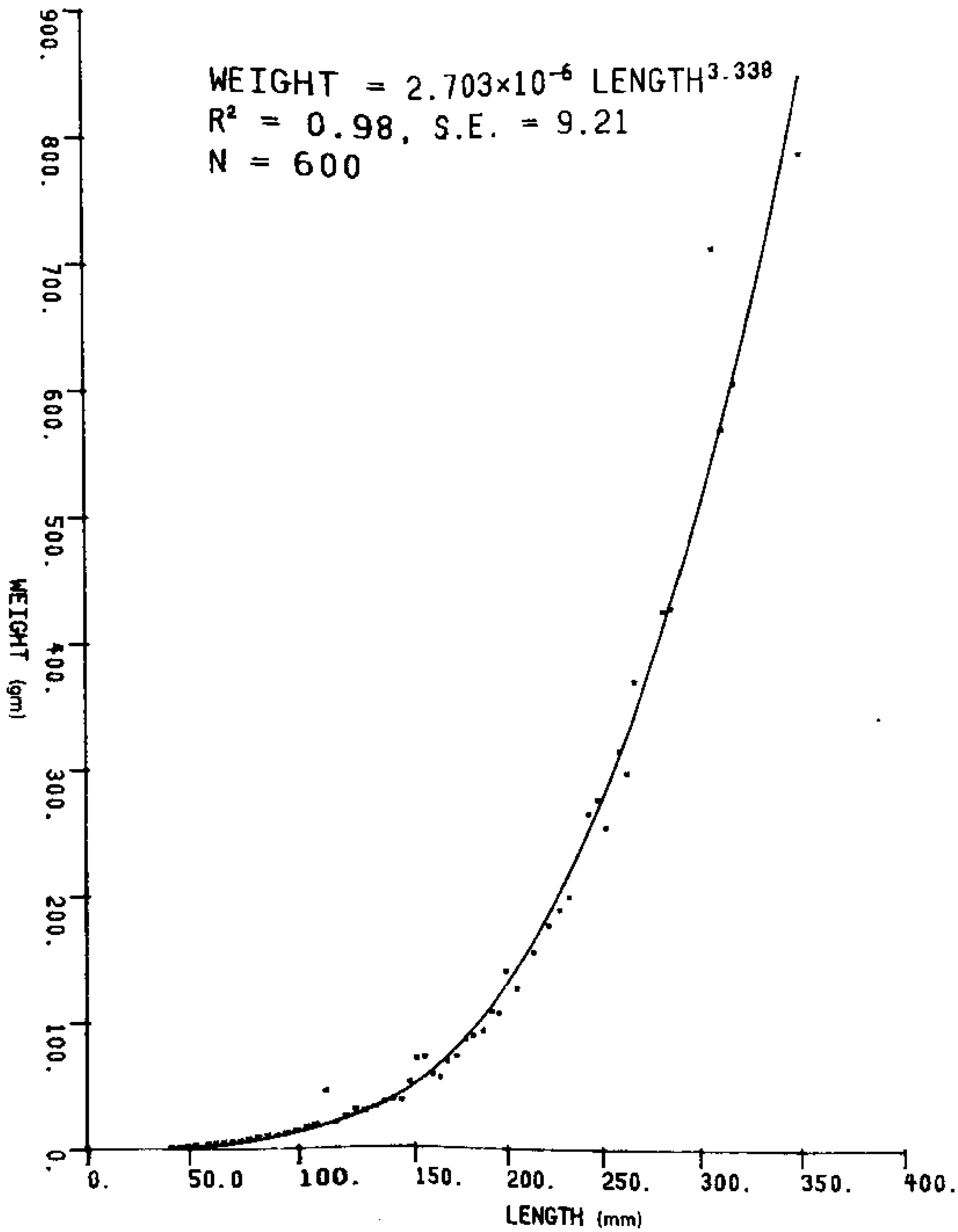
Appendix Figure 3. Length-weight regression for *Morone americana* from the Albemarle Sound.



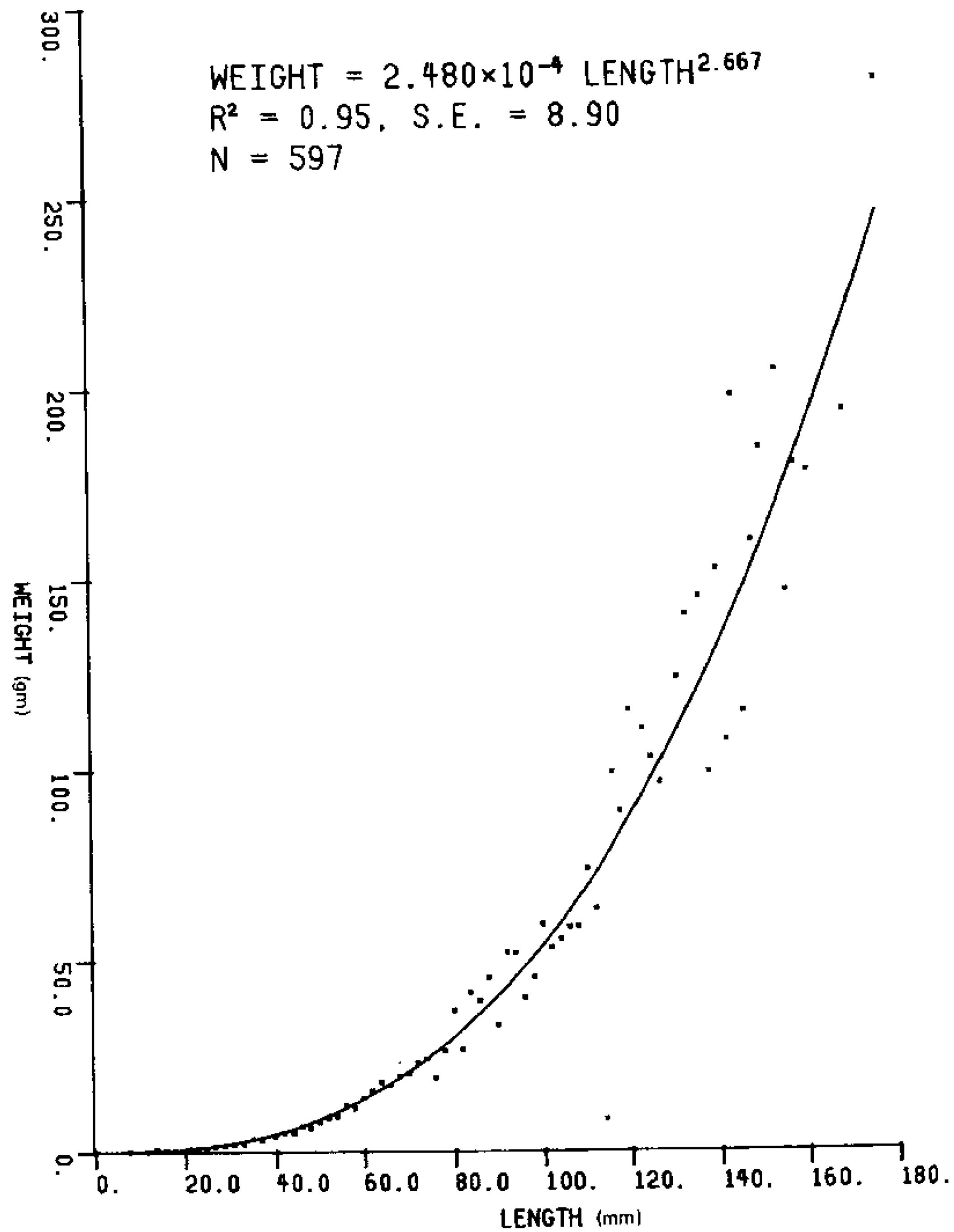
Appendix Figure 4. Length-weight regression for *Alosa aestivalis* from the Albemarle Sound.



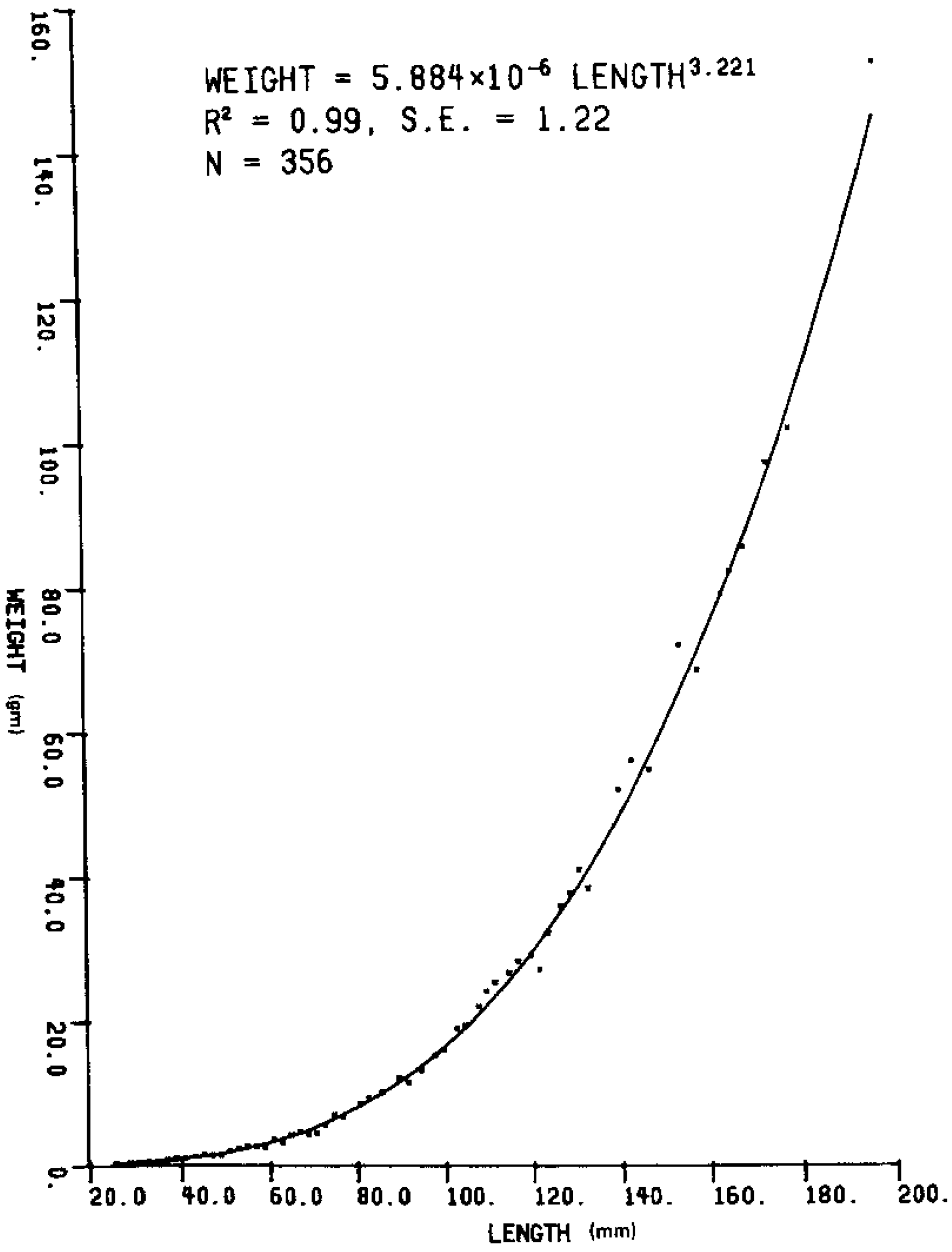
Appendix Figure 5. Length-weight regression for *Trinectes maculatus* from the Albemarle Sound.



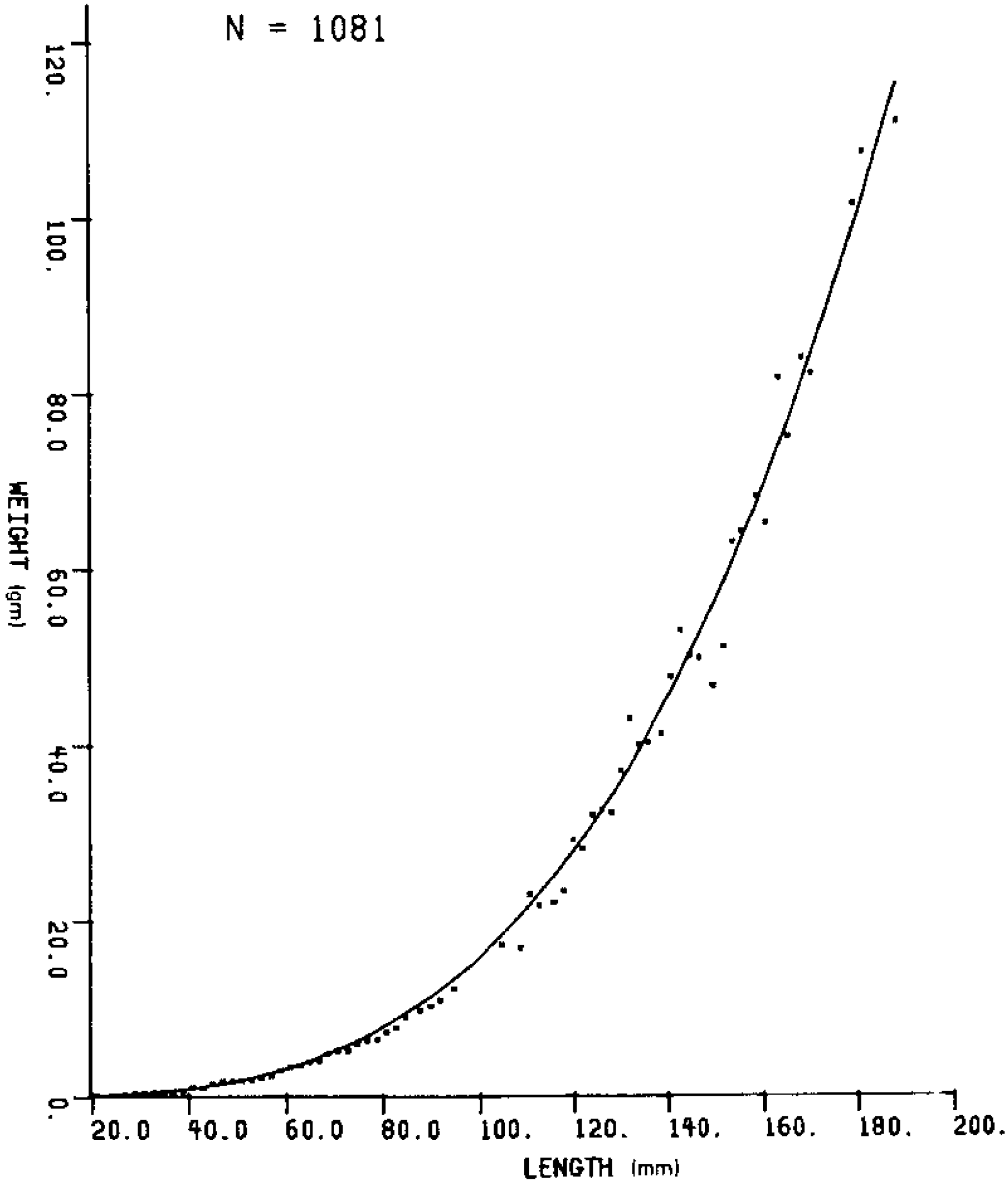
Appendix Figure 6. Length-weight regression for *Ictalurus catus* from the Albemarle Sound.



