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NOAA Technical Report NMFS SSRF-717

Gulf of Maine-Georges Bank Ichthyoplankton Collected on ICNAF Larval Herring Surveys September 1971-February 1975

John B. Colton, Jr. and Ruth R. Byron

November 1977

U.S. DEPARTMENT OF COMMERCE
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U.S. DEPARTMENT OF COMMERCE

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National Marine Fisheries Service

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JOHN B. COLTON, JR. and RUTH R. BYRON¹

ABSTRACT

The families, genera, and species of all larval fishes are tabulated and the abundance, length frequencies, and distribution of 12 species and 2 families are summarized utilizing data collected on 8 ichthyoplankton surveys of the Gulf of Maine-Georges Bank area. The segregation of coastal and oceanic species north and south of the coastal/slope water boundary during December is evidenced in a comparison of the distribution of upper 100-m integrated temperature and Atlantic herring, *Mycetophidae*, and *Paralepididae* larvae. All larval barracudinas and lanternfishes occurred in areas where the integrated temperature was above 11° and 13°C, respectively. Ninety-one percent of positive larval herring tows were in areas where the integrated temperature was below 13°C.

INTRODUCTION

In 1971 the International Commission for the Northwest Atlantic Fisheries (ICNAF) inaugurated a series of cooperative surveys of larval Atlantic herring, *Clupea harengus harengus* L., in the Gulf of Maine-Georges Bank area. The objectives of these surveys were to delimit the major herring spawning grounds and to obtain relative estimates of spawning stock size and information on larval drift and dispersal (International Commission for the Northwest Atlantic Fisheries 1971, 1972). These surveys, incorporating standardized sampling methods and stations, have been continued annually since inception. Vessels from six countries have participated, and 28 full-scale surveys have been completed as of June 1976. In addition, a number of supplementary coastal cruises of more limited scope have been undertaken in connection with this study.

In this paper we present summaries of the abundance, length frequencies, and distribution of the more abundant larval fishes collected on eight cruises by U.S. vessels from September 1971 to February 1975. The data were based on 61-cm, 0.505 mm-mesh bongo net samples collected on the following cruises:

Cruise No.	Date	No. stations
<i>Delaware II</i> 71-4	22 Sept.-3 Oct. 1971	122
<i>Albatross IV</i> 71-7	3-17 Dec. 1971	148
<i>Albatross IV</i> 72-9	28 Nov.-15 Dec. 1972	127
<i>Albatross IV</i> 73-9	4-20 Dec. 1973	113
<i>Albatross IV</i> 74-2	11-22 Feb. 1974	56
<i>Delaware II</i> 74-12	8-12 Oct. 1974	56
<i>Albatross IV</i> 74-13	4-18 Dec. 1974	108
<i>Albatross IV</i> 75-2	15-28 Feb. 1975	87

FIELD AND LABORATORY METHODS

Stations were made sequentially on a standardized grid pattern (International Commission for the Northwest Atlantic Fisheries 1972). At each station a 3.5-knot (6.5-km/h), double-oblique tow was made using paired 61-cm bongo samplers (Posgay and Marak in press) fitted with 0.505-mm and 0.333-mm nylon mesh nets. The sampler accessories (flowmeter, time-depth recorder, towing wire, and wire depressor) were rigged from specifications described by Posgay and Marak (in press). On *Delaware II* Cruise 71-4, the maximum depth of tow was 200 m or approximately 5 m off the bottom. The net was deployed at 50 m/min and retrieved at 20 m/min to 40-m depth. The upper 40 m of the water column was sampled in 20, 2-m intertidal steps of 1-min duration. On *Albatross IV* Cruise 71-7 the sampling procedure was similar except that the net was retrieved continuously at 10 m/min from 40 m to the surface. On all other cruises the maximum depth of tow was 100 m or approximately 5 m off the bottom, and the net was deployed at 50 m/min and retrieved at 10 m/min. Pertinent station data for the eight cruises are listed in Tables 3-10.

All samples were processed at the Northeast Fisheries Center, Narragansett Laboratory, National Marine Fisheries Service, NOAA. Fish larvae were sorted from the total 0.505-mm mesh samples and the larvae from each sample enumerated by species or to the lowest taxa possible. For samples having less than 100 of a species, all larvae were measured to the nearest 0.1-mm standard length. The larvae were later combined into 1-mm and 3-mm size groups. In samples containing more than 100 larvae of a species, a subsample of at least 100 specimens was taken for length measurements and the total length frequency for that species determined by multiplying the number at each length interval by the reciprocal of the aliquot fraction.

¹Northeast Fisheries Center, Narragansett Laboratory, National Marine Fisheries Service, NOAA, Narragansett, RI 02882.

The flowmeter readings for each tow were converted to m^3 of water filtered. These values for a given cruise were then plotted against maximum tow depth. Obvious discrepancies in volume values caused by windmilling, etc., were corrected on the basis of average tow depth-volume filtered values. Numbers of larvae per unit volume and numbers under a unit surface area were then determined for each tow.

ICHTHYOPLANKTON SUMMARIES

The families, genera, and species of larval fishes identified on each cruise are summarized in Table 1. The families are arranged in phylogenetic order (based on Greenwood et al. 1966) and the genera listed in alphabetical order. Often the specific identity of larvae could not be ascertained and separation was made only to the generic or family level. This was most often the case for oceanic specimens collected in slope water along the edge of the continental shelf. Because of seasonal and annual differences in the species composition and abundance of larvae, the same taxa were not enumerated for each cruise. We have summarized the abundance, length frequencies, and distribution of larvae on an individual cruise basis and have included only the dominant taxa (Table 2) and species of commercial interest which occurred in at least 5% of the total stations occupied. Larvae of 12 species of fishes are included in this summary, as well as 2 familial groupings:

CLUPEIDAE (herrings)

Clupea harengus harengus - Atlantic herring

GADIDAE (codfishes and hakes)

Gadus morhua - Atlantic cod

Melanogrammus aeglefinus - Haddock

Merluccius bilinearis - Silver hake

Pollachius virens - Pollock

Rhinonemus cimbrius - Fourbeard rockling

Urophycis chuss - Red hake

AMMODYTIDAE (sand lances)

Ammodytes dubius - Northern sand lance

STROMATEIDAE (butterfishes)

Peprilus triacanthus - Butterfish

BOTHIDAE (lefteye flounders)

Citharichthys arctifrons - Gulf Stream flounder

Scophthalmus aquosus - Windowpane

PLEURONECTIDAE (righteye flounders)

Glyptocephalus cynoglossus - Witch flounder

MYCTOPHIDAE (lanternfishes)

PARALEPIDIDAE (barracudinas)

Statistics for individual taxa were calculated for each cruise using the dominance-frequency method of Fager and McGowan (1963). These statistics are summarized in Table 2. The abundance (no./100 m^3) of species and families for individual cruises and stations are listed in Tables 3-10. The species length frequencies for individual cruises are given in Tables 11-14. The distributions (no./10 m^2) of species and families are shown

in Figures 1-8. The no./100 m^3 values listed in Tables 3-10 can be converted to no./10 m^2 by multiplying these values by $d/10$, where d is the sample depth.

DISCUSSION

A conspicuous and significant aspect of the larval fish distribution is the almost total segregation of coastal (boreal) and oceanic (tropical and subtropical) species north and south of the 100-m isobath during the December surveys. This divergence coincided with the location of the coastal/slope water boundary (thermal front) which is manifest in the surface layer (upper 100 m) along the edge of the continental shelf during November-January (Colton and Stoddard 1972). In late winter and spring, the surface thermal front is located further (approximately 20 km) offshore (Wright 1976), and oceanic, vertebrate and invertebrate indicator species do not occur along the edge of the shelf (Colton 1961; Colton et al. 1962). In late summer and early fall when shelf water temperatures are maximum, the surface thermal front is no longer present (Colton and Stoddard 1972), and oceanic indicator species are frequently found over Georges Bank and contiguous areas (Figure 1; Colton 1961; Colton et al. 1962).