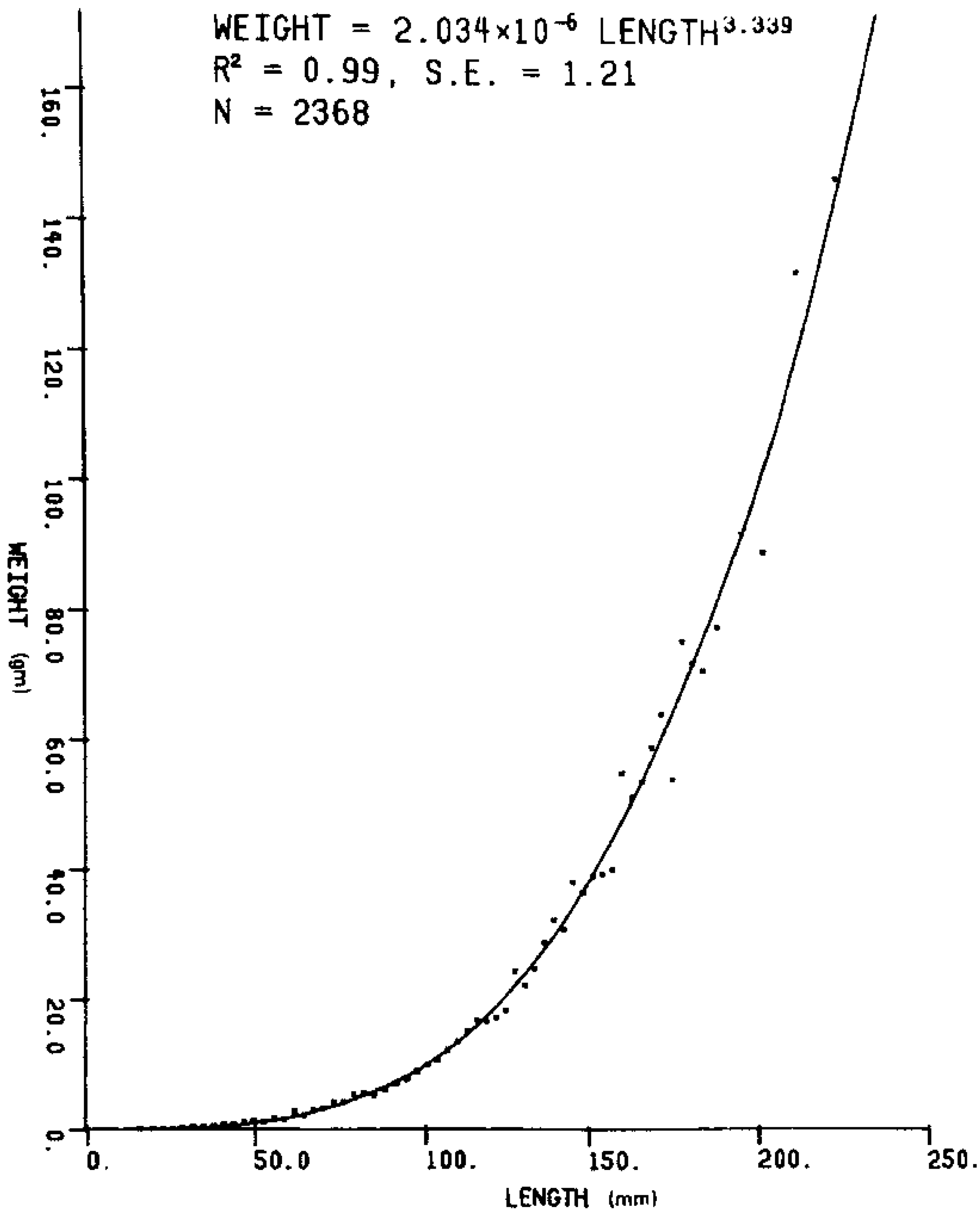
Appendix Figure 7. Length-weight regression for *Callinectes sapidus* from the Albemarle Sound.



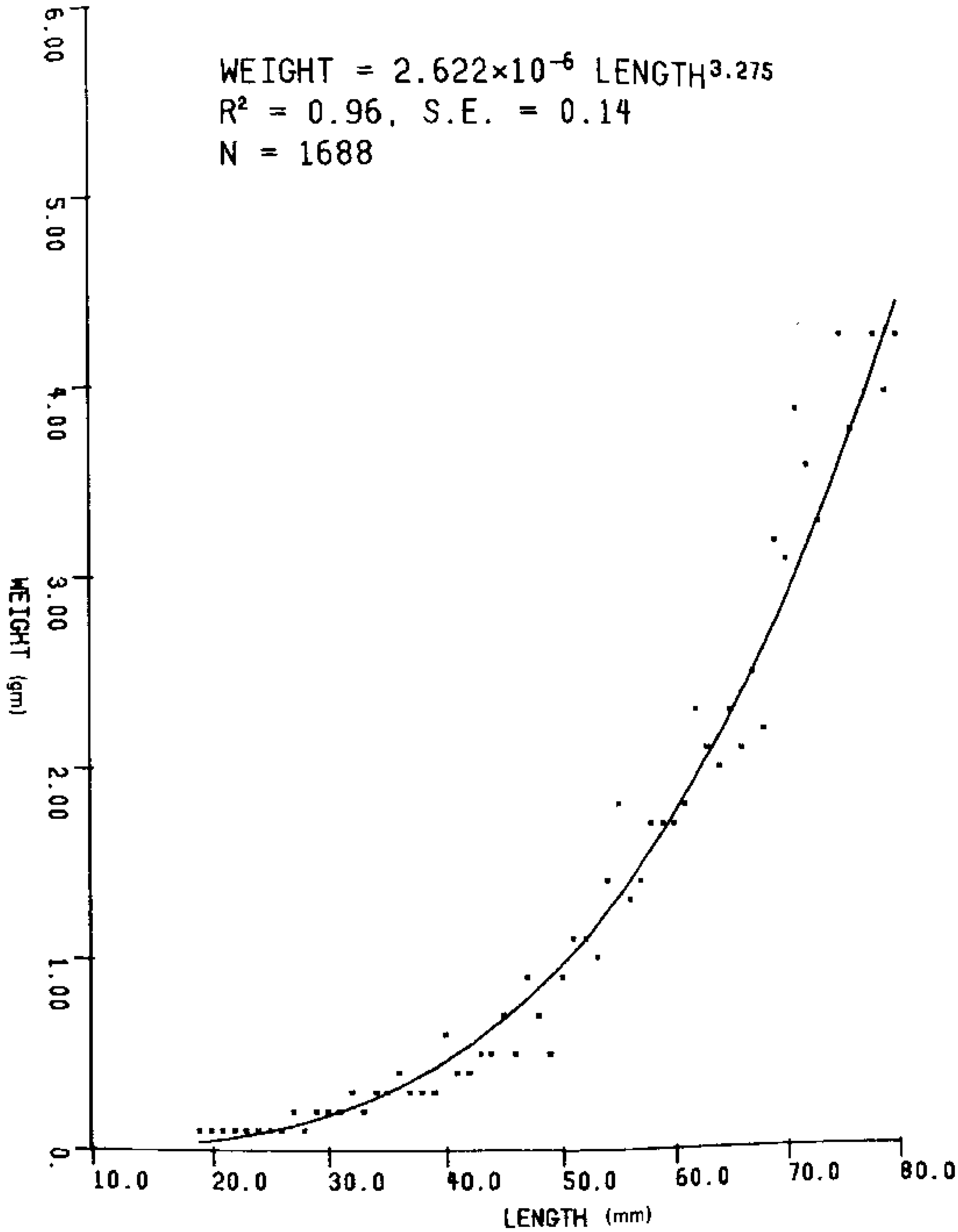
Appendix Figure 8. Length-weight regression for *Leiostomus xanthurus* from the Albemarle Sound.



Appendix Figure 9. Length-weight regression for *Leiostomus xanthurus* from the Neuse River estuary.



Appendix Figure 10. Length-weight regression for *Micropogon undulatus* from the Neuse River estuary.



Appendix Figure 11. Length-weight regression for *Anchoa mitchilli* from the Neuse River estuary.

Appendix C. Listing of Original Data

Key to Appendix C

SP: Species
DATE: Day, month, year
L: Location
S: Station
TOT-NO: Total number
TOT-WT: Total weight
CHL-A: Chlorophyll a
SAL: Salinity (ppt)
TEMP: Temperature (degrees C)
D-O: Dissolved oxygen (ml/l)

LOCATION CODE: 1 - Albemarle Sound, 2 - Neuse River Estuary

TOTAL WEIGHT CODE: Insert decimal before last digit

SPECIES CODE:

001 Alosa aestivalis
002 Alosa psuedoharengus
003 Brevoortia tyrannus
004 Dorosoma cepedianum
005 Opisthonema oglinum
006 Anchoa mitchilli
007 Morone americana
008 Morone saxatilis
009 Leiostomus xanthurus
010 Micropogon undulatus
011 Bairdella chrysura
012 Perca flavescens
013 Menticirrhus americanus
014 Paralichthys lethostigma
015 Ictalurus catus
016 Ictalurus punctatus
017 Ictalurus nebulosus
018 Trinectes maculatus
019 Anguilla rostrata
020 Pomatomus saltatrix
021 Lagodon rhomboides
022 Amia calva
023 Peprilus alepidotus
024 Sygnathus fuscus
025 Eucinostomus argenteus
026 Symphurus plagiusa
027 Notropis sp.
028 Lepomis gibbosus
029 Etheostoma olhmsteadi
030 Cynoscion regalis
031 Eucinostomus argenteus
032 Sciaenops ocellata
033 Mugil cephalus
034 Sciaenops ocellata
035 Urophycis chuss
036 Urophycis regius
037 Paralichthys dentatus
038 Lepisosteus osseus
039 Monocanthus hispidus
101 Callinectes sapidus
102 Callinectes similis
103 Penaeus aztecus
104 Penaeus duorarum
105 Penaeus setiferus
106 Rithropanopeus harrisii
107 Palaemonetes pugio
108 Palaemonetes vulgaris
109 Rithropanopeus harrisii

SP	DATE	L	S	IDI-NO	IDI-WI	CHL-A	SAL	TEMP	D-O
1	80273	1	2	1	3	-1	1.4	8.6	-1
1	260972	1	3	10	9	6.89	-1	-1	-1
1	110673	1	5	92	34	4.33	-1	-1	6.03
1	230672	1	7	60	20	4.49	0.0	23.0	6.39
1	260772	1	7	17	10	4.81	0.2	28.3	5.06
1	61272	1	7	5	10	1.60	0.7	9.8	7.70
1	110673	1	7	15	4	4.33	0.0	26.0	5.55
1	110673	1	8	3	1	2.40	0.0	26.0	5.36
1	110673	1	9	83	29	4.00	0.0	27.0	5.27
1	260672	1	11	11	3	5.13	0.4	22.5	6.82
1	270772	1	11	7	4	9.30	0.0	28.7	5.60
1	110673	1	11	5	1	4.33	0.0	27.0	5.18
1	260672	1	12	2	1	8.98	0.0	23.0	4.26
1	270972	1	12	18	23	1.92	0.0	23.4	6.16
1	260672	1	13	48	13	4.81	0.0	24.3	6.62
1	310872	1	13	1	1	7.69	0.0	26.4	5.22
1	110673	1	13	185	36	3.20	0.0	27.0	5.23
1	260672	1	14	1	0	29.67	0.0	23.7	6.61
1	170173	1	14	1	3	-1	0.0	3.3	-1
1	110673	1	14	97	24	17.64	0.0	-1	5.07
1	260672	1	15	62	17	12.83	0.0	23.2	4.52
1	260772	1	15	1	1	43.30	0.0	28.2	6.03
1	170173	1	15	1	2	-1	0.0	3.3	-1
2	30473	1	4	2	13	8.33	7.0	12.0	7.49
2	230672	1	5	1	3	2.88	1.2	23.1	6.61
2	60273	1	5	4	38	-1	0.4	7.3	-1
2	60273	1	7	3	26	-1	0.2	7.2	-1
2	180173	1	9	1	9	-1	0.0	3.4	-1
2	110673	1	9	1	2	4.00	0.0	27.0	5.27
2	40473	1	10	2	17	5.13	0.0	13.0	7.12
2	30473	1	12	1	17	4.00	0.0	13.0	6.71
2	70273	1	13	1	10	-1	0.0	8.0	-1
2	110673	1	14	38	30	17.64	0.0	-1	5.07
2	260672	1	15	2	3	12.83	0.0	23.2	4.52

SP	DATE	L S	TOI-NO	TOI-WT	CHL-A	SAL	TEMP	D-O
2	110673	115	1	1	12.83	0.0	27.0	5.36
3	230672	1 4	9	18	3.20	1.9	23.9	6.05
3	130373	1 4	2	70	4.49	1.2	10.3	7.33
3	30473	1 4	11	1	8.33	7.0	12.0	7.49
3	110673	1 4	4	4	5.61	0.0	26.0	4.91
3	230672	1 5	3	4	2.88	1.2	23.1	6.61
3	30473	1 5	43	5	3.52	0.0	13.0	4.96
3	80573	1 5	4	2	8.01	0.0	19.0	5.97
3	110673	1 5	5	3	4.33	-1	-1	6.03
3	230672	1 7	6	5	4.49	0.0	23.0	6.39
3	30473	1 7	4	36	5.13	0.0	12.0	5.30
3	110673	1 7	1	1	4.33	0.0	26.0	5.55
3	260672	1 8	13	26	4.81	1.0	22.1	6.18
3	40473	1 8	8	78	4.00	0.0	13.0	7.26
3	110673	1 8	1	1	2.40	0.0	26.0	5.36
3	30473	1 9	10	2	4.16	0.0	14.0	7.26
3	110673	1 9	4	5	4.00	0.0	27.0	5.27
3	110673	110	8	15	2.72	0.0	26.0	5.23
3	260672	111	1	1	5.13	0.4	22.5	6.82
3	80573	114	1	0	19.24	0.0	19.0	5.55
3	90573	115	4	2	29.67	0.0	19.0	5.77
4	60273	1 5	1	23	-1	0.4	7.3	-1
4	130373	1 5	1	20	1.60	0.8	11.1	7.47
4	170173	114	2	74	-1	0.0	3.3	-1
4	51272	115	4	72	2.40	0.0	9.0	7.24
4	170173	115	2	109	-1	0.0	3.3	-1
4	70273	115	9	283	-1	0.0	7.4	-1
4	120373	115	1	37	1.28	0.0	12.7	7.15
4	90573	115	1	47	29.67	0.0	19.0	5.77
5	180173	1 7	1	15	-1	0.0	5.5	-1
5	170173	1 8	1	5	-1	0.5	2.8	-1
5	170173	110	1	8	-1	0.4	2.9	-1
6	171072	1 2	3	2	2.08	1.0	20.6	5.27
6	201172	1 2	2	1	3.36	1.9	11.9	6.53

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
6	51272	1	2	2	1	0.80	1.9	9.5	7.32
6	80273	1	2	20	9	-1	1.4	8.6	-1
6	70573	1	2	4	5	2.72	0.0	19.0	5.59
6	100673	1	2	4	3	1.60	-1	-1	5.05
6	250772	1	3	2	1	2.40	1.0	29.3	5.06
6	260972	1	3	2	0	6.89	-1	-1	-1
6	171072	1	3	3	2	6.89	2.4	20.1	6.09
6	201172	1	3	4	3	3.36	2.3	11.1	6.99
6	51272	1	3	1	0	3.20	1.9	9.2	7.78
6	80273	1	3	2	1	-1	1.2	8.6	-1
6	120373	1	3	1	1	4.00	1.2	12.0	7.21
6	20473	1	3	53	37	4.00	0.5	14.0	7.22
6	70573	1	3	138	87	7.34	0.0	19.0	6.27
6	100673	1	3	25	15	1.76	0.0	27.0	5.28
6	250772	1	4	47	13	3.52	1.2	29.2	5.27
6	290872	1	4	55	11	10.42	0.9	27.5	4.56
6	260972	1	4	197	42	9.62	-1	-1	5.71
6	171072	1	4	4	2	9.62	2.9	21.1	5.71
6	151172	1	4	2	1	5.13	1.7	14.2	6.86
6	51272	1	4	32	8	4.81	1.7	9.0	8.06
6	180173	1	4	1	0	-1	0.0	3.8	-1
6	130373	1	4	105	65	4.49	1.2	10.3	7.33
6	30473	1	4	153	102	8.33	7.0	12.0	7.49
6	80573	1	4	49	32	9.94	0.0	18.5	5.99
6	110673	1	4	5	3	5.61	0.0	26.0	4.91
6	250772	1	5	30	3	3.20	0.6	28.7	5.46
6	290872	1	5	37	8	5.61	0.2	26.9	5.14
6	171072	1	5	11	2	4.81	2.1	20.7	6.03
6	151172	1	5	40	14	3.21	1.4	14.4	6.63
6	30473	1	5	67	50	3.52	0.0	13.0	4.96
6	80573	1	5	329	136	8.01	0.0	19.0	5.97
6	110673	1	5	25	11	4.33	-1	-1	6.03
6	260772	1	7	45	4	4.81	0.2	28.3	5.06
6	270972	1	7	1	0	2.72	2.3	23.6	6.06

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
6	171072	1	7	3	1	2.72	1.2	20.4	6.06
6	161172	1	7	5	2	5.61	1.2	12.9	6.76
6	61272	1	7	3	2	1.60	0.7	9.8	7.70
6	30473	1	7	115	103	5.13	0.0	12.0	5.30
6	80573	1	7	39	24	4.81	0.0	19.0	6.12
6	110673	1	7	3	2	4.33	0.0	26.0	5.55
6	270772	1	8	4	2	4.49	1.1	29.0	5.66
6	280972	1	8	17	5	5.13	1.9	23.7	5.78
6	191072	1	8	1	1	5.13	2.5	17.7	5.78
6	201172	1	8	5	3	2.08	2.5	12.1	6.85
6	51272	1	8	15	4	1.28	1.5	9.3	7.62
6	170173	1	8	1	2	-1	0.5	2.8	-1
6	40473	1	8	75	47	4.00	0.0	13.0	7.26
6	90573	1	8	14	9	3.20	0.0	19.0	6.15
6	110673	1	8	9	7	2.40	0.0	26.0	5.36
6	30473	1	9	1	1	4.16	0.0	14.0	7.26
6	80573	1	9	9	8	4.81	0.0	19.0	6.11
6	280972	1	10	34	-1	6.73	0.9	23.8	5.88
6	201172	1	10	4	2	5.93	0.8	11.8	7.22
6	40473	1	10	1	1	5.13	0.0	13.0	7.12
6	90573	1	10	7	6	4.00	0.0	19.0	6.25
6	110673	1	10	1	1	2.72	0.0	26.0	5.23
6	270772	1	11	1	0	9.30	0.0	28.7	5.60
6	300872	1	11	96	33	8.49	0.6	27.4	5.01
6	270972	1	11	56	25	6.73	0.9	23.5	5.78
6	181072	1	11	3	1	6.73	1.1	20.7	5.78
6	161172	1	11	1	0	9.30	0.0	13.4	7.23
6	80573	1	11	2	3	8.66	0.0	19.0	5.94
6	110673	1	11	20	19	4.33	0.0	27.0	5.18
6	260772	1	12	1	1	21.33	0.0	29.7	5.90
6	270972	1	12	33	12	1.92	0.0	23.4	6.16
6	161172	1	12	1	1	0.80	0.0	13.2	6.52
6	110673	1	12	3	4	8.01	0.0	27.0	5.22
6	270972	1	13	1	0	1.12	0.0	23.4	5.69

SP	DATE	L	S	IOI-NO	IOI-WI	CHL-A	SAL	TEMP	D-O
6	310872	1	14	1	1	20.84	0.0	25.9	5.54
6	270972	1	14	5	4	13.63	0.0	23.6	6.13
6	110673	1	14	2	3	17.64	0.0	-1	5.07
6	90573	1	15	1	1	29.67	0.0	19.0	5.77
7	160173	1	2	1	3	-1	1.3	2.7	-1
7	80273	1	2	1	4	-1	1.4	8.6	-1
7	50373	1	2	6	139	6.98	0.9	12.4	1.48
7	20473	1	2	5	51	2.08	0.0	14.0	6.66
7	100673	1	2	1	28	1.60	-1	-1	5.05
7	51272	1	3	1	6	3.20	1.9	9.2	7.78
7	160173	1	3	3	14	-1	1.3	2.7	-1
7	120373	1	3	6	362	4.00	1.2	12.0	7.21
7	20473	1	3	2	104	4.00	0.5	14.0	7.22
7	70573	1	3	1	7	7.34	0.0	19.0	6.27
7	60273	1	4	3	378	-1	0.6	6.8	-1
7	30473	1	4	1	104	8.33	7.0	12.0	7.49
7	180173	1	5	1	6	-1	0.0	3.1	-1
7	60273	1	5	13	1003	-1	0.4	7.3	-1
7	130373	1	5	1	77	1.60	0.8	11.1	7.47
7	30473	1	5	1	50	3.52	0.0	13.0	4.96
7	230672	1	7	8	2	4.49	0.0	23.0	6.39
7	300872	1	7	6	22	1.60	0.3	27.4	4.94
7	61272	1	7	2	130	1.60	0.7	9.8	7.70
7	180173	1	7	2	149	-1	0.0	5.5	-1
7	60273	1	7	5	193	-1	0.2	7.2	-1
7	30473	1	7	3	151	5.13	0.0	12.0	5.30
7	51272	1	8	1	37	1.28	1.5	9.3	7.62
7	170173	1	8	9	678	-1	0.5	2.8	-1
7	70273	1	8	5	344	-1	0.0	6.9	-1
7	120373	1	8	6	420	2.40	0.4	10.4	7.68
7	260772	1	9	1	100	6.89	0.2	29.6	5.49
7	180173	1	9	12	322	-1	0.0	3.4	-1
7	60273	1	9	21	586	-1	0.2	7.0	-1
7	130373	1	9	1	6	2.08	0.2	10.5	7.61

SP	DATE	L S	IOI-NO	IOI-WI	CHL-A	SAL	TEMP	D-O
7	30473	1 9	1	52	4.16	0.0	14.0	7.26
7	170173	110	13	806	-1	0.4	2.9	-1
7	120373	110	13	793	4.33	0.1	9.9	7.94
7	40473	110	1	118	5.13	0.0	13.0	7.12
7	181072	111	1	32	6.73	1.1	20.7	5.78
7	170173	111	4	150	-1	0.0	3.2	-1
7	70273	111	1	81	-1	0.0	7.4	-1
7	120373	111	1	4	5.61	0.0	11.1	7.59
7	110673	111	1	0	4.33	0.0	27.0	5.18
7	260772	112	7	7	21.33	0.0	29.7	5.90
7	181072	112	10	610	1.92	0.0	21.4	6.16
7	170173	112	27	1048	-1	0.0	2.9	-1
7	70273	112	1	6	-1	0.0	7.5	-1
7	120373	112	11	251	1.92	0.0	11.9	7.68
7	30473	112	4	115	4.00	0.0	13.0	6.71
7	80573	112	1	6	5.77	0.0	19.0	5.29
7	110673	112	6	3	8.01	0.0	27.0	5.22
7	260672	113	7	1	4.81	0.0	24.3	6.62
7	270772	113	4	64	2.88	0.0	27.0	5.71
7	310872	113	15	430	7.69	0.0	26.4	5.22
7	181072	113	11	511	1.12	0.0	21.0	5.69
7	161172	113	1	53	0.64	0.0	12.4	5.65
7	170173	113	1	5	-1	0.0	4.0	-1
7	70273	113	3	100	-1	0.0	8.0	-1
7	120373	113	1	34	6.89	0.0	12.2	7.00
7	30473	113	1	7	11.72	0.0	15.0	7.01
7	110673	113	19	5	3.20	0.0	27.0	5.23
7	260672	114	23	591	29.67	0.0	23.7	6.61
7	280772	114	5	4	22.45	0.0	28.1	6.14
7	310872	114	145	7336	20.84	0.0	25.9	5.54
7	270972	114	1	3	13.63	0.0	23.6	6.13
7	181072	114	35	1383	13.63	0.0	21.4	6.13
7	161172	114	25	1047	5.13	0.0	12.9	6.47
7	61272	114	17	863	0.64	0.0	8.3	7.36

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
7	170173	1	14	15	624	-1	0.0	3.3	-1
7	70273	1	14	34	1143	-1	0.0	7.0	-1
7	30473	1	14	12	179	9.14	0.0	14.0	6.62
7	80573	1	14	29	1433	19.24	0.0	19.0	5.55
7	110673	1	14	8	56	17.64	0.0	-1	5.07
7	260672	1	15	5	225	12.83	0.0	23.2	4.52
7	260772	1	15	5	235	43.30	0.0	28.2	6.03
7	300872	1	15	9	221	8.82	0.0	27.8	5.36
7	161072	1	15	32	1453	4.49	0.1	21.0	5.91
7	161172	1	15	54	2889	6.73	0.0	12.8	6.19
7	51272	1	15	73	3637	2.40	0.0	9.0	7.24
7	170173	1	15	248	10233	-1	0.0	3.3	-1
7	70273	1	15	172	8594	-1	0.0	7.4	-1
7	120373	1	15	8	342	1.28	0.0	12.7	7.15
7	30473	1	15	14	422	5.13	0.0	14.0	6.71
7	90573	1	15	7	217	29.67	0.0	19.0	5.77
7	110673	1	15	49	242	12.83	0.0	27.0	5.36
8	80273	1	2	1	12	-1	1.4	8.6	-1
8	290872	1	3	1	6	4.81	0.8	27.1	4.90
8	160173	1	3	1	16	-1	1.3	2.7	-1
8	180173	1	4	1	15	-1	0.0	3.8	-1
8	290872	1	5	5	16	5.61	0.2	26.9	5.14
8	260672	1	8	5	485	4.81	1.0	22.1	6.18
8	260672	1	10	1	61	3.68	0.7	22.8	6.29
8	161172	1	12	1	6	0.80	0.0	13.2	6.52
8	260672	1	13	1	0	4.81	0.0	24.3	6.62
9	230672	1	2	1	5	1.12	0.5	23.0	5.50
9	70573	1	2	2	1	2.72	0.0	19.0	5.59
9	100673	1	2	35	76	1.60	-1	-1	5.05
9	230672	1	3	2	14	2.08	1.2	22.5	5.62
9	290872	1	3	1	42	4.81	0.8	27.1	4.90
9	171072	1	3	1	49	6.89	2.4	20.1	6.09
9	70573	1	3	18	13	7.34	0.0	19.0	6.27
9	100673	1	3	5	14	1.76	0.0	27.0	5.28

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
9	230672	1	4	1	1	3.20	1.9	23.9	6.05
9	171072	1	4	2	154	9.62	2.9	21.1	5.71
9	80573	1	4	16	161	9.94	0.0	18.5	5.99
9	110673	1	4	99	296	5.61	0.0	26.0	4.91
9	230672	1	5	1	9	2.88	1.2	23.1	6.61
9	290872	1	5	10	573	5.61	0.2	26.9	5.14
9	80573	1	5	22	16	8.01	0.0	19.0	5.97
9	110673	1	5	21	48	4.33	-1	-1	6.03
9	260772	1	7	2	24	4.81	0.2	28.3	5.06
9	300872	1	7	5	106	1.60	0.3	27.4	4.94
9	80573	1	7	8	54	4.81	0.0	19.0	6.12
9	110673	1	7	11	34	4.33	0.0	26.0	5.55
9	260672	1	8	7	167	4.81	1.0	22.1	6.18
9	280972	1	8	1	38	5.13	1.9	23.7	5.78
9	191072	1	8	5	196	5.13	2.5	17.7	5.78
9	90573	1	8	5	5	3.20	0.0	19.0	6.15
9	110673	1	8	25	54	2.40	0.0	26.0	5.36
9	270672	1	9	8	46	4.16	0.7	23.5	5.85
9	300872	1	9	13	521	1.92	0.2	27.5	5.35
9	270972	1	9	1	84	1.60	0.7	23.0	5.81
9	280972	1	10	1	36	6.73	0.9	23.8	5.88
9	110673	1	10	69	181	2.72	0.0	26.0	5.23
9	300872	1	11	17	360	8.49	0.6	27.4	5.01
9	270972	1	11	4	101	6.73	0.9	23.5	5.78
9	181072	1	11	1	24	6.73	1.1	20.7	5.78
9	110673	1	11	1	1	4.33	0.0	27.0	5.18
9	270972	1	12	2	86	1.92	0.0	23.4	6.16
9	181072	1	12	1	64	1.92	0.0	21.4	6.16
-1	260972	1	5	-1	-1	4.81	2.0	23.0	6.03
-1	130373	1	7	-1	-1	2.56	0.5	10.4	7.45
-1	51272	1	12	-1	-1	0.64	0.0	8.9	6.85
-1	270972	1	15	-1	-1	4.49	0.0	23.6	5.91
10	230672	1	2	18	46	1.12	0.5	23.0	5.50
10	250772	1	2	5	29	1.60	0.9	29.6	4.64