To illustrate the relationship of temperature to the distribution of coastal and oceanic larval fish species during December, we determined integrated temperatures to a maximum depth of 100 m, or to the bottom in shoaler areas, using *Albatross IV* Cruise 74-13 expendable bathythermograph values at standard depths of 0, 10, 20, 30, 50, 75, and 100 m. The distribution of these integrated temperatures and a plot of the abundance of larval Atlantic herring, Myctophidae, and Paralepididae versus integrated temperature values are shown in Figure 9. All larval barracudinas and lanternfishes were collected in areas where the integrated temperature was above 11° and 13°C respectively. Ninety-one percent of the positive larval herring tows were made in areas where the integrated temperature was below 13°C and 80% of the positive tows were below 11°C.

We do not imply that the observed distribution patterns of larval fishes are controlled directly by temperature. Laboratory experiments have shown the upper lethal temperature (and salinity) for early stage larval herring to be appreciably higher than the temperature-salinity values characteristic of slope water (Blaxter 1960; Holliday and Blaxter 1960). There are marked differences in abundance, species composition and species diversity of zooplankton between coastal and slope water. The mean standing crop is greater in coastal water and the number of species greater in slope water (Clarke 1940; Grice and Hart 1962). It is possible, therefore, that the distribution of coastal fish species, such as herring, is more contingent on biological factors (availability of suitable zooplankton forage organisms) than on the physical characteristics of their environment. Hopefully, when additional data from these cruises have been processed, we will be able to elucidate the biotic and

abiotic factors controlling seasonal and annual variations in distribution and abundance of coastal and oceanic larval fishes.²

ACKNOWLEDGMENTS

The larval fishes used in this study were sorted and identified by the staff of the Ichthyoplankton Investigation, Northeast Fisheries Center Narragansett Laboratory, National Marine Fisheries Service, NOAA. We thank Susan Senerchia for the initial tabulation of the cruise data, Alice DeNofa and Dorothy Shavers for typing the tables, and Lianne Armstrong for preparing the figures.

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²In the interim, persons desiring more specific information regarding these cruises or wishing to examine specimens from these collections should contact: Thomas McKenney, Northeast Fisheries Center Narragansett Laboratory, National Marine Fisheries Service, NOAA, Narragansett, R.I. 02882.

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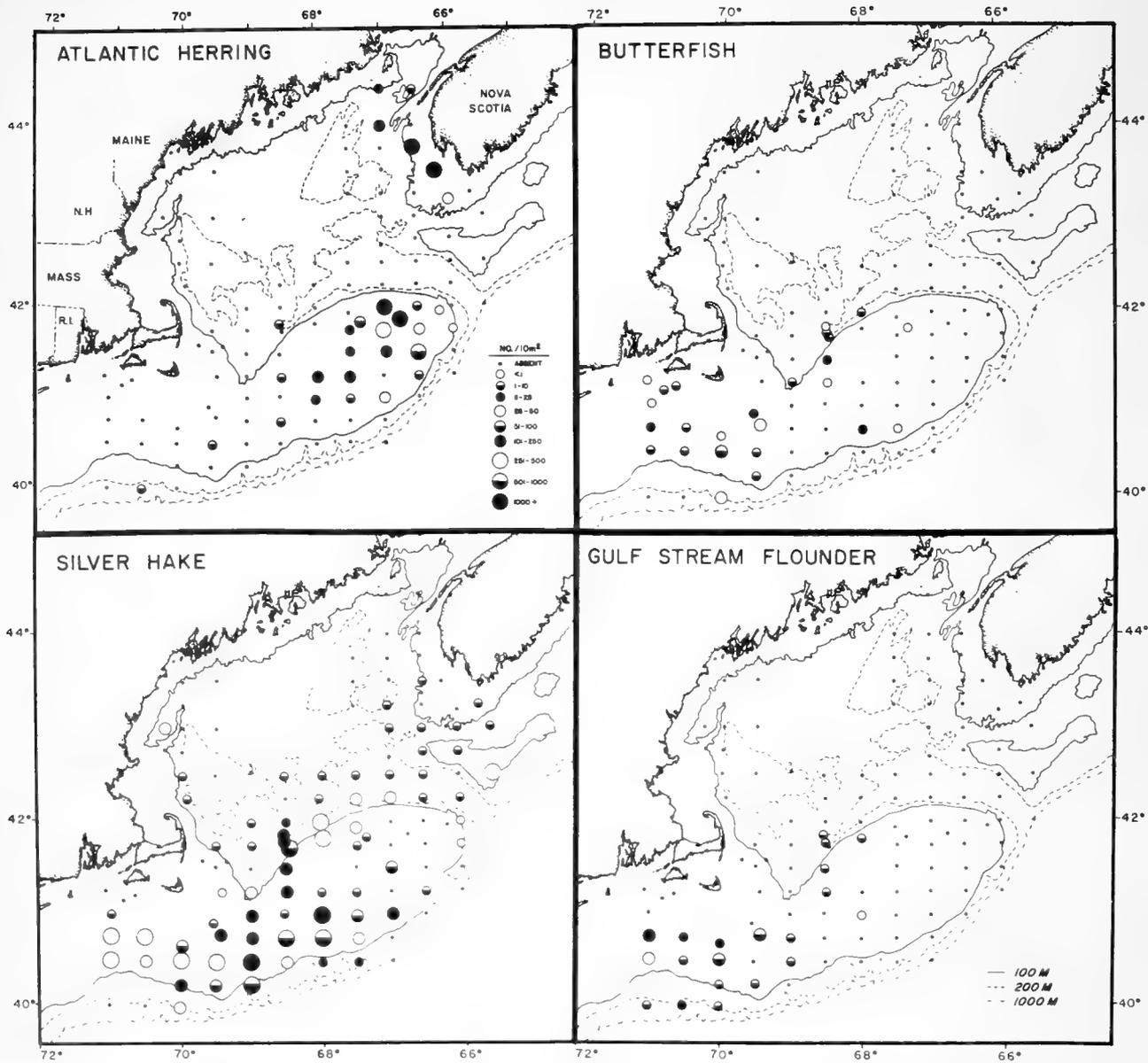


Figure 1.—Larval fish distribution, *Delaware II* Cruise 71-4, 22 September-3 October 1971.