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
10	290872	1	2	33	134	2.08	0.9	27.6	4.67
10	171072	1	2	3	20	2.08	1.0	20.6	5.27
10	201172	1	2	8	131	3.36	1.9	11.9	6.53
10	160173	1	2	22	311	-1	1.3	2.7	-1
10	80273	1	2	5	49	-1	1.4	8.6	-1
10	20473	1	2	1	13	2.08	0.0	14.0	6.66
10	70573	1	2	4	2	2.72	0.0	19.0	5.59
10	100673	1	2	262	362	1.60	-1	-1	5.05
10	230672	1	3	47	148	2.08	1.2	22.5	5.62
10	250772	1	3	4	27	2.40	1.0	29.3	5.06
10	201172	1	3	3	29	3.36	2.3	11.1	6.99
10	51272	1	3	14	167	3.20	1.9	9.2	7.78
10	160173	1	3	5	70	-1	1.3	2.7	-1
10	80273	1	3	1	0	-1	1.2	8.6	-1
10	70573	1	3	29	45	7.34	0.0	19.0	6.27
10	100673	1	3	36	75	1.76	0.0	27.0	5.28
10	230672	1	4	15	73	3.20	1.9	23.9	6.05
10	250772	1	4	3	16	3.52	1.2	29.2	5.27
10	290872	1	4	3	7	10.42	0.9	27.5	4.56
10	260972	1	4	23	82	9.62	-1	-1	5.71
10	171072	1	4	24	155	9.62	2.9	21.1	5.71
10	151172	1	4	6	79	5.13	1.7	14.2	6.86
10	51272	1	4	3	39	4.81	1.7	9.0	8.06
10	60273	1	4	2	0	-1	0.6	6.8	-1
10	30473	1	4	7	3	8.33	7.0	12.0	7.49
10	80573	1	4	46	35	9.94	0.0	18.5	5.99
10	110673	1	4	48	83	5.61	0.0	26.0	4.91
10	230672	1	5	3	13	2.88	1.2	23.1	6.61
10	250772	1	5	1	7	3.20	0.6	28.7	5.46
10	290872	1	5	38	361	5.61	0.2	26.9	5.14
10	171072	1	5	2	50	4.81	2.1	20.7	6.03
10	130373	1	5	1	2	1.60	0.8	11.1	7.47
10	30473	1	5	9	8	3.52	0.0	13.0	4.96
10	80573	1	5	40	60	8.01	0.0	19.0	5.97

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
10	110673	1	5	55	115	4.33	-1	-1	6.03
10	230672	1	7	16	44	4.49	0.0	23.0	6.39
10	260772	1	7	3	24	4.81	0.2	28.3	5.06
10	300872	1	7	15	154	1.60	0.3	27.4	4.94
10	270972	1	7	1	0	2.72	2.3	23.6	6.06
10	171072	1	7	4	18	2.72	1.2	20.4	6.06
10	180173	1	7	1	16	-1	0.0	5.5	-1
10	30473	1	7	10	8	5.13	0.0	12.0	5.30
10	80573	1	7	25	52	4.81	0.0	19.0	6.12
10	110673	1	7	43	72	4.33	0.0	26.0	5.55
10	260672	1	8	9	63	4.81	1.0	22.1	6.18
10	10972	1	8	72	644	19.30	0.6	25.0	5.02
10	280972	1	8	6	30	5.13	1.9	23.7	5.78
10	191072	1	8	11	103	5.13	2.5	17.7	5.78
10	201172	1	8	2	15	2.08	2.5	12.1	6.85
10	51272	1	8	2	5	1.28	1.5	9.3	7.62
10	170173	1	8	11	73	-1	0.5	2.8	-1
10	40473	1	8	4	5	4.00	0.0	13.0	7.26
10	90573	1	8	5	8	3.20	0.0	19.0	6.15
10	110673	1	8	434	588	2.40	0.0	26.0	5.36
10	300872	1	9	7	81	1.92	0.2	27.5	5.35
10	30473	1	9	1	0	4.16	0.0	14.0	7.26
10	260672	1	10	4	27	3.68	0.7	22.8	6.29
10	270772	1	10	1	14	7.69	0.6	28.7	5.33
10	10972	1	10	35	380	13.36	0.7	25.1	4.63
10	280972	1	10	6	104	6.73	0.9	23.8	5.88
10	191072	1	10	1	14	6.73	1.0	18.1	5.88
10	170173	1	10	19	129	-1	0.4	2.9	-1
10	90573	1	10	1	1	4.00	0.0	19.0	6.25
10	110673	1	10	162	247	2.72	0.0	26.0	5.23
10	260672	1	11	4	20	5.13	0.4	22.5	6.82
10	270772	1	11	2	12	9.30	0.0	28.7	5.60
10	300872	1	11	28	184	8.49	0.6	27.4	5.01
10	270972	1	11	11	76	6.73	0.9	23.5	5.78

SP	DATE	L S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
10	181072	111	6	43	6.73	1.1	20.7	5.78
10	161172	111	1	15	9.30	0.0	13.4	7.23
10	80573	111	2	3	8.66	0.0	19.0	5.94
10	110673	111	7	24	4.33	0.0	27.0	5.18
10	260772	112	8	38	21.33	0.0	29.7	5.90
10	181072	112	1	1	1.92	0.0	21.4	6.16
10	161172	112	1	10	0.80	0.0	13.2	6.52
10	80573	112	1	5	5.77	0.0	19.0	5.29
10	110673	112	12	33	8.01	0.0	27.0	5.22
10	310872	114	36	429	20.84	0.0	25.9	5.54
10	270972	114	3	24	13.63	0.0	23.6	6.13
10	260672	115	1	3	12.83	0.0	23.2	4.52
10	260772	115	5	28	43.30	0.0	28.2	6.03
10	300872	115	8	69	8.82	0.0	27.8	5.36
10	110673	115	13	41	12.83	0.0	27.0	5.36
11	290872	1 4	1	3	10.42	0.9	27.5	4.56
12	171072	1 2	1	97	2.08	1.0	20.6	5.27
12	201172	1 3	2	204	3.36	2.3	11.1	6.99
12	51272	1 3	1	5	3.20	1.9	9.2	7.78
12	80573	1 9	1	57	4.81	0.0	19.0	6.11
12	310872	113	1	105	7.69	0.0	26.4	5.22
12	181072	113	1	67	1.12	0.0	21.0	5.69
12	70273	113	4	191	-1	0.0	8.0	-1
12	110673	113	1	2	3.20	0.0	27.0	5.23
12	70273	114	1	48	-1	0.0	7.0	-1
14	171072	1 2	1	140	2.08	1.0	20.6	5.27
14	20473	1 2	3	155	2.08	0.0	14.0	6.66
14	201172	1 3	1	51	3.36	2.3	11.1	6.99
14	160173	1 3	1	96	-1	1.3	2.7	-1
14	120373	1 3	8	544	4.00	1.2	12.0	7.21
14	171072	1 4	1	139	9.62	2.9	21.1	5.71
14	151172	1 4	1	139	5.13	1.7	14.2	6.86
14	60273	1 4	7	547	-1	0.6	6.8	-1
14	110673	1 5	1	176	4.33	-1	-1	6.03

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
14	60273	1	7	1	45	-1	0.2	7.2	-1
14	260672	1	8	1	50	4.81	1.0	22.1	6.18
14	51272	1	8	1	128	1.28	1.5	9.3	7.62
14	170173	1	8	3	294	-1	0.5	2.8	-1
14	70273	1	8	3	330	-1	0.0	6.9	-1
14	300872	1	9	2	261	1.92	0.2	27.5	5.35
14	180173	1	9	1	62	-1	0.0	3.4	-1
14	60273	1	9	1	66	-1	0.2	7.0	-1
14	30473	1	9	1	48	4.16	0.0	14.0	7.26
14	191072	1	10	1	57	6.73	1.0	18.1	5.88
14	170173	1	11	2	239	-1	0.0	3.2	-1
14	270972	1	12	1	131	1.92	0.0	23.4	6.16
14	310872	1	13	1	61	7.69	0.0	26.4	5.22
14	181072	1	13	1	457	1.12	0.0	21.0	5.69
14	70273	1	13	1	122	-1	0.0	8.0	-1
14	310872	1	14	1	89	20.84	0.0	25.9	5.54
14	181072	1	14	1	84	13.63	0.0	21.4	6.13
14	70273	1	15	2	309	-1	0.0	7.4	-1
15	201172	1	2	1	3	3.36	1.9	11.9	6.53
15	51272	1	2	2	43	0.80	1.9	9.5	7.32
15	250772	1	3	1	26	2.40	1.0	29.3	5.06
15	120373	1	3	2	72	4.00	1.2	12.0	7.21
15	100673	1	3	1	10	1.76	0.0	27.0	5.28
15	260972	1	4	1	198	9.62	-1	-1	5.71
15	130373	1	4	1	94	4.49	1.2	10.3	7.33
15	180173	1	5	1	177	-1	0.0	3.1	-1
15	60273	1	5	2	68	-1	0.4	7.3	-1
15	130373	1	5	2	432	1.60	0.8	11.1	7.47
15	110673	1	5	1	15	4.33	-1	-1	6.03
15	230672	1	7	1	126	4.49	0.0	23.0	6.39
15	300872	1	7	1	83	1.60	0.3	27.4	4.94
15	180173	1	7	1	315	-1	0.0	5.5	-1
15	60273	1	7	1	53	-1	0.2	7.2	-1
15	120373	1	8	1	712	2.40	0.4	10.4	7.68

SP	DATE	L S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
15	180173	1 9	1	6	-1	0.0	3.4	-1
15	60273	1 9	1	78	-1	0.2	7.0	-1
15	130373	1 9	2	55	2.08	0.2	10.5	7.61
15	30473	1 9	2	56	4.16	0.0	14.0	7.26
15	10972	110	1	40	13.36	0.7	25.1	4.63
15	191072	110	1	190	6.73	1.0	18.1	5.88
15	201172	110	3	1093	5.93	0.8	11.8	7.22
15	70273	110	3	210	-1	0.1	7.9	-1
15	40473	110	2	103	5.13	0.0	13.0	7.12
15	90573	110	2	57	4.00	0.0	19.0	6.25
15	170173	111	2	53	-1	0.0	3.2	-1
15	120373	111	1	145	5.61	0.0	11.1	7.59
15	30473	111	1	5	5.61	0.0	13.9	7.07
15	181072	112	3	852	1.92	0.0	21.4	6.16
15	170173	112	1	6	-1	0.0	2.9	-1
15	30473	112	4	25	4.00	0.0	13.0	6.71
15	310872	113	32	313	7.69	0.0	26.4	5.22
15	181072	113	8	89	1.12	0.0	21.0	5.69
15	161172	113	6	82	0.64	0.0	12.4	5.65
15	51272	113	1	5	0.96	0.0	9.0	6.70
15	120373	113	1	73	6.89	0.0	12.2	7.00
15	30473	113	5	425	11.22	0.0	15.0	7.01
15	80573	113	1	161	6.41	0.0	19.0	5.34
15	110673	113	2	194	3.20	0.0	27.0	5.23
15	260672	114	6	85	29.67	0.0	23.7	6.61
15	280772	114	4	4	22.45	0.0	28.1	6.14
15	310872	114	42	2064	20.84	0.0	25.9	5.54
15	270972	114	6	202	13.63	0.0	23.6	6.13
15	181072	114	15	891	13.63	0.0	21.4	6.13
15	161172	114	53	1291	5.13	0.0	12.9	6.47
15	61272	114	116	5654	0.64	0.0	8.3	7.36
15	170173	114	1	55	-1	0.0	3.3	-1
15	70273	114	45	1018	-1	0.0	7.0	-1
15	120373	114	13	165	4.49	0.0	12.1	6.67

SP	DATE	L S	IOI-NO	IOI-WI	CHL-A	SAL	TEMP	D-O
15	30473	114	14	384	9.14	0.0	14.0	6.62
15	80573	114	8	100	19.24	0.0	19.0	5.55
15	110673	114	2	19	17.64	0.0	-1	5.07
15	260672	115	2	38	12.83	0.0	23.2	4.52
15	260772	115	4	330	43.30	0.0	28.2	6.03
15	300872	115	10	504	8.82	0.0	27.8	5.36
15	161072	115	9	99	4.49	0.1	21.0	5.91
15	161172	115	21	712	6.73	0.0	12.8	6.19
15	51272	115	8	736	2.40	0.0	9.0	7.24
15	170173	115	39	3752	-1	0.0	3.3	-1
15	70273	115	62	1837	-1	0.0	7.4	-1
15	120373	115	4	36	1.28	0.0	12.7	7.15
15	30473	115	14	371	5.13	0.0	14.0	6.71
15	90573	115	7	75	29.67	0.0	19.0	5.77
15	110673	115	1	25	12.93	0.0	27.0	5.36
16	310872	114	7	445	20.84	0.0	25.9	5.54
16	161072	114	1	157	13.63	0.0	21.4	6.13
16	161172	114	3	651	5.13	0.0	12.9	6.47
16	70273	114	1	441	-1	0.0	7.0	-1
16	90573	114	1	204	19.24	0.0	19.0	5.55
16	110673	114	1	182	17.64	0.0	-1	5.07
16	161172	115	1	3	6.73	0.0	12.8	6.19
16	51272	115	1	635	2.40	0.0	9.0	7.24
16	170173	115	1	580	-1	0.0	3.3	-1
16	70273	115	1	198	-1	0.0	7.4	-1
16	110673	115	2	367	12.83	0.0	27.0	5.36
17	60273	1 5	1	140	-1	0.4	7.3	-1
17	230672	1 7	1	60	4.49	0.0	23.0	6.39
17	310872	113	1	70	7.69	0.0	26.4	5.22
17	260672	114	1	97	29.67	0.0	23.7	6.61
17	310872	114	5	838	20.84	0.0	25.9	5.54
17	170173	115	1	305	-1	0.0	3.3	-1
17	70273	115	3	42	-1	0.0	7.4	-1
18	230672	1 2	40	1227	1.12	0.5	23.0	5.50