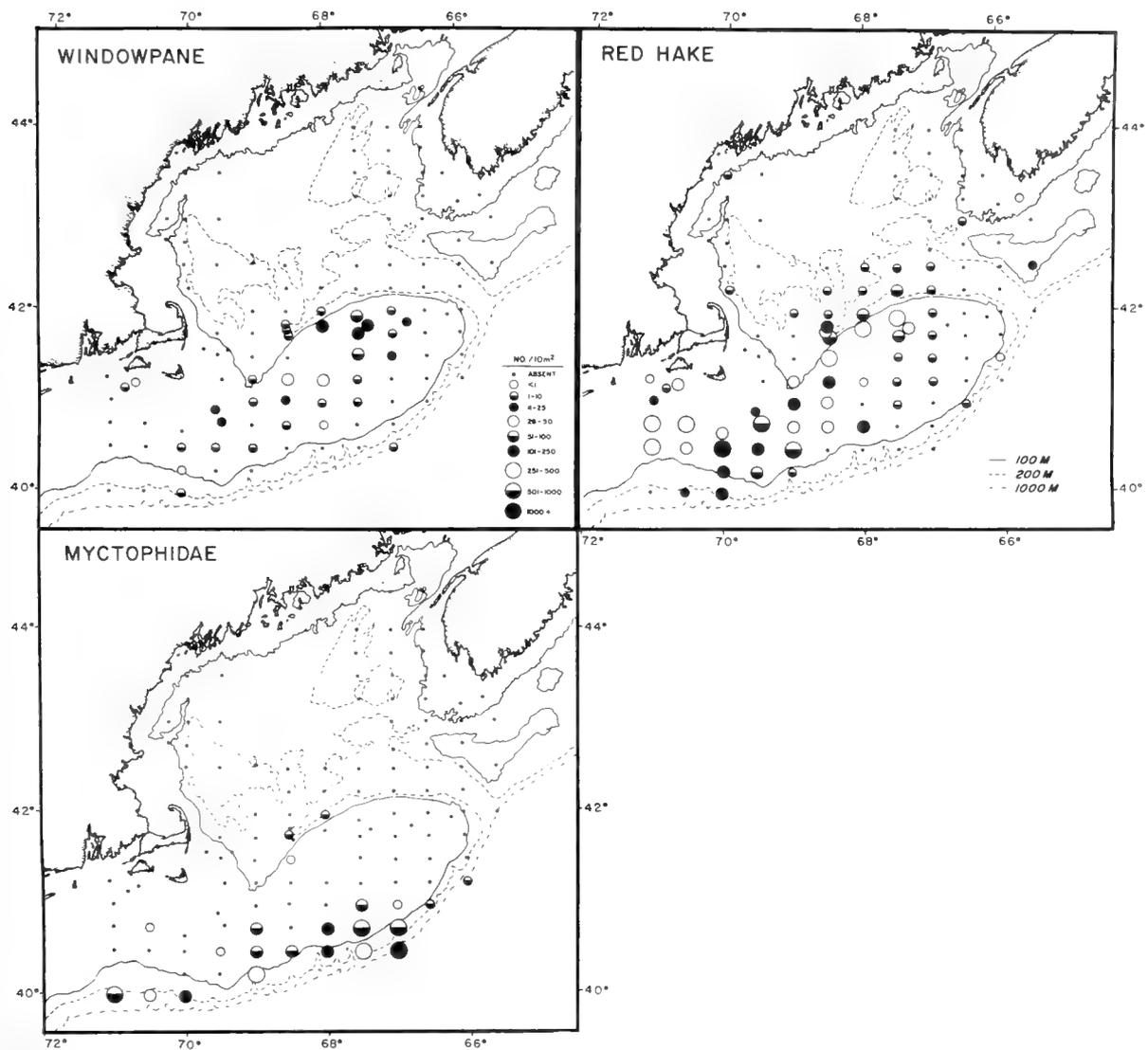


Figure 1.—Continued.

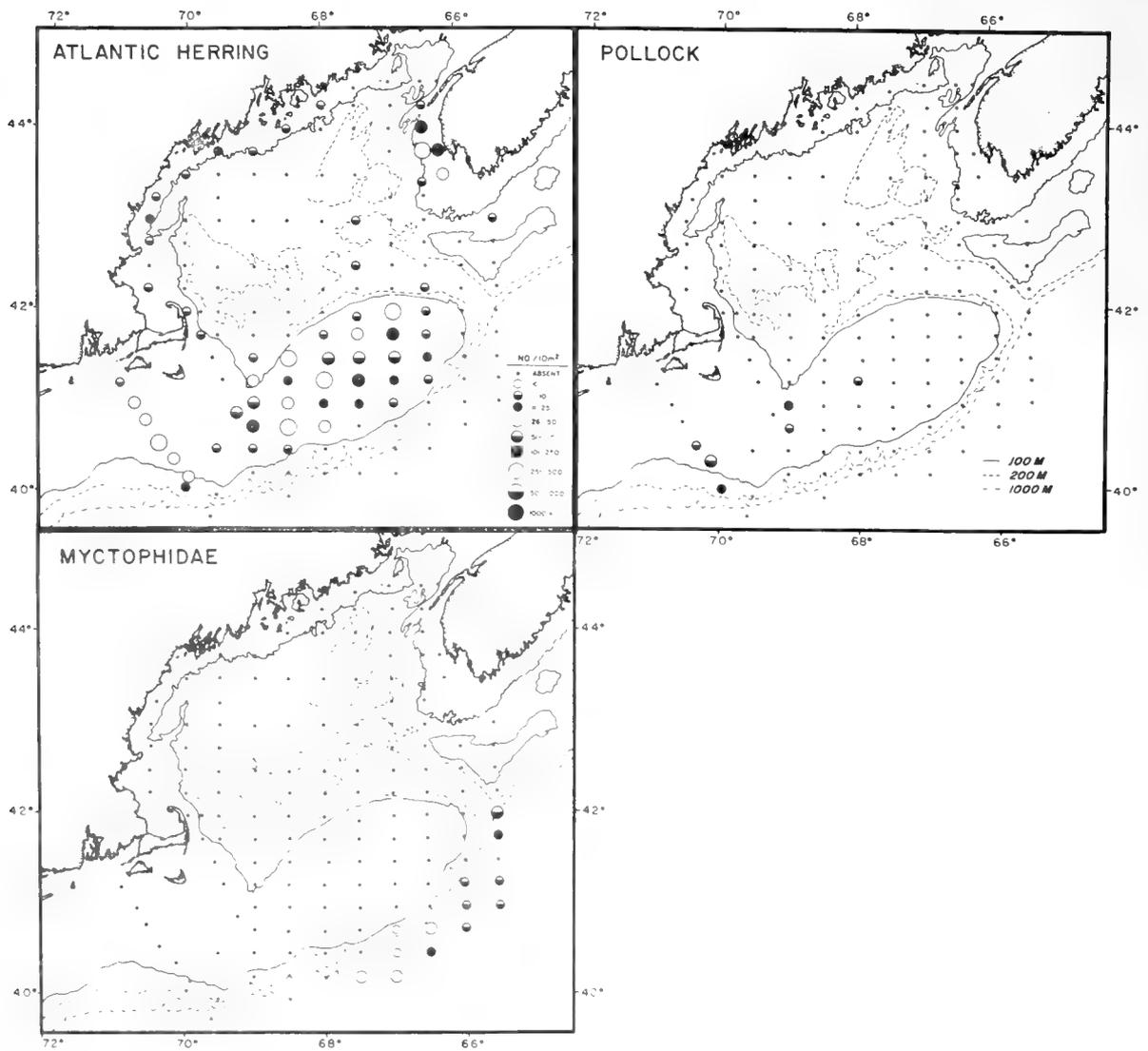


Figure 2.—Larval fish distribution, *Albatross IV* Cruise 71-7, 3-17 December 1971.

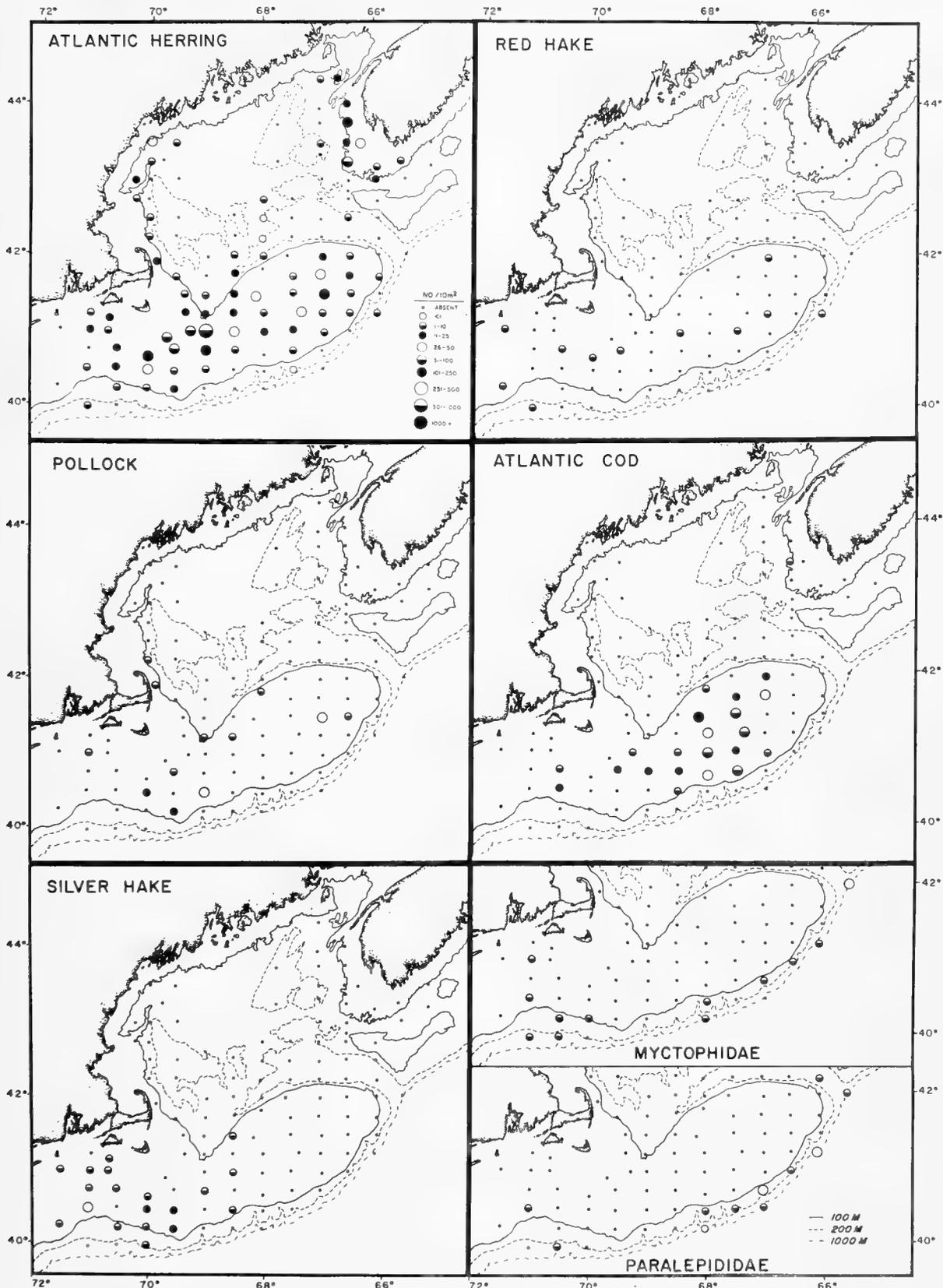


Figure 3.—Larval fish distribution, *Atlatross IV* Cruise 72-9, 28 November-15 December 1972.

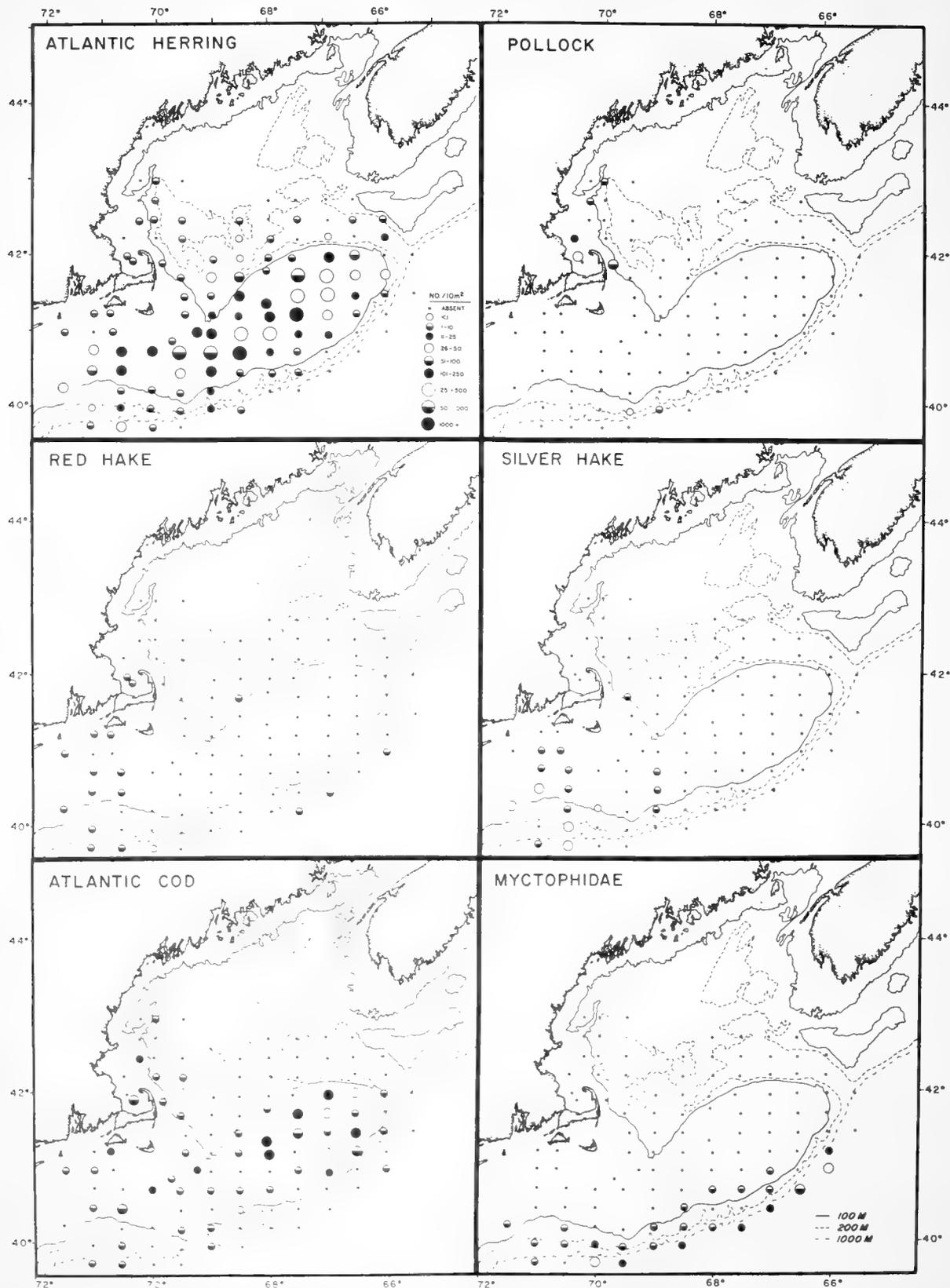


Figure 4.—Larval fish distribution, *Albatross IV* Cruise 73-9, 4-20 December 1973.