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
18	250772	1	2	23	708	1.60	0.9	29.6	4.64
18	290872	1	2	9	122	2.08	0.9	27.6	4.67
18	260972	1	2	8	202	2.08	-1	-1	5.27
18	171072	1	2	2	50	2.08	1.0	20.6	5.27
18	201172	1	2	8	188	3.36	1.9	11.9	6.53
18	51272	1	2	11	163	0.80	1.9	9.5	7.32
18	50373	1	2	3	31	6.98	0.9	12.4	1.48
18	20473	1	2	7	178	2.08	0.0	14.0	6.66
18	70573	1	2	1	33	2.72	0.0	19.0	5.59
18	100673	1	2	44	984	1.60	-1	-1	5.05
18	230672	1	3	13	214	2.08	1.2	22.5	5.62
18	250772	1	3	2	44	2.40	1.0	29.3	5.06
18	290872	1	3	1	21	4.81	0.8	27.1	4.90
18	260972	1	3	1	21	6.89	-1	-1	-1
18	171072	1	3	3	77	6.89	2.4	20.1	6.09
18	51272	1	3	2	53	3.20	1.9	9.2	7.78
18	80273	1	3	2	26	-1	1.2	8.6	-1
18	120373	1	3	6	139	4.00	1.2	12.0	7.21
18	20473	1	3	2	34	4.00	0.5	14.0	7.22
18	70573	1	3	4	79	7.34	0.0	19.0	6.27
18	100673	1	3	1	11	1.76	0.0	27.0	5.28
18	230672	1	4	9	152	3.20	1.9	23.9	6.05
18	250772	1	4	1	12	3.52	1.2	29.2	5.27
18	260972	1	4	1	11	9.62	-1	-1	5.71
18	171072	1	4	5	141	9.62	2.9	21.1	5.71
18	151172	1	4	7	135	5.13	1.7	14.2	6.86
18	51272	1	4	4	79	4.81	1.7	9.0	8.06
18	60273	1	4	3	50	-1	0.6	6.8	-1
18	130373	1	4	2	30	4.49	1.2	10.3	7.33
18	30473	1	4	2	38	8.33	7.0	12.0	7.49
18	80573	1	4	9	223	9.94	0.0	18.5	5.99
18	110673	1	4	2	31	5.61	0.0	26.0	4.91
18	230672	1	5	1	10	2.88	1.2	23.1	6.61
18	250772	1	5	1	19	3.20	0.6	28.7	5.46

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
18	290872	1	5	6	81	5.61	0.2	26.9	5.14
18	171072	1	5	14	162	4.81	2.1	20.7	6.03
18	61272	1	5	1	6	1.12	1.1	9.6	7.68
18	110673	1	5	1	9	4.33	-1	-1	6.03
18	230672	1	7	5	75	4.49	0.0	23.0	6.39
18	260772	1	7	6	95	4.81	0.2	28.3	5.06
18	300872	1	7	1	2	1.60	0.3	27.4	4.94
18	270972	1	7	1	16	2.72	2.3	23.6	6.06
18	171072	1	7	17	174	2.72	1.2	20.4	6.06
18	60273	1	7	4	52	-1	0.2	7.2	-1
18	30473	1	7	12	170	5.13	0.0	12.0	5.30
18	80573	1	7	10	125	4.81	0.0	19.0	6.12
18	110673	1	7	2	17	4.33	0.0	26.0	5.55
18	260672	1	8	7	93	4.81	1.0	22.1	6.18
18	270772	1	8	2	22	4.49	1.1	29.0	5.66
18	10972	1	8	12	211	19.30	0.6	25.0	5.02
18	191072	1	8	11	245	5.13	2.5	17.7	5.78
18	201172	1	8	3	45	2.08	2.5	12.1	6.85
18	51272	1	8	1	23	1.28	1.5	9.3	7.62
18	70273	1	8	6	86	-1	0.0	6.9	-1
18	120373	1	8	6	108	2.40	0.4	10.4	7.68
18	90573	1	8	2	71	3.20	0.0	19.0	6.15
18	110673	1	8	1	9	2.40	0.0	26.0	5.36
18	270672	1	9	7	56	4.16	0.7	23.5	5.85
18	260772	1	9	3	6	6.89	0.2	29.6	5.49
18	300872	1	9	23	86	1.92	0.2	27.5	5.35
18	270972	1	9	9	66	1.60	0.7	23.0	5.81
18	61272	1	9	1	10	0.80	0.4	9.5	7.46
18	180173	1	9	1	5	-1	0.0	3.4	-1
18	60273	1	9	6	28	-1	0.2	7.0	-1
18	30473	1	9	14	75	4.16	0.0	14.0	7.26
18	80573	1	9	3	17	4.81	0.0	19.0	6.11
18	110673	1	9	5	42	4.00	0.0	27.0	5.27
18	260672	1	10	4	-1	3.68	0.7	22.8	6.29

SP	DATE	L_S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
18	10972	110	6	104	13.36	0.7	25.1	4.63
18	280972	110	2	-1	6.73	0.9	23.8	5.88
18	191072	110	3	49	6.73	1.0	18.1	5.88
18	40473	110	1	30	5.13	0.0	13.0	7.12
18	90573	110	2	44	4.00	0.0	19.0	6.25
18	260672	111	4	56	5.13	0.4	22.5	6.82
18	300872	111	1	3	8.49	0.6	27.4	5.01
18	170173	111	1	22	-1	0.0	3.2	-1
18	30473	111	1	18	5.61	0.0	13.9	7.07
18	80573	111	2	41	8.66	0.0	19.0	5.94
18	260772	112	1	2	21.33	0.0	29.7	5.90
18	300872	112	2	6	4.81	0.0	27.4	5.45
18	181072	112	1	18	1.92	0.0	21.4	6.16
18	161172	112	3	90	0.80	0.0	13.2	6.52
18	70273	112	1	19	-1	0.0	7.5	-1
18	30473	112	6	125	4.00	0.0	13.0	6.71
18	260672	113	1	21	4.81	0.0	24.3	6.62
18	270772	113	5	70	2.88	0.0	27.0	5.71
18	310872	113	6	82	7.69	0.0	26.4	5.22
18	270972	113	4	20	1.12	0.0	23.4	5.69
18	181072	113	2	36	1.12	0.0	21.0	5.69
18	170173	113	3	54	-1	0.0	4.0	-1
18	120373	113	1	9	6.89	0.0	12.2	7.00
18	110673	113	4	39	3.20	0.0	27.0	5.23
18	280772	114	7	127	22.45	0.0	28.1	6.14
18	310872	114	18	271	20.84	0.0	25.9	5.54
18	161172	114	13	351	5.13	0.0	12.9	6.47
18	61272	114	10	152	0.64	0.0	8.3	7.36
18	70273	114	1	6	-1	0.0	7.0	-1
18	120373	114	1	5	4.49	0.0	12.1	6.67
18	30473	114	13	164	9.14	0.0	14.0	6.62
18	80573	114	1	13	19.24	0.0	19.0	5.55
18	260672	115	1	12	12.83	0.0	23.2	4.52
18	260772	115	6	46	43.30	0.0	28.2	6.03

SP	DATE	L S	IOI-NO	IOI-WT	CHL-A	SAL	TEMP	D-O
18	300872	115	1	3	8.82	0.0	27.8	5.36
18	161072	115	14	228	4.49	0.1	21.0	5.91
18	161172	115	7	203	6.73	0.0	12.8	6.19
18	51272	115	1	8	2.40	0.0	9.0	7.24
18	170173	115	2	13	-1	0.0	3.3	-1
18	70273	115	5	47	-1	0.0	7.4	-1
18	120373	115	3	37	1.28	0.0	12.7	7.15
18	30473	115	4	74	5.13	0.0	14.0	6.71
18	110673	115	1	27	12.83	0.0	27.0	5.36
19	230672	1 2	3	17	1.12	0.5	23.0	5.50
19	290872	1 2	1	7	2.08	0.9	27.6	4.67
19	201172	1 2	2	170	3.36	1.9	11.9	6.53
19	51272	1 2	1	34	0.80	1.9	9.5	7.32
19	80273	1 2	2	214	-1	1.4	8.6	-1
19	50373	1 2	1	61	6.98	0.9	12.4	1.48
19	100673	1 2	1	67	1.60	-1	-1	5.05
19	230672	1 3	1	4	2.08	1.2	22.5	5.62
19	51272	1 3	1	37	3.20	1.9	9.2	7.78
19	160173	1 3	1	17	-1	1.3	2.7	-1
19	80273	1 3	3	231	-1	1.2	8.6	-1
19	70573	1 3	4	220	7.34	0.0	19.0	6.27
19	180173	1 4	1	181	-1	0.0	3.8	-1
19	60273	1 4	6	687	-1	0.6	6.8	-1
19	60273	1 5	2	47	-1	0.4	7.3	-1
19	130373	1 5	1	82	1.60	0.8	11.1	7.47
19	30473	1 5	5	158	3.52	0.0	13.0	4.96
19	60273	1 7	4	79	-1	0.2	7.2	-1
19	30473	1 7	3	72	5.13	0.0	12.0	5.30
19	170173	1 8	1	21	-1	0.5	2.8	-1
19	70273	1 8	4	232	-1	0.0	6.9	-1
19	120373	1 8	2	348	2.40	0.4	10.4	7.68
19	180173	1 9	1	57	-1	0.0	3.4	-1
19	60273	1 9	6	151	-1	0.2	7.0	-1
19	280972	110	1	-1	6.73	0.9	23.8	5.88

SP	DATE	L S	IOI-NO	IOI-WT	CHL-A	SAL	TEMP	D-O
19	170173	110	1	30	-1	0.4	2.9	-1
19	120373	110	1	8	4.33	0.1	9.9	7.94
19	40473	110	9	245	5.13	0.0	13.0	7.12
19	70273	112	1	7	-1	0.0	7.5	-1
19	120373	112	4	97	1.92	0.0	11.9	7.68
19	30473	112	2	64	4.00	0.0	13.0	6.71
19	270772	113	1	65	2.88	0.0	27.0	5.71
19	181072	113	1	28	1.12	0.0	21.0	5.69
19	70273	113	1	9	-1	0.0	8.0	-1
19	260672	114	2	53	29.67	0.0	23.7	6.61
19	280772	114	1	12	22.45	0.0	28.1	6.14
19	310872	114	19	1029	20.84	0.0	25.9	5.54
19	181072	114	6	346	13.63	0.0	21.4	6.13
19	161172	114	4	185	5.13	0.0	12.9	6.47
19	61272	114	5	189	0.64	0.0	8.3	7.36
19	70273	114	2	25	-1	0.0	7.0	-1
19	30473	114	1	20	9.14	0.0	14.0	6.62
19	80573	114	1	80	19.24	0.0	19.0	5.55
19	260772	115	2	38	43.30	0.0	28.2	6.03
19	300872	115	1	79	8.82	0.0	27.8	5.36
19	161172	115	2	67	6.73	0.0	12.8	6.19
19	51272	115	8	332	2.40	0.0	9.0	7.24
19	70273	115	15	482	-1	0.0	7.4	-1
19	120373	115	1	65	1.28	0.0	12.7	7.15
19	30473	115	1	60	5.13	0.0	14.0	6.71
19	110673	115	6	330	12.83	0.0	27.0	5.36
22	161072	115	1	534	4.49	0.1	21.0	5.91
26	260672	112	1	0	8.98	0.0	23.0	4.26
27	310872	113	1	1	7.69	0.0	26.4	5.22
28	160173	1 3	2	81	-1	1.3	2.7	-1
28	260772	1 9	1	61	6.89	0.2	29.6	5.49
28	180173	1 9	1	94	-1	0.0	3.4	-1
28	70273	114	1	142	-1	0.0	7.0	-1
28	170173	115	3	318	-1	0.0	3.3	-1

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
29	310872	1	13	1	1	7.69	0.0	26.4	5.22
29	270972	1	13	1	2	1.12	0.0	23.4	5.69
29	181072	1	13	1	2	1.12	0.0	21.0	5.69
29	170173	1	13	2	6	-1	0.0	4.0	-1
29	110673	1	13	1	29	3.20	0.0	27.0	5.23
29	310872	1	14	4	5	20.84	0.0	25.9	5.54
29	30473	1	14	1	3	9.14	0.0	14.0	6.62
29	260772	1	15	1	1	43.30	0.0	28.2	6.03
29	161072	1	15	1	2	4.49	0.1	21.0	5.91
29	170173	1	15	1	1	-1	0.0	3.3	-1
29	110673	1	15	2	1	12.83	0.0	27.0	5.36
30	250772	1	4	2	9	3.52	1.2	29.2	5.27
37	260672	1	10	1	68	3.68	0.7	22.8	6.29
38	170173	1	15	1	315	-1	0.0	3.3	-1
90	191072	1	8	5	196	5.13	2.5	17.7	5.78
101	230672	1	2	1	74	1.12	0.5	23.0	5.50
101	250772	1	2	2	174	1.60	0.9	29.6	4.64
101	290872	1	2	3	122	2.08	0.9	27.6	4.67
101	260972	1	2	2	102	2.08	-1	-1	5.27
101	171072	1	2	1	5	2.08	1.0	20.6	5.27
101	201172	1	2	1	40	3.36	1.9	11.9	6.53
101	51272	1	2	1	1	0.80	1.9	9.5	7.32
101	80273	1	2	2	15	-1	1.4	8.6	-1
101	20473	1	2	1	20	2.08	0.0	14.0	6.66
101	70573	1	2	1	84	2.72	0.0	19.0	5.59
101	100673	1	2	6	163	1.60	-1	-1	5.05
101	230672	1	3	16	485	2.08	1.2	22.5	5.62
101	250772	1	3	2	13	2.40	1.0	29.3	5.06
101	290872	1	3	16	662	4.81	0.8	27.1	4.90
101	260972	1	3	8	429	6.89	-1	-1	-1
101	171072	1	3	16	550	6.89	2.4	20.1	6.09
101	201172	1	3	7	91	3.36	2.3	11.1	6.99
101	51272	1	3	6	119	3.20	1.9	9.2	7.78
101	80273	1	3	6	72	-1	1.2	8.6	-1