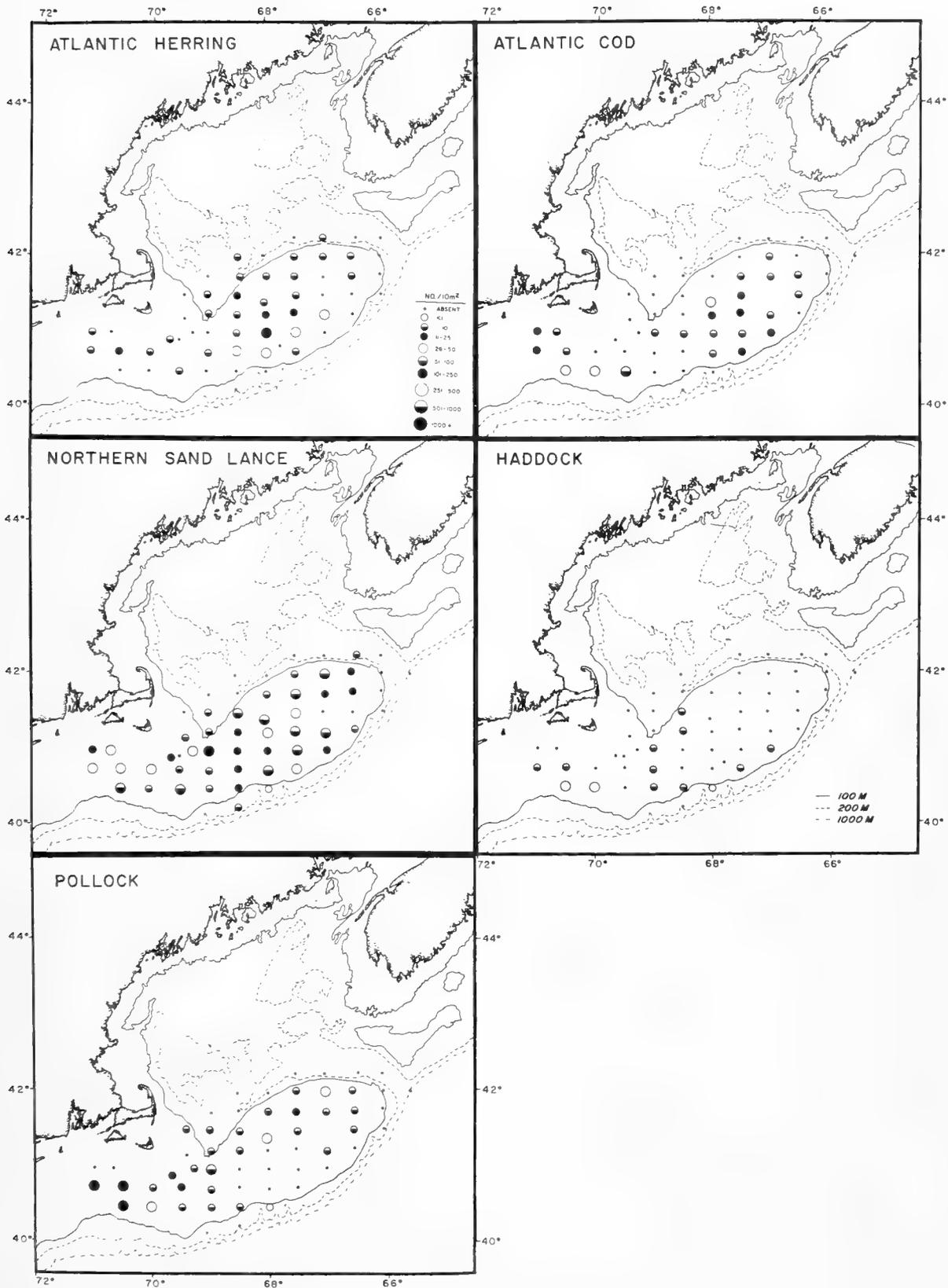


Figure 5.—Larval fish distribution, *Albatross IV* Cruise 74-2, 11-22 February 1974.

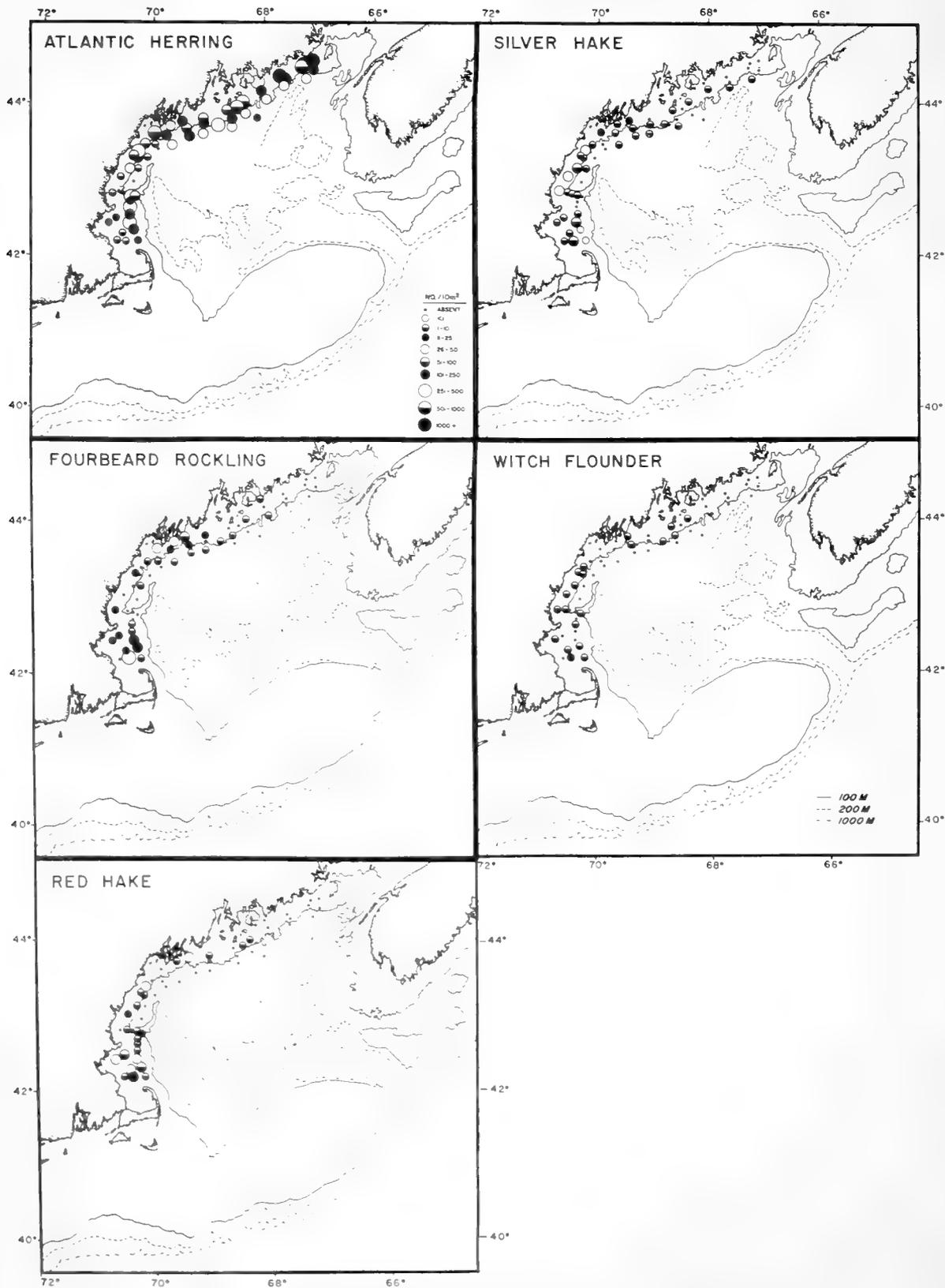


Figure 6.—Larval fish distribution, *Delaware II* Cruise 74-12, 8-12 October 1974.

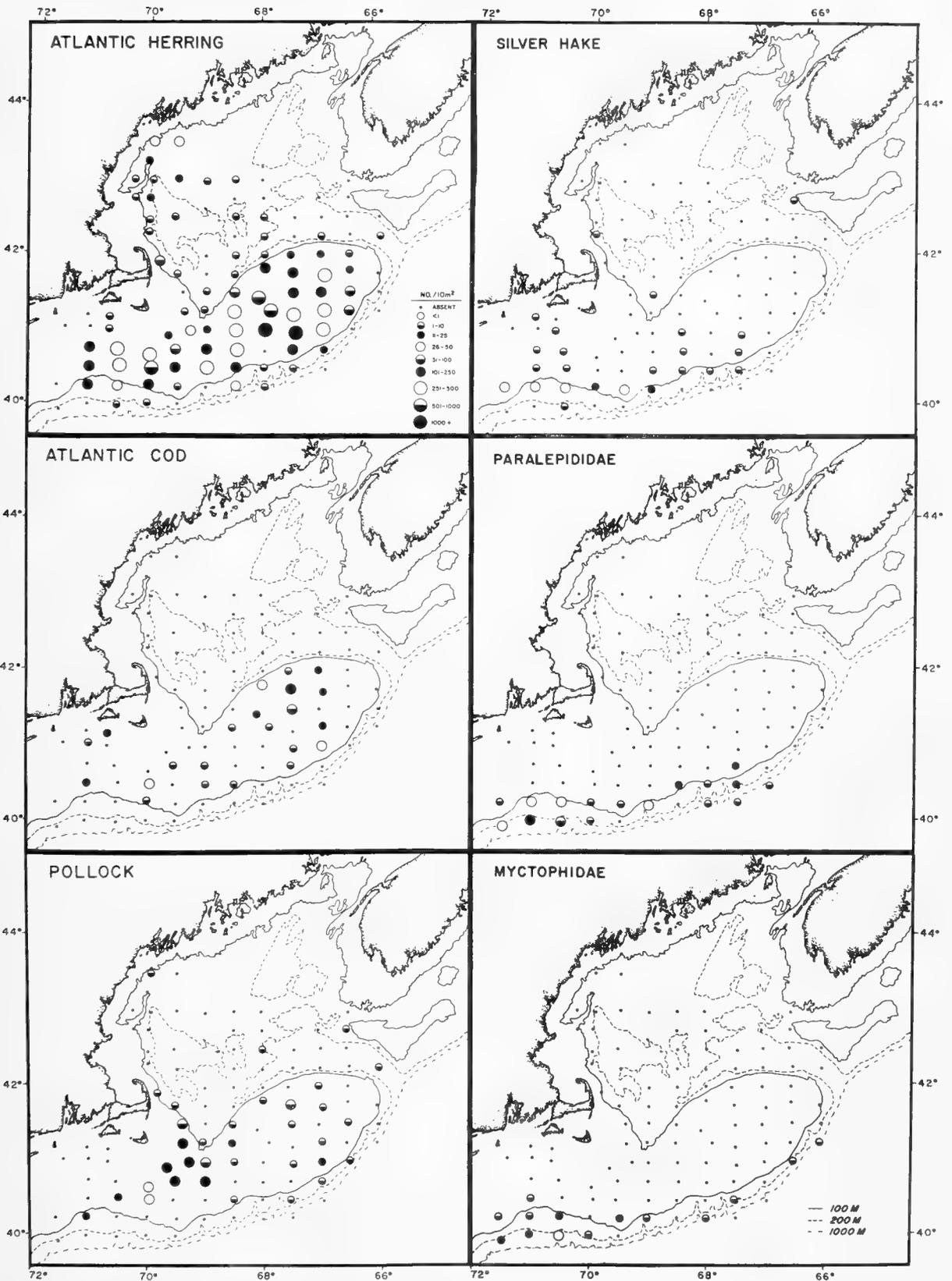


Figure 7.—Larval fish distribution, *Albatross IV* Cruise 74-13, 4-18 December 1974.

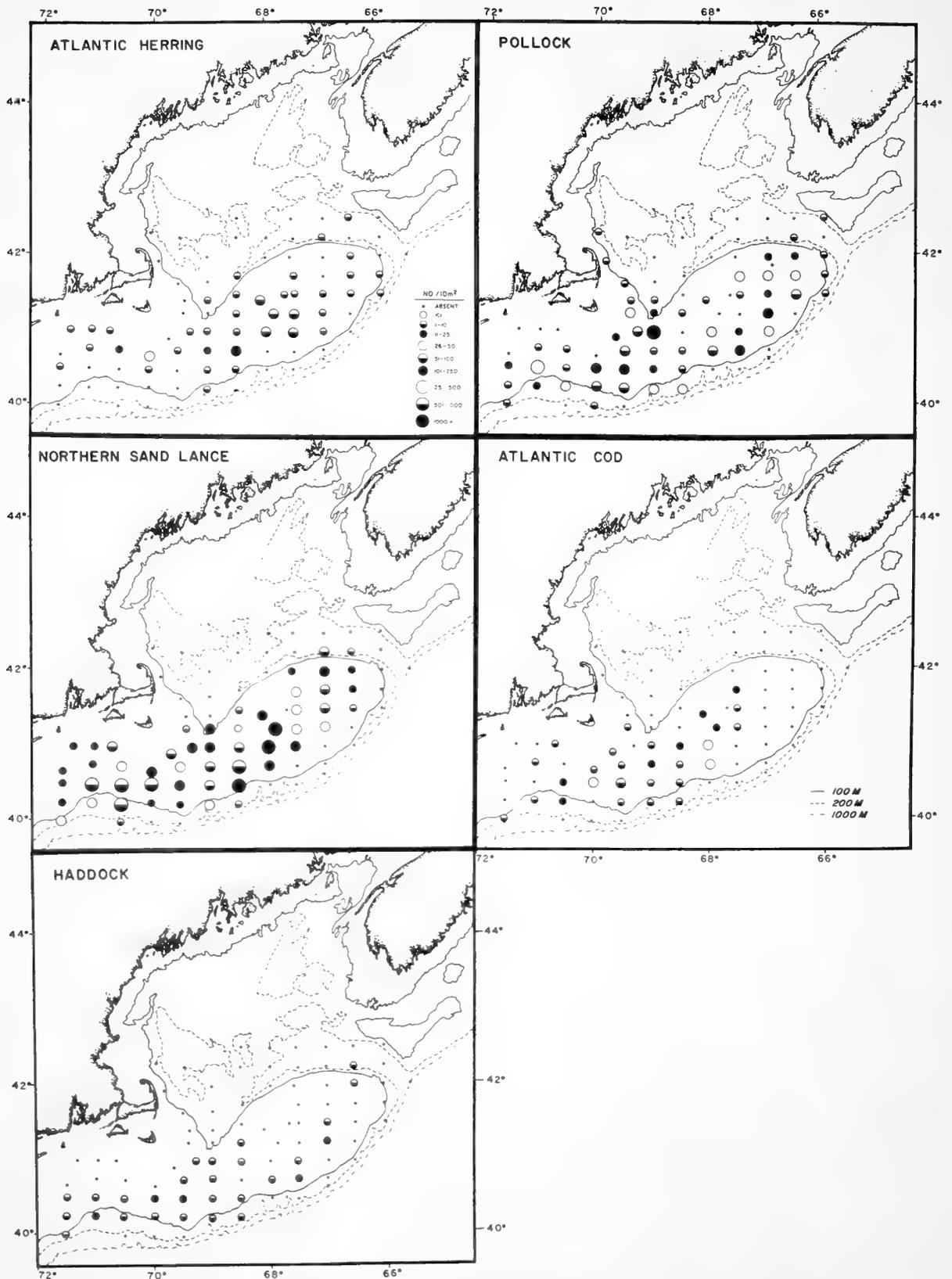


Figure 8.—Larval fish distribution, *Albatross IV* Cruise 75-2, 15-28 February 1975.