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
101	120373	1	3	22	407	4.00	1.2	12.0	7.21
101	70573	1	3	1	21	7.34	0.0	19.0	6.27
101	100673	1	3	6	211	1.76	0.0	27.0	5.28
101	230672	1	4	7	442	3.20	1.9	23.9	6.05
101	250772	1	4	11	229	3.52	1.2	29.2	5.27
101	290872	1	4	1	6	10.42	0.9	27.5	4.56
101	260972	1	4	13	290	9.62	-1	-1	5.71
101	171072	1	4	5	199	9.62	2.9	21.1	5.71
101	151172	1	4	2	81	5.13	1.7	14.2	6.86
101	51272	1	4	4	25	4.81	1.7	9.0	8.06
101	30473	1	4	3	41	8.33	7.0	12.0	7.49
101	80573	1	4	9	271	9.94	0.0	18.5	5.99
101	110673	1	4	1	15	5.61	0.0	26.0	4.91
101	230672	1	5	2	25	2.88	1.2	23.1	6.61
101	250772	1	5	5	93	3.20	0.6	28.7	5.46
101	290872	1	5	2	37	5.61	0.2	26.9	5.14
101	171072	1	5	12	240	4.81	2.1	20.7	6.03
101	151172	1	5	2	22	3.21	1.4	14.4	6.63
101	61272	1	5	5	50	1.12	1.1	9.6	7.68
101	130373	1	5	14	286	1.60	0.8	11.1	7.47
101	30473	1	5	8	44	3.52	0.0	13.0	4.96
101	80573	1	5	4	218	8.01	0.0	19.0	5.97
101	110673	1	5	4	9	4.33	-1	-1	6.03
101	230672	1	7	7	324	4.49	0.0	23.0	6.39
101	260772	1	7	6	144	4.81	0.2	28.3	5.06
101	300872	1	7	10	256	1.60	0.3	27.4	4.94
101	270972	1	7	3	473	2.72	2.3	23.6	6.06
101	171072	1	7	12	410	2.72	1.2	20.4	6.06
101	161172	1	7	4	137	5.61	1.2	12.9	6.76
101	60273	1	7	1	1	-1	0.2	7.2	-1
101	30473	1	7	10	80	5.13	0.0	12.0	5.30
101	80573	1	7	2	79	4.81	0.0	19.0	6.12
101	110673	1	7	2	122	4.33	0.0	26.0	5.55
101	260672	1	8	8	375	4.81	1.0	22.1	6.18

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
101	270772	1	8	11	305	4.49	1.1	29.0	5.66
101	10972	1	8	18	135	19.30	0.6	25.0	5.02
101	280972	1	8	4	103	5.13	1.9	23.7	5.78
101	191072	1	8	10	493	5.13	2.5	17.7	5.78
101	201172	1	8	12	240	2.08	2.5	12.1	6.85
101	51272	1	8	16	407	1.28	1.5	9.3	7.62
101	170173	1	8	2	39	-1	0.5	2.8	-1
101	120373	1	8	14	277	2.40	0.4	10.4	7.68
101	90573	1	8	1	31	3.20	0.0	19.0	6.15
101	110673	1	8	17	988	2.40	0.0	26.0	5.36
101	270672	1	9	8	315	4.16	0.7	23.5	5.85
101	260772	1	9	8	417	6.89	0.2	29.6	5.49
101	300872	1	9	18	593	1.92	0.2	27.5	5.35
101	270972	1	9	23	1636	1.60	0.7	23.0	5.81
101	181072	1	9	27	673	1.60	1.0	21.1	5.81
101	161172	1	9	2	25	6.89	0.7	12.6	5.74
101	61272	1	9	1	3	0.80	0.4	9.5	7.46
101	130373	1	9	2	34	2.08	0.2	10.5	7.61
101	30473	1	9	7	128	4.16	0.0	14.0	7.26
101	80573	1	9	1	3	4.81	0.0	19.0	6.11
101	110673	1	9	2	117	4.00	0.0	27.0	5.27
101	260672	1	10	4	-1	3.68	0.7	22.8	6.29
101	10972	1	10	25	1166	13.36	0.7	25.1	4.63
101	280972	1	10	8	-1	6.7	0.9	23.8	35.
101	191072	1	10	17	1701	6.73	1.0	18.1	5.88
101	51272	1	10	2	22	1.12	0.4	9.3	7.24
101	120373	1	10	3	39	4.33	0.1	9.9	7.94
101	40473	1	10	2	25	5.13	0.0	13.0	7.12
101	260672	1	11	1	11	5.13	0.4	22.5	6.82
101	270772	1	11	2	158	9.30	0.0	28.7	5.60
101	300872	1	11	5	57	8.49	0.6	27.4	5.01
101	270972	1	11	4	64	6.73	0.9	23.5	5.78
101	181072	1	11	3	61	6.73	1.1	20.7	5.78
101	51272	1	11	1	4	0.64	0.0	9.2	7.54

SP	DATE	L S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
101	120373	111	3	35	5.61	0.0	11.1	7.59
101	260772	112	1	38	21.33	0.0	29.7	5.90
101	300872	112	4	82	4.81	0.0	27.4	5.45
101	270972	112	3	116	1.92	0.0	23.4	6.16
101	181072	112	1	3	1.92	0.0	21.4	6.16
101	30473	112	1	2	4.00	0.0	13.0	6.71
101	260672	113	1	83	4.81	0.0	24.3	6.62
101	270772	113	1	58	2.88	0.0	27.0	5.71
101	310872	113	2	113	7.69	0.0	26.4	5.22
101	270972	113	2	128	1.12	0.0	23.4	5.69
101	161172	113	1	11	0.64	0.0	12.4	5.65
101	110673	113	1	63	3.20	0.0	27.0	5.23
101	280772	114	1	100	22.45	0.0	28.1	6.14
101	260772	115	1	28	43.30	0.0	28.2	6.03
103	290872	1 2	3	20	2.08	0.9	27.6	4.67
103	250772	1 4	1	9	3.52	1.2	29.2	5.27
107	100673	1 2	2	1	1.60	-1	-1	5.05
109	201172	1 3	1	0	3.36	2.3	11.1	6.99
109	51272	1 3	1	1	3.20	1.9	9.2	7.78
109	120373	1 3	1	0	4.00	1.2	12.0	7.21
109	120373	111	1	3	5.61	0.0	11.1	7.59
2	230273	2 5	1	5	1.82	0.0	5.0	8.12
2	230273	211	1	8	2.15	1.6	4.7	7.76
2	230273	212	11	62	15.71	8.9	4.9	8.38
2	230273	216	2	22	7.50	10.3	3.5	8.25
2	230273	217	3	20	5.01	10.5	4.2	8.40
3	230273	2 6	1	8	1.06	1.6	4.5	8.10
3	250773	2 6	1	15	21.65	7.8	28.0	5.22
3	230273	2 9	9	126	1.84	4.1	5.0	8.14
3	120473	211	1	23	4.38	3.4	13.7	6.46
3	250773	211	1	2	14.31	14.4	26.0	4.95
3	230273	212	2	50	15.71	8.9	4.9	8.38
3	230273	213	3	35	5.72	11.2	4.2	7.63
3	211172	215	1	12	5.93	14.5	12.7	6.17

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
3	230273	2	16	8	104	7.50	10.3	3.5	8.25
3	120473	2	16	1	28	29.64	11.0	13.6	6.19
3	230273	2	17	16	183	5.01	10.5	4.2	8.40
5	211172	2	7	1	14	9.62	3.9	11.9	7.47
5	230273	2	12	6	59	15.71	8.9	4.9	8.38
5	230273	2	14	1	3	7.50	10.4	4.3	8.11
6	130872	2	3	26	5	8.82	2.6	27.7	.30
6	121072	2	3	8	4	26.06	10.0	20.8	-1
6	211172	2	3	2	1	3.20	3.2	12.6	6.24
6	141272	2	3	9	3	1.44	9.7	11.1	4.40
6	130872	2	4	61	9	14.25	6.6	26.8	4.53
6	121072	2	4	24	11	18.56	10.0	21.0	4.59
6	211172	2	4	1	0	6.09	6.4	13.2	6.79
6	141272	2	4	11	3	2.40	8.4	11.5	5.57
6	150373	2	4	1	0	4.49	0.3	18.7	5.60
6	130872	2	5	2	1	13.63	7.0	27.0	5.56
6	121072	2	5	6	4	18.44	10.4	20.2	5.58
6	211172	2	5	10	4	18.44	3.3	12.5	6.85
6	141272	2	5	6	2	2.40	10.0	11.8	5.95
6	230273	2	5	2	1	1.82	0.0	5.0	8.12
6	150373	2	5	2	0	5.77	0.4	18.4	5.99
6	130872	2	6	66	21	19.24	8.8	27.4	4.63
6	121072	2	6	17	10	11.90	10.6	20.1	5.56
6	211172	2	6	2	1	17.96	6.0	13.2	6.98
6	230273	2	6	18	7	1.06	1.6	4.5	8.10
6	150373	2	6	4	4	3.20	0.4	17.7	5.84
6	130872	2	7	5	1	11.22	16.0	27.8	3.64
6	211172	2	7	8	6	9.62	3.9	11.9	7.47
6	141272	2	7	1	0	13.63	9.6	11.8	5.71
6	230273	2	7	13	6	2.04	1.5	4.8	7.76
6	150373	2	7	24	8	8.01	0.9	17.0	6.56
6	120473	2	7	2	1	4.29	0.2	13.9	6.15
6	250773	2	7	8	3	18.10	8.9	28.0	5.13
6	210873	2	7	48	27	30.92	7.4	30.3	2.95

SP	DATE	L	S	IOI-NO	IOI-WT	CHL-A	SAL	TEMP	D-O
6	130872	2	8	42	9	8.33	15.2	27.9	1.77
6	121072	2	8	2	3	29.14	9.9	19.3	6.83
6	211172	2	8	9	12	20.04	6.7	12.8	6.70
6	230273	2	8	1	1	1.80	2.6	5.0	7.98
6	150373	2	8	2	1	9.14	1.2	17.1	6.56
6	170573	2	8	1	1	33.67	4.6	22.4	4.78
6	250773	2	8	4	4	12.60	10.0	27.0	4.52
6	130872	2	9	226	75	8.33	11.8	28.1	4.62
6	121072	2	9	37	37	8.57	13.5	18.8	5.87
6	211172	2	9	1	1	5.93	8.7	11.9	7.12
6	141272	2	9	58	40	29.67	9.1	11.9	5.58
6	230273	2	9	10	5	1.84	4.1	5.0	8.14
6	150373	2	9	7	2	17.80	5.0	13.0	5.05
6	250773	2	9	31	11	12.02	11.7	26.5	4.63
6	130872	2	10	26	3	10.08	17.8	28.0	1.46
6	121072	2	10	13	15	10.88	13.8	19.3	5.66
6	211172	2	10	3	3	10.42	8.8	12.7	7.01
6	141272	2	10	6	2	30.79	8.1	11.6	5.86
6	230273	2	10	1	1	1.60	2.2	4.3	7.63
6	150373	2	10	2	1	11.70	7.7	9.8	5.02
6	120473	2	10	1	1	5.76	1.0	13.7	6.42
6	250773	2	10	13	8	12.02	12.2	26.0	5.03
6	130872	2	11	10	3	8.01	18.1	28.7	4.96
6	121072	2	11	19	28	7.50	13.7	18.7	5.66
6	141272	2	11	16	17	39.29	10.8	11.3	5.12
6	230273	2	11	1	1	2.15	1.6	4.7	7.76
6	120473	2	11	11	14	4.38	3.4	13.7	6.46
6	170573	2	11	10	22	8.80	6.8	21.9	5.35
6	110673	2	11	5	7	9.30	22.7	28.4	4.09
6	250773	2	11	73	66	14.31	14.4	26.0	4.95
6	210873	2	11	7	6	14.91	14.0	28.6	3.86
6	130872	2	12	34	15	11.45	13.4	27.6	3.69
6	121072	2	12	14	6	7.01	13.9	20.1	5.37
6	141272	2	12	58	61	2.40	9.9	12.0	6.39

SP	DATE	L S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
6	230273	212	10	5	15.71	8.9	4.9	8.38
6	150373	212	12	10	25.33	5.2	13.6	4.96
6	120473	212	33	25	32.16	4.2	14.3	5.80
6	170573	212	6	11	14.75	5.0	22.4	4.99
6	110673	212	15	28	10.74	11.8	26.5	2.46
6	250773	212	45	53	17.64	15.0	28.5	4.71
6	210873	212	53	45	20.84	11.5	29.5	4.20
6	121072	213	3	4	8.41	15.1	19.3	5.20
6	141272	213	2	1	8.82	9.2	11.9	6.34
6	230273	213	247	398	5.72	11.2	4.2	7.63
6	120473	213	1	5	15.12	5.7	13.4	6.48
6	250773	213	13	10	13.63	15.0	26.5	4.85
6	121072	214	11	14	7.21	15.7	19.2	5.68
6	211172	214	4	3	5.93	14.4	12.8	6.72
6	141272	214	3	0	7.53	12.9	11.7	5.61
6	230273	214	29	42	7.50	10.4	4.3	8.11
6	120473	214	6	7	55.44	6.4	13.8	6.55
6	250773	214	13	13	10.90	16.7	26.0	4.84
6	121072	215	73	75	9.02	16.4	18.6	5.38
6	211172	215	9	9	5.93	14.5	12.7	6.17
6	141272	215	3	1	4.00	12.6	11.7	5.85
6	230273	215	68	91	9.89	10.9	4.6	7.86
6	120473	215	4	7	29.50	9.9	13.8	6.36
6	110673	215	1	1	9.62	16.9	26.3	4.60
6	250773	215	23	21	12.83	16.7	25.0	4.02
6	130872	216	216	130	5.61	16.4	27.7	5.07
6	121072	216	13	16	8.33	16.8	19.0	5.10
6	141272	216	12	20	5.13	13.3	11.5	6.67
6	230273	216	119	172	7.50	10.3	3.5	8.25
6	120473	216	5	8	29.64	11.0	13.6	6.19
6	110673	216	4	3	5.61	12.5	26.7	2.24
6	250773	216	15	12	12.02	17.2	25.0	4.90
6	130872	217	11	3	9.16	16.5	27.8	4.92
6	121072	217	29	7	5.61	16.5	18.9	5.56

SP	DATE	L S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
6	141272	217	2	1	7.85	14.3	11.3	5.09
6	230273	217	71	69	5.01	10.5	4.2	8.40
6	120473	217	9	13	16.07	9.0	13.2	5.74
6	170573	217	1	1	8.01	9.9	20.0	4.28
6	250773	217	12	13	10.02	17.8	25.0	4.79
6	210873	217	2	2	7.21	17.9	28.3	1.30
7	230273	2 5	1	4	1.82	0.0	5.0	8.12
9	170573	2 3	2	2	6.41	6.1	21.2	4.54
9	110673	2 3	2	8	6.41	8.2	26.4	3.43
9	121072	2 4	1	31	18.56	10.0	21.0	4.59
9	170573	2 4	48	72	8.01	7.0	21.3	4.79
9	110673	2 4	1	7	16.35	2.1	28.0	4.59
9	170573	2 5	55	79	14.43	6.6	21.0	5.77
9	110673	2 5	19	91	21.65	2.4	28.1	4.22
9	120473	2 6	1	0	2.64	0.1	14.2	6.06
9	170573	2 6	1	3	23.25	7.6	21.1	5.59
9	230273	2 7	1	45	2.04	1.5	4.8	7.76
9	120473	2 7	63	34	4.29	0.2	13.9	6.15
9	170573	2 7	75	64	19.85	4.6	22.6	4.50
9	110673	2 7	7	25	22.71	8.6	26.7	1.19
9	250773	2 7	13	39	18.10	8.9	28.0	5.13
9	210873	2 7	5	26	30.92	7.4	30.3	2.95
9	121072	2 8	2	50	29.14	9.9	19.3	6.83
9	120473	2 8	9	5	11.51	0.2	13.7	6.63
9	170573	2 8	209	185	33.67	4.6	22.4	4.78
9	110673	2 8	1	8	14.11	15.0	25.4	2.43
9	250773	2 8	4	9	12.60	10.0	27.0	4.52
9	130872	2 9	5	58	8.33	11.8	28.1	4.62
9	230273	2 9	17	744	1.84	4.1	5.0	8.14
9	120473	2 9	11	36	5.61	0.5	13.5	6.45
9	170573	2 9	200	316	33.67	5.9	23.6	5.41
9	250773	2 9	12	39	12.02	11.7	26.5	4.63
9	120473	210	1	0	5.76	1.0	13.7	6.42
9	170573	210	25	43	23.25	8.7	22.0	4.41