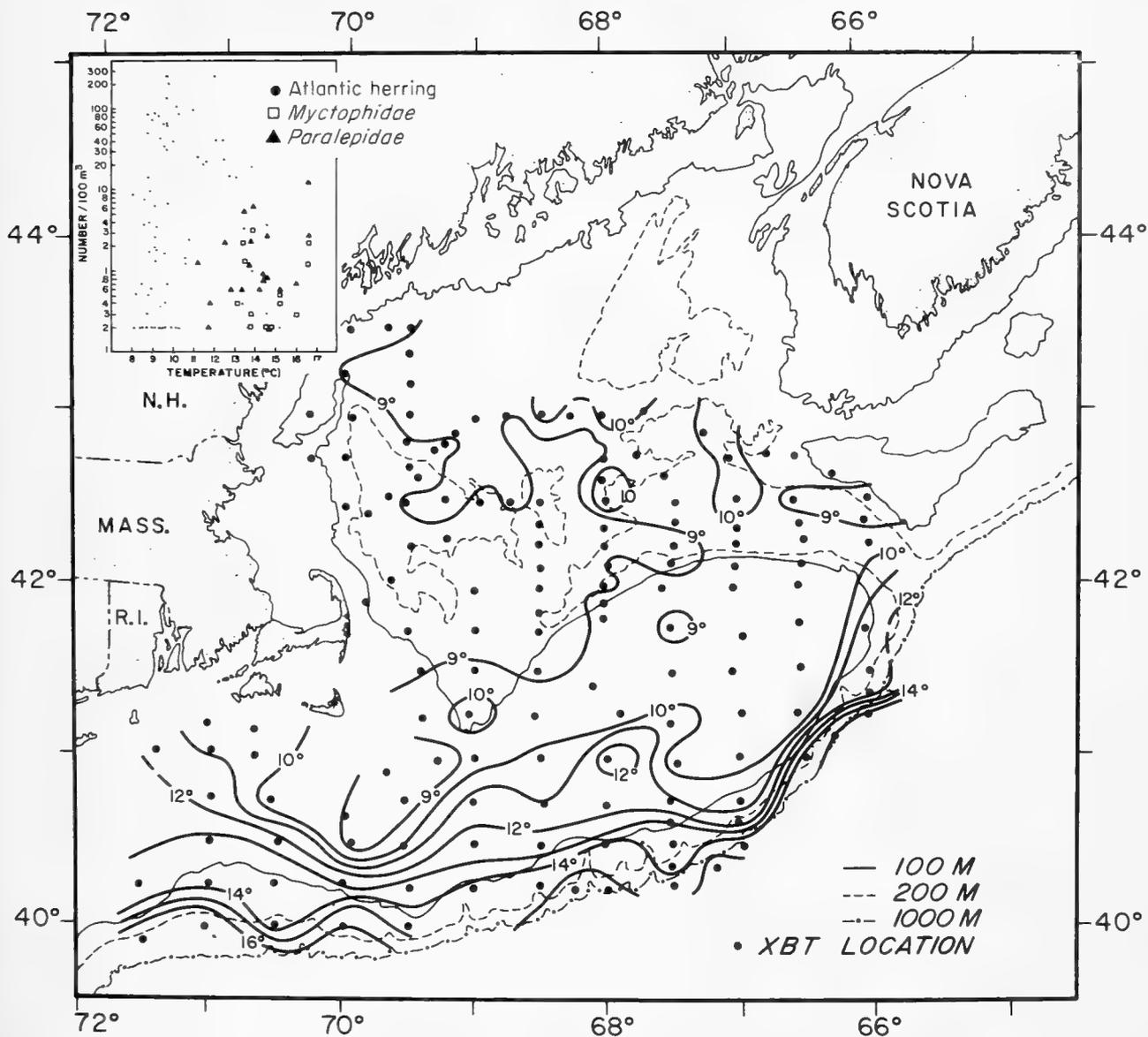


Figure 9.—Distribution of upper 100-m integrated temperatures and their relationship to the distribution of Atlantic herring, Myctophidae, and Paralepididae larvae, *Albatross IV* Cruise 74-13.

TABLE 1.—Synopsis of families, genera and

	Del. II 71-4	Alb. IV 71-7	Alb. IV 72-9	Alb. IV 73-9	Alb. IV 74-2	Del. II 74-12	Alb. IV 74-13	Alb. IV 75-2
ELOPIDAE ¹	X	X	-	-	-	-	-	-
<i>Elops saurus</i>	-	-	-	X	-	-	X	-
ANGUILLIDAE	-	X	X	X	-	-	X	X
<i>Anguilla rostrata</i>	-	-	-	-	-	-	X	-
MORINGUIDAE	X	-	-	X	-	-	-	-
MURAEIIDAE	X	X	-	-	-	-	-	-
NETTASTOMATIDAE	X	-	-	-	-	-	-	-
NESSORHAMPHIDAE	-	-	-	-	-	-	-	X
CONGRIDAE	X	X	-	X	-	-	X	X
OPHICHTHIDAE	X	-	-	X	-	-	X	-
NEMICHTHYIDAE	-	X	-	-	-	-	-	-
NOTOCANTHIFORMES	-	-	-	-	-	-	X	-
CLUPEIDAE	X	X	-	X	-	X	-	-
<i>Clupea harengus harengus</i>	X	X	X	X	X	X	X	X
CHARGAULIDAE	X	-	-	-	-	-	X	-
GONOSTOMATIDAE	X	X	X	X	X	-	X	-
<i>Cyclotnone</i> sp.	-	-	-	-	-	-	X	-
<i>Gonostoma elongatum</i>	-	-	-	-	-	-	X	-
<i>Gonostoma</i> sp.	-	-	-	-	-	-	X	-
<i>Maurolicus muelleri</i>	-	-	-	-	-	X	X	-
<i>Vinciguerria nimbaria</i>	-	-	-	-	-	-	X	-
CHAULIODONTIDAE	-	X	-	-	-	-	-	-
STOMIATIDAE	-	-	-	X	-	-	-	-
SYNODONTIDAE	-	-	X	X	-	-	X	-
<i>Synodus</i> sp.	-	-	-	-	-	-	-	-
PARALEPIDIDAE	X	-	-	X	X	-	X	X
<i>Notolepis rissoi</i>	-	-	-	-	-	-	X	-
<i>Paralepis coregonoides</i>	-	-	-	-	-	-	X	-
SCOPELARCHIDAE	-	-	-	-	-	-	X	-
NOTOSCOPIDAE	-	-	-	X	-	-	X	-
MYCTOPHIDAE	X	-	X	-	-	-	X	X
<i>Ceratoscopelus maderensis</i>	-	-	-	-	-	-	X	-
<i>Ceratoscopelus</i> sp.	-	-	-	-	-	-	X	-
<i>Diaphus du erili</i>	-	-	-	-	-	-	X	-
<i>Myctophum</i> sp.	-	-	-	-	-	-	X	-
LOPHIIDAE	-	-	-	-	-	-	-	-
<i>Lophius americanus</i>	-	-	-	-	-	-	-	-
ANTENNARPTIDAE	-	-	-	X	-	-	X	-
OGCOEPHALIDAE	-	-	-	-	-	-	-	-
CERATIIDAE	X	-	-	-	-	-	-	-
BREGMACEROTIDAE	-	X	-	-	-	-	X	-
<i>Bregmaceros</i> sp.	-	-	-	-	-	-	X	-
GADIDAE	X	-	X	X	X	-	X	X
<i>Gadus morhua</i>	-	X	X	X	X	-	X	X
<i>Melanogrammus aeglefinus</i>	X	-	-	-	-	-	-	X
<i>Pollachius virens</i>	-	X	X	-	-	X	X	-
<i>Rhinonemus cimbricus</i>	X	X	X	-	-	X	X	-
<i>Urophycis chuss</i>	X	X	X	-	-	X	X	-
<i>Urophycis regius</i>	X	-	-	-	-	-	X	-
<i>Urophycis</i> sp.	-	-	-	-	-	-	-	-
MERLUCCIIDAE	-	X	-	-	-	X	-	-
<i>Merluccius albidus</i>	-	-	-	-	-	-	-	-
<i>Merluccius bilinearis</i>	X	X	-	-	-	X	X	X
<i>Merluccius</i> sp.	-	-	-	-	-	-	X	X
OPHIDIIDAE	X	X	-	-	-	-	X	-
CARAPIDAE	X	X	-	-	-	-	-	-
ZOARCIDAE	-	-	-	-	-	-	-	-
<i>Macrozoarces americanus</i>	-	-	-	-	-	-	-	X
MACROURIDAE	X	-	-	-	-	-	X	-
SCOMBERESOCIDAE	-	-	-	-	-	-	-	-
<i>Scomberesox saurus</i>	-	-	-	-	-	-	-	-
MELAMPHAEIDAE	-	-	-	-	-	-	-	-
GASTEROSTEIDAE	-	-	-	-	-	-	X	-
SYNGNATHIDAE	-	-	-	-	-	-	X	-
SCORPAENIDAE	-	-	-	-	-	-	-	-
<i>Sebastes</i> sp.	-	-	-	-	-	-	-	-
TRIGLIDAE	-	-	-	-	-	-	-	-
COTTIDAE	-	-	-	-	-	-	-	X
<i>Myoxocephalus octodecemspinosus</i>	-	-	-	-	X	-	-	X