SP	DATE	L_S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
9	130872	211	1	28	8.01	18.1	28.7	4.96
9	141272	211	6	215	39.29	10.8	11.3	5.12
9	120473	211	69	1087	4.38	3.4	13.7	6.46
9	170573	211	316	503	8.80	6.8	21.9	5.35
9	110673	211	70	288	9.30	22.7	28.4	4.09
9	250773	211	16	66	14.31	14.4	26.0	4.95
9	210873	211	3	17	14.91	14.0	28.6	3.86
9	130872	212	1	20	11.45	13.4	27.6	3.69
9	150373	212	1	121	25.33	5.2	13.6	4.96
9	120473	212	606	758	32.16	4.2	14.3	5.80
9	170573	212	241	350	14.75	5.0	22.4	4.99
9	110673	212	32	82	10.74	11.8	26.5	2.46
9	250773	212	3	13	17.64	15.0	28.5	4.71
9	230273	213	3	124	5.72	11.2	4.2	7.63
9	120473	213	7	411	15.12	5.7	13.4	6.48
9	250773	213	7	32	13.63	15.0	26.5	4.85
9	230273	214	2	76	7.50	10.4	4.3	8.11
9	120473	214	4	207	55.44	6.4	13.8	6.55
9	170573	214	2	5	8.82	13.2	21.0	0.24
9	250773	214	3	18	10.90	16.7	26.0	4.84
9	121072	215	1	84	9.02	16.4	18.6	5.38
9	230273	215	1	11	9.89	10.9	4.6	7.86
9	120473	215	3	169	29.50	9.9	13.8	6.36
9	110673	215	12	48	9.62	16.9	26.3	4.60
9	250773	215	6	30	12.83	16.7	25.0	4.02
9	121072	216	1	36	8.33	16.8	19.0	5.10
9	230273	216	4	136	7.50	10.3	3.5	8.25
9	120473	216	1	66	29.64	11.0	13.6	6.19
9	170573	216	1	2	7.21	13.7	21.5	5.03
9	110673	216	13	48	5.61	12.5	26.7	2.24
9	250773	216	3	16	12.02	17.2	25.0	4.90
9	130872	217	2	22	9.16	16.5	27.8	4.92
9	121072	217	2	55	5.61	16.5	18.9	5.56
9	230273	217	1	41	5.01	10.5	4.2	8.40

SP	DATE	L S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
9	120473	217	35	449	16.07	9.0	13.2	5.74
9	170573	217	1435	2261	8.01	9.9	20.0	4.28
9	110673	217	203	609	8.33	17.0	26.1	1.61
9	250773	217	31	132	10.02	17.8	25.0	4.79
-1	230273	2 3	-1	-1	0.60	0.0	5.4	7.79
-1	250773	2 3	-1	-1	26.46	3.9	27.5	5.14
-1	210873	2 3	-1	-1	37.68	11.0	30.0	3.53
-1	250773	2 4	-1	-1	78.64	5.0	27.5	5.25
-1	210873	2 4	-1	-1	48.11	11.1	29.4	0.99
-1	250773	2 5	-1	-1	25.60	6.1	28.0	5.42
-1	210873	2 5	-1	-1	28.29	9.4	30.1	0.87
-1	141272	2 6	-1	-1	2.40	9.0	11.4	6.17
-1	110673	2 6	-1	-1	36.56	13.5	25.0	1.37
-1	210873	2 6	-1	-1	18.29	12.0	30.6	1.50
-1	210873	2 8	-1	-1	16.03	14.3	29.8	2.85
-1	110673	2 9	-1	-1	9.78	16.9	25.0	1.04
-1	210873	2 9	-1	-1	16.03	15.7	28.7	3.31
-1	110673	210	-1	-1	11.38	18.0	25.2	2.09
-1	210873	210	-1	-1	14.91	16.0	28.9	4.56
-1	211172	212	-1	-1	5.61	11.9	12.5	6.69
-1	110673	213	-1	-1	6.41	21.1	24.5	0.60
-1	210873	213	-1	-1	9.46	16.2	27.8	2.85
-1	110673	214	-1	-1	7.69	22.7	24.1	1.57
-1	210873	214	-1	-1	8.01	16.5	27.2	4.25
-1	130872	215	-1	-1	6.09	14.2	27.7	4.90
-1	170573	215	-1	-1	10.74	14.0	20.6	0.38
10	121072	2 3	9	96	26.06	10.0	20.8	-1
10	211172	2 3	1	0	3.20	3.2	12.6	6.24
10	141272	2 3	1	3	1.44	9.7	11.1	4.40
10	150373	2 3	13	83	4.00	0.1	18.0	5.36
10	120473	2 3	53	301	1.49	0.1	14.3	5.49
10	170573	2 3	8	15	6.41	6.1	21.2	4.54
10	110673	2 3	2	5	6.41	8.2	26.4	3.43
10	121072	2 4	1	7	18.56	10.0	21.0	4.59

SP	DATE	L	S	IOI-NO	IOI-WI	CHL-A	SAL	TEMP	D-O
10	211172	2	4	1	2	6.09	6.4	13.2	6.79
10	150373	2	4	56	208	4.49	0.3	18.7	5.60
10	120473	2	4	69	152	2.20	0.0	14.9	5.88
10	170573	2	4	68	55	8.01	7.0	21.3	4.79
10	110673	2	4	4	15	16.35	2.1	28.0	4.59
10	130872	2	5	1	29	13.63	7.0	27.0	5.56
10	121072	2	5	4	62	18.44	10.4	20.2	5.58
10	211172	2	5	10	168	18.44	3.3	12.5	6.85
10	150373	2	5	68	181	5.77	0.4	18.4	5.99
10	120473	2	5	23	158	1.37	0.1	13.6	6.34
10	170573	2	5	13	30	14.43	6.6	21.0	5.77
10	110673	2	5	33	94	21.65	2.4	28.1	4.22
10	121072	2	6	2	49	11.90	10.6	20.1	5.56
10	230273	2	6	56	63	1.06	1.6	4.5	8.10
10	150373	2	6	34	106	3.20	0.4	17.7	5.84
10	120473	2	6	25	154	2.64	0.1	14.2	6.06
10	170573	2	6	3	8	23.25	7.6	21.1	5.59
10	250773	2	6	23	217	21.65	7.8	28.0	5.22
10	211172	2	7	2	34	9.62	3.9	11.9	7.47
10	141272	2	7	1	1	13.63	9.6	11.8	5.71
10	230273	2	7	34	92	2.04	1.5	4.8	7.76
10	150373	2	7	128	550	8.01	0.9	17.0	6.56
10	120473	2	7	191	509	4.29	0.2	13.9	6.15
10	170573	2	7	113	99	19.85	4.6	22.6	4.50
10	110673	2	7	20	93	22.71	8.6	26.7	1.19
10	210873	2	7	6	62	30.92	7.4	30.3	2.95
10	121072	2	8	6	122	29.14	9.9	19.3	6.83
10	211172	2	8	10	67	20.04	6.7	12.8	6.70
10	230273	2	8	19	139	1.80	2.6	5.0	7.98
10	150373	2	8	5	25	9.14	1.2	17.1	6.56
10	120473	2	8	107	85	11.51	0.2	13.7	6.63
10	170573	2	8	204	281	33.67	4.6	22.4	4.78
10	250773	2	8	3	5	12.60	10.0	27.0	4.52
10	121072	2	9	6	123	8.57	13.5	18.8	5.87

SP	DATE	L S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
10	211172	2 9	1	1	5.93	8.7	11.9	7.12
10	141272	2 9	10	196	29.67	9.1	11.9	5.58
10	230273	2 9	140	2544	1.84	4.1	5.0	8.14
10	150373	2 9	10	70	17.80	5.0	13.0	5.05
10	120473	2 9	217	986	5.61	0.5	13.5	6.45
10	170573	2 9	68	108	33.67	5.9	23.6	5.41
10	250773	2 9	1	14	12.02	11.7	26.5	4.63
10	141272	210	1	1	30.79	8.1	11.6	5.86
10	230273	210	58	296	1.60	2.2	4.3	7.63
10	120473	210	182	359	5.76	1.0	13.7	6.42
10	170573	210	338	279	23.25	8.7	22.0	4.41
10	250773	210	1	9	12.02	12.2	26.0	5.03
10	121072	211	1	1	7.50	13.7	18.7	5.66
10	211172	211	3	3	9.14	10.0	12.8	6.99
10	141272	211	5	91	39.29	10.8	11.3	5.12
10	230273	211	26	274	2.15	1.6	4.7	7.76
10	150373	211	3	90	18.44	3.6	16.6	6.15
10	120473	211	303	1199	4.38	3.4	13.7	6.46
10	170573	211	90	134	8.80	6.8	21.9	5.35
10	110673	211	48	115	9.30	22.7	28.4	4.09
10	250773	211	7	47	14.31	14.4	26.0	4.95
10	210873	211	42	441	14.91	14.0	28.6	3.86
10	150373	212	2	13	25.33	5.2	13.6	4.96
10	120473	212	353	1943	32.16	4.2	14.3	5.80
10	170573	212	129	209	14.75	5.0	22.4	4.99
10	110673	212	51	130	10.74	11.8	26.5	2.46
10	250773	212	16	76	17.64	15.0	28.5	4.71
10	121072	213	6	154	8.41	15.1	19.3	5.20
10	211172	213	1	1	5.45	13.0	12.8	6.99
10	141272	213	3	2	8.82	9.2	11.9	6.34
10	230273	213	25	105	5.72	11.2	4.2	7.63
10	120473	213	44	1382	15.12	5.7	13.4	6.48
10	170573	213	1	82	19.24	12.5	21.3	5.84
10	250773	213	2	31	13.63	15.0	26.5	4.85

SP	DATE	L S	IOI-NO	IOI-WI	CHL-A	SAL	TEMP	D-O
10	121072	214	8	405	7.21	15.7	19.2	5.68
10	211172	214	2	1	5.93	14.4	12.8	6.72
10	230273	214	21	269	7.50	10.4	4.3	8.11
10	150373	214	3	12	26.26	4.0	15.6	2.70
10	120473	214	24	773	55.44	6.4	13.8	6.55
10	250773	214	1	6	10.90	16.7	26.0	4.84
10	121072	215	4	128	9.02	16.4	18.6	5.38
10	211172	215	7	104	5.93	14.5	12.7	6.17
10	141272	215	2	0	4.00	12.6	11.7	5.85
10	230273	215	17	78	9.89	10.9	4.6	7.86
10	120473	215	21	954	29.50	9.9	13.8	6.36
10	110673	215	20	145	9.62	16.9	26.3	4.60
10	250773	215	18	125	12.83	16.7	25.0	4.02
10	210873	215	1	12	9.62	19.0	27.6	4.32
10	130872	216	1	7	5.61	16.4	27.7	5.07
10	121072	216	14	154	8.33	16.8	19.0	5.10
10	230273	216	23	148	7.50	10.3	3.5	8.25
10	150373	216	5	22	29.83	10.8	11.0	4.14
10	120473	216	19	771	29.64	11.0	13.6	6.19
10	170573	216	1	0	7.21	13.7	21.5	5.03
10	110673	216	8	93	5.61	12.5	26.7	2.24
10	250773	216	11	98	12.02	17.2	25.0	4.90
10	210873	216	33	395	8.49	16.9	27.2	4.80
10	121072	217	7	208	5.61	16.5	18.9	5.56
10	230273	217	2	0	5.01	10.5	4.2	8.40
10	120473	217	44	1056	16.07	9.0	13.2	5.74
10	170573	217	113	903	8.01	9.9	20.0	4.28
10	110673	217	49	241	8.33	17.0	26.1	1.61
10	250773	217	17	209	10.02	17.8	25.0	4.79
10	210873	217	8	75	7.21	17.9	28.3	1.30
11	130872	211	1	4	8.01	18.1	28.7	4.96
11	121072	214	1	26	7.21	15.7	19.2	5.68
11	121072	217	1	20	5.61	16.5	18.9	5.56
13	141272	2 9	1	14	29.67	9.1	11.9	5.58

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
14	121072	2	4	1	24	18.56	10.0	21.0	4.59
14	230273	2	4	1	11	1.96	0.0	5.0	8.06
14	141272	2	5	1	94	2.40	10.0	11.8	5.95
14	230273	2	5	1	68	1.82	0.0	5.0	8.12
14	230273	2	6	1	74	1.06	1.6	4.5	8.10
14	230273	2	8	1	66	1.80	2.6	5.0	7.98
14	150373	2	8	1	121	9.14	1.2	17.1	6.56
14	150373	2	9	2	89	17.80	5.0	13.0	5.05
14	170573	2	9	1	93	33.67	5.9	23.6	5.41
14	120473	2	11	1	1	4.38	3.4	13.7	6.46
14	230273	2	12	1	32	15.71	8.9	4.9	8.38
14	121072	2	14	1	97	7.21	15.7	19.2	5.68
18	121072	2	3	1	11	26.06	10.0	20.8	-1
18	150373	2	3	3	38	4.00	0.1	18.0	5.36
18	120473	2	3	11	107	1.49	0.1	14.3	5.49
18	230273	2	4	1	8	1.96	0.0	5.0	8.06
18	120473	2	4	3	4	2.20	0.0	14.9	5.88
18	230273	2	5	1	9	1.82	0.0	5.0	8.12
18	150373	2	5	2	24	5.77	0.4	18.4	5.99
18	150373	2	7	2	18	8.01	0.9	17.0	6.56
18	120473	2	7	2	18	4.29	0.2	13.9	6.15
18	141272	2	8	2	5	6.41	9.6	11.7	4.14
18	230273	2	8	1	1	1.80	2.6	5.0	7.98
18	120473	2	8	2	24	11.51	0.2	13.7	6.63
18	120473	2	9	3	28	5.61	0.5	13.5	6.45
18	120473	2	10	2	20	5.76	1.0	13.7	6.42
18	120473	2	11	2	31	4.38	3.4	13.7	6.46
18	170573	2	11	2	19	8.80	6.8	21.9	5.35
18	121072	2	13	1	21	8.41	15.1	19.3	5.20
18	121072	2	15	1	28	9.02	16.4	18.6	5.38
18	110673	2	16	1	43	5.61	12.5	26.7	2.24
18	121072	2	17	2	47	5.61	16.5	18.9	5.56
19	150373	2	3	1	43	4.00	0.1	18.0	5.36
19	230273	2	9	1	412	1.84	4.1	5.0	8.14

SP	DATE	L S	IOI-NO	IOI-WI	CHL-A	SAL	TEMP	D-O
19	120473	2 9	1	147	5.61	0.5	13.5	6.45
19	120473	211	1	28	4.38	3.4	13.7	6.46
20	130872	212	1	31	11.45	13.4	27.6	3.69
20	120473	217	1	361	16.07	9.0	13.2	5.74
21	230273	2 6	1	14	1.06	1.6	4.5	8.10
21	230273	2 8	1	10	1.80	2.6	5.0	7.98
21	141272	213	1	22	8.82	9.2	11.9	6.34
21	121072	217	1	19	5.61	16.5	18.9	5.56
23	130872	216	2	18	5.61	16.4	27.7	5.07
23	210873	216	1	1	8.49	16.9	27.2	4.80
23	210873	217	1	0	7.21	17.9	28.3	1.30
24	130872	217	2	3	9.16	16.5	27.8	4.92
26	120473	211	3	18	4.38	3.4	13.7	6.46
26	141272	214	1	38	7.53	12.9	11.7	5.61
26	120473	214	1	23	55.44	6.4	13.8	6.55
28	141272	2 4	1	8	2.40	8.4	11.5	5.57
30	210873	2 7	1	1	30.92	7.4	30.3	2.95
30	170573	210	1	26	23.25	8.7	22.0	4.41
30	110673	211	1	72	9.30	22.7	28.4	4.09
30	210873	211	15	15	14.91	14.0	28.6	3.86
30	210873	212	3	4	20.84	11.5	29.5	4.20
30	121072	213	4	69	8.41	15.1	19.3	5.20
30	121072	214	2	56	7.21	15.7	19.2	5.68
30	121072	215	2	42	9.02	16.4	18.6	5.38
30	120473	215	2	87	29.50	9.9	13.8	6.36
30	250773	215	6	112	12.83	16.7	25.0	4.02
30	121072	216	1	22	8.33	16.8	19.0	5.10
30	120473	216	1	33	29.64	11.0	13.6	6.19
30	250773	216	2	26	12.02	17.2	25.0	4.90
30	170573	217	1	78	8.01	9.9	20.0	4.28
30	110673	217	1	38	8.33	17.0	26.1	1.61
30	250773	217	1	17	10.02	17.8	25.0	4.79
31	121072	217	1	0	5.61	16.5	18.9	5.56
33	230273	2 7	6	240	2.04	1.5	4.8	7.76

SP	DATE	L	S	IOI=NO	IOI=WT	CHL=A	SAL	TEMP	D=O
34	211172	2	8	1	1	20.04	6.7	12.8	6.70
34	230273	2	12	1	2	15.71	8.9	4.9	8.38
35	120473	2	11	1	39	4.38	3.4	13.7	6.46
35	120473	2	17	1	72	16.07	9.0	13.2	5.74
36	170573	2	11	1	37	8.80	6.8	21.9	5.35
39	250773	2	9	1	37	12.02	11.7	26.5	4.63
39	210873	2	15	1	60	9.62	19.0	27.6	4.32
101	130872	2	3	1	69	8.82	2.6	27.7	.30
101	121072	2	3	2	246	26.06	10.0	20.8	-1
101	211172	2	3	2	180	3.20	3.2	12.6	6.24
101	150373	2	3	1	33	4.00	0.1	18.0	5.36
101	130872	2	4	14	626	14.25	6.6	26.8	4.53
101	150373	2	4	1	46	4.49	0.3	18.7	5.60
101	170573	2	4	1	51	8.01	7.0	21.3	4.79
101	130872	2	5	4	89	13.63	7.0	27.0	5.56
101	150373	2	5	4	336	5.77	0.4	18.4	5.99
101	150373	2	6	1	91	3.20	0.4	17.7	5.84
101	120473	2	6	3	101	2.64	0.1	14.2	6.06
101	250773	2	6	1	99	21.65	7.8	28.0	5.22
101	130872	2	7	12	1206	11.22	16.0	27.8	3.64
101	211172	2	7	6	103	9.62	3.9	11.9	7.47
101	141272	2	7	4	387	13.63	9.6	11.8	5.71
101	230273	2	7	1	1	2.04	1.5	4.8	7.76
101	150373	2	7	4	285	8.01	0.9	17.0	6.56
101	120473	2	7	12	143	4.29	0.2	13.9	6.15
101	170573	2	7	5	441	19.85	4.6	22.6	4.50
101	250773	2	7	1	125	18.10	8.9	28.0	5.13
101	210873	2	7	1	135	30.92	7.4	30.3	2.95
101	130872	2	8	9	190	8.33	15.2	27.9	1.77
101	121072	2	8	1	36	29.14	9.9	19.3	6.83
101	211172	2	8	4	198	20.04	6.7	12.8	6.70
101	141272	2	8	3	70	6.41	9.6	11.7	4.14
101	120473	2	8	7	76	11.51	0.2	13.7	6.63
101	170573	2	8	1	4	33.67	4.6	22.4	4.78

SP	DATE	L	S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
101	250773	2	8	1	83	12.60	10.0	27.0	4.52
101	130872	2	9	7	211	8.33	11.8	28.1	4.62
101	230273	2	9	1	1	1.84	4.1	5.0	8.14
101	120473	2	9	4	343	5.61	0.5	13.5	6.45
101	130872	2	10	4	231	10.08	17.8	28.0	1.46
101	230273	2	10	1	1	1.60	2.2	4.3	7.63
101	120473	2	10	1	14	5.76	1.0	13.7	6.42
101	130872	2	11	22	1149	8.01	18.1	28.7	4.96
101	121072	2	11	4	7	7.50	13.7	18.7	5.66
101	230273	2	11	2	3	2.15	1.6	4.7	7.76
101	120473	2	11	8	37	4.38	3.4	13.7	6.46
101	170573	2	11	1	352	8.80	6.8	21.9	5.35
101	110673	2	11	2	226	9.30	22.7	28.4	4.09
101	210873	2	11	1	184	14.91	14.0	28.6	3.86
101	130872	2	12	19	1584	11.45	13.4	27.6	3.69
101	121072	2	12	7	821	7.01	13.9	20.1	5.37
101	150373	2	12	3	220	25.33	5.2	13.6	4.96
101	120473	2	12	1	10	32.16	4.2	14.3	5.80
101	170573	2	12	1	9	14.75	5.0	22.4	4.99
101	110673	2	12	1	161	10.74	11.8	26.5	2.46
101	250773	2	12	1	271	17.64	15.0	28.5	4.71
101	210873	2	12	2	196	20.84	11.5	29.5	4.20
101	130872	2	13	3	38	5.26	13.3	27.6	5.46
101	150373	2	13	1	0	17.16	9.5	9.6	3.77
101	130872	2	14	2	79	4.85	13.6	27.6	5.45
101	230273	2	14	1	0	7.50	10.4	4.3	8.11
101	150373	2	14	1	1	26.26	4.0	15.6	2.70
101	230273	2	15	3	3	9.89	10.9	4.6	7.86
101	150373	2	15	1	11	26.26	4.0	15.6	2.70
101	120473	2	15	2	210	29.50	9.9	13.8	6.36
101	250773	2	15	1	27	12.83	16.7	25.0	4.02
101	121072	2	16	2	284	8.33	16.8	19.0	5.10
101	230273	2	16	1	0	7.50	10.3	3.5	8.25
101	110673	2	16	7	973	5.61	12.5	26.7	2.24

SP	DATE	L S	IOI-NO	IOI-WT	CHL-A	SAL	TEMP	D-O
101	130872	217	12	588	9.16	16.5	27.8	4.92
101	121072	217	6	159	5.61	16.5	18.9	5.56
101	211172	217	1	64	3.52	15.0	12.0	5.61
101	230273	217	1	0	5.01	10.5	4.2	8.40
101	150373	217	1	13	5.45	10.8	9.2	0.90
101	170573	217	3	217	8.01	9.9	20.0	4.28
102	121072	211	5	31	7.50	13.7	18.7	5.66
102	141272	211	1	14	39.29	10.8	11.3	5.12
103	130872	2 8	7	92	8.33	15.2	27.9	1.77
103	211172	2 8	2	10	20.04	6.7	12.8	6.70
103	130872	2 9	2	24	8.33	11.8	28.1	4.62
103	121072	2 9	3	70	8.57	13.5	18.8	5.87
103	121072	211	3	70	7.50	13.7	18.7	5.66
103	110673	211	27	151	9.30	22.7	28.4	4.09
103	130872	212	12	183	11.45	13.4	27.6	3.69
103	121072	212	1	33	7.01	13.9	20.1	5.37
103	110673	212	3	16	10.74	11.8	26.5	2.46
103	130872	213	1	11	5.26	13.3	27.6	5.46
103	121072	213	1	18	8.41	15.1	19.3	5.20
103	121072	214	5	80	7.21	15.7	19.2	5.68
103	121072	216	3	43	8.33	16.8	19.0	5.10
103	121072	217	3	43	5.61	16.5	18.9	5.56
103	250773	217	1	20	10.02	17.8	25.0	4.79
104	121072	2 7	1	13	26.72	9.5	19.2	5.56
104	121072	2 8	3	18	29.14	9.9	19.3	6.83
104	211172	2 8	1	1	20.04	6.7	12.8	6.70
104	130872	2 9	3	6	8.33	11.8	28.1	4.62
104	121072	2 9	3	31	8.57	13.5	18.8	5.87
104	211172	2 9	1	2	5.93	8.7	11.9	7.12
104	141272	2 9	3	17	29.67	9.1	11.9	5.58
104	130872	211	1	10	8.01	18.1	28.7	4.96
104	121072	211	1	5	7.50	13.7	18.7	5.66
104	211172	211	1	7	9.14	10.0	12.8	6.99
104	141272	211	11	33	39.29	10.8	11.3	5.12

SP	DATE	L S	TOT-NO	TOT-WT	CHL-A	SAL	TEMP	D-O
104	230273	211	2	5	2.15	1.6	4.7	7.76
104	110673	211	1	15	9.30	22.7	28.4	4.09
104	121072	212	2	6	7.01	13.9	20.1	5.37
104	121072	213	3	26	8.41	15.1	19.3	5.20
104	211172	213	1	7	5.45	13.0	12.8	6.99
104	141272	213	2	22	8.82	9.2	11.9	6.34
104	121072	214	12	116	7.21	15.7	19.2	5.68
104	141272	214	1	3	7.53	12.9	11.7	5.61
104	211172	215	2	11	5.93	14.5	12.7	6.17
104	121072	216	6	54	8.33	16.8	19.0	5.10
104	211172	216	1	9	4.97	14.9	12.3	5.81
104	121072	217	8	55	5.61	16.5	18.9	5.56
104	141272	217	1	3	7.85	14.3	11.3	5.09
104	110673	217	1	15	8.33	17.0	26.1	1.61
105	130872	2 8	1	5	8.33	15.2	27.9	1.77
105	141272	2 9	1	3	29.67	9.1	11.9	5.58
105	211172	210	1	6	10.42	8.8	12.7	7.01
105	130872	211	2	7	8.01	18.1	28.7	4.96
105	121072	211	2	9	7.50	13.7	18.7	5.66
105	141272	211	2	8	39.29	10.8	11.3	5.12
105	250773	211	1	2	14.31	14.4	26.0	4.95
105	130872	212	1	3	11.45	13.4	27.6	3.69
105	210873	212	1	13	20.84	11.5	29.5	4.20
105	121072	215	3	18	9.02	16.4	18.6	5.38
105	211172	215	1	3	5.93	14.5	12.7	6.17
105	121072	216	1	4	8.33	16.8	19.0	5.10
105	121072	217	1	7	5.61	16.5	18.9	5.56
107	141272	2 4	2	0	2.40	8.4	11.5	5.57
107	120473	2 4	1	0	2.20	0.0	14.9	5.88
107	230273	2 5	4	0	1.82	0.0	5.0	8.12
107	230273	2 6	1	0	1.06	1.6	4.5	8.10
107	150373	2 7	1	0	8.01	0.9	17.0	6.56
107	120473	2 7	2	1	4.29	0.2	13.9	6.15
107	230273	2 8	2	1	1.80	2.6	5.0	7.98

SP	DATE	L	S	IOI-NO	IOI-WT	CHL-A	SAL	TEMP	D-O
107	120473	2	8	2	1	11.51	0.2	13.7	6.63
107	170573	2	8	4	1	33.67	4.6	22.4	4.78
107	230273	2	9	13	2	1.84	4.1	5.0	8.14
107	230273	2	10	1	0	1.60	2.2	4.3	7.63
107	120473	2	10	2	1	5.76	1.0	13.7	6.42
107	170573	2	10	2	1	23.25	8.7	22.0	4.41
107	230273	2	11	13	4	2.15	1.6	4.7	7.76
107	170573	2	11	1	0	8.80	6.8	21.9	5.35
107	170573	2	12	4	1	14.75	5.0	22.4	4.99
107	230273	2	13	3	1	5.72	11.2	4.2	7.63
107	141272	2	14	1	0	7.53	12.9	11.7	5.61
107	230273	2	14	1	0	7.50	10.4	4.3	8.11
107	120473	2	14	3	1	55.44	6.4	13.8	6.55
107	230273	2	15	4	0	9.89	10.9	4.6	7.86
107	120473	2	16	1	0	29.64	11.0	13.6	6.19
107	230273	2	17	5	1	5.01	10.5	4.2	8.40
107	170573	2	17	1	0	8.01	9.9	20.0	4.28
108	120473	2	8	1	0	11.51	0.2	13.7	6.63
108	120473	2	12	1	1	32.16	4.2	14.3	5.80
108	230273	2	17	2	0	5.01	10.5	4.2	8.40
109	120473	2	3	1	1	1.49	0.1	14.3	5.49
109	150373	2	4	1	1	4.49	0.3	18.7	5.60
109	120473	2	16	1	0	29.64	11.0	13.6	6.19
109	230273	2	17	1	0	5.01	10.5	4.2	8.40

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