¹Families are indicated as being present only when all specimens could not be identified to a lower taxonomic level.

species collected on larval herring surveys.

	Del. II 71-4	A1b. IV 71-7	A1b. IV 72-9	A1b. IV 73-9	A1b. IV 74-2	Del. II 74-12	A1b. IV 74-13	A1b. IV 75-2
CYCLOPTERIDAE	X	-	-	-	-	-	X	X
<u>Cyclopterus lumpus</u>	X	-	-	-	-	-	-	-
<u>Liparis inquilinus</u>	-	-	-	-	X	X	-	-
<u>Liparis sp.</u>	-	-	X	X	-	-	-	-
SERRANIDAE	X	-	-	X	-	-	X	-
APOGONIDAE	X	X	-	-	-	-	X	-
CARANGIDAE	X	-	-	-	-	-	-	-
GERRIDAE	X	-	-	-	-	-	-	-
SPARIDAE	X	-	-	-	-	-	-	-
SCIAENIDAE	X	-	-	-	-	-	X	-
POMACENTRIDAE	-	-	-	-	-	-	X	-
MUGILIDAE	-	-	-	X	-	-	-	-
SPHYRAENIDAE	-	-	-	-	-	-	-	-
<u>Sphyraena borealis</u>	X	-	-	-	-	-	-	-
LABRIDAE	X	X	X	X	-	-	X	-
<u>Tautoga onitis</u>	-	-	-	-	-	X	-	-
<u>Tautoglabrus adspersus</u>	X	-	-	-	-	-	-	-
SCARIDAE	-	-	-	X	-	-	X	-
BLENNIIDAE	-	-	-	X	-	-	-	-
STICHAETIDAE	-	-	-	-	-	-	-	-
<u>Cryptacanthodes maculatus</u>	-	-	-	-	X	-	-	-
<u>Ulvaria subbifurcata</u>	X	-	-	-	-	-	-	-
PHOLIDAE	-	-	-	-	-	-	-	-
<u>Pholis gunnellus</u>	X	-	-	-	X	X	-	X
AMMODYTIDAE	-	-	-	-	-	-	-	-
<u>Ammodytes americanus</u>	X	-	-	-	-	-	-	-
<u>Ammodytes dubius</u>	-	-	-	-	X	-	-	X
<u>Ammodytes sp.</u>	-	-	-	-	-	-	X	-
CALLIONYMIDAE	-	-	-	-	-	-	X	-
<u>Callionymus sp.</u>	-	-	-	X	-	-	X	-
GOBITIDAE	X	X	X	-	X	-	X	-
GEMPYLIDAE	-	X	-	X	-	-	-	-
NOMEIDAE	-	-	-	X	-	-	-	-
STROMATEIDAE	-	-	-	-	-	-	-	-
<u>Peprilus alepidotus</u>	X	-	-	-	-	-	-	-
<u>Peprilus triacanthus</u>	X	-	-	-	-	-	-	-
SCOPHTHALMIDAE	-	-	-	X	-	-	-	-
<u>Scophthalmus aquosus</u>	X	-	X	X	-	X	X	-
BOTHIDAE	X	X	X	X	-	X	X	-
<u>Bothus ocellatus</u>	X	X	X	X	-	-	-	-
<u>Bothus sp.</u>	X	-	-	X	-	-	X	-
<u>Citharichthys arctifrons</u>	X	-	-	X	-	-	X	-
<u>Citharichthys sp.</u>	X	-	-	-	-	-	X	-
<u>Cyclopsetta fimbriata</u>	X	-	-	-	-	-	-	-
<u>Cyclopsetta sp.</u>	X	-	-	X	-	-	-	-
<u>Etropus microstomus</u>	X	-	-	-	-	-	-	-
<u>Etropus sp.</u>	-	X	-	-	-	-	-	-
<u>Hippoglossina oblonga</u>	X	-	X	-	-	-	X	-
<u>Monolene sp.</u>	-	-	-	X	-	-	-	-
<u>Paralichthys dentatus</u>	-	-	-	X	-	X	X	X
<u>Paralichthys oblongus</u>	X	-	-	-	-	-	-	-
<u>Syacium sp.</u>	-	-	X	X	-	-	-	-
PLEURONECTIDAE	X	-	-	-	X	X	-	-
<u>Glyptocephalus cynoglossus</u>	X	-	-	-	-	X	-	-
<u>Hippoglossoides platessoides</u>	-	-	-	-	-	-	-	X
<u>Limanda ferruginea</u>	-	-	-	-	-	X	X	-
<u>Poecilopsetta sp.</u>	-	-	-	-	-	-	X	-
<u>Scophthalmus aquosus</u>	-	-	-	-	-	X	-	-
CYNOGLOSSIDAE	X	-	-	-	-	-	-	-
<u>Symphurus sp.</u>	X	-	-	-	-	-	X	-
BALISTIDAE	X	-	-	-	-	-	-	-
TETRAODONTIDAE	X	-	-	X	-	-	-	-

Table 2. Relative abundance of larval fishes collected

Delaware II 71-4					Albatross IV 72-9				
Taxon	Average Rank ¹	Dominance ²	Abundance ³	Frequency ⁴	Taxon	Average Rank	Dominance	Abundance	Frequency
Silver hake	5.62	44/122	0.1-384.8 (192.4)	72/122	Atlantic herring	6.12	54/127	0.1-107.2 (53.6)	73/127
Red hake	4.96	17/122	0.1-247.2 (123.6)	59/122	Atlantic cod	4.02	11/127	0.2-35.5 (17.8)	22/127
Atlantic herring	3.74	17/122	0.1-625.3 (312.7)	29/122	Silver hake	3.84	7/127	0.2-5.1 (2.6)	19/127
Windowpane	3.65	1/122	0.1-54.9 (27.5)	33/122	Paralepididae	3.54	7/127	0.1-4.5 (2.3)	11/127
Myctophidae	3.46	10/122	0.1-112.9 (56.5)	22/122	Myctophidae	3.53	3/127	0.2-3.9 (1.5)	12/127
Butterfish	3.36	1/122	0.1-11.9 (6.0)	25/122	Pollock	3.53	4/127	0.3-7.6 (3.8)	12/127
Gulf Stream flounder	3.21	0	0.1-54.7 (27.4)	20/122	Red hake	3.43	0	0.1-0.9 (0.4)	11/127
Albatross IV 71-7					Albatross IV 73-9				
Atlantic herring	2.70	58/148	0.1-76.5 (38.3)	59/148	Atlantic herring	5.34	57/113	0.1-338.4 (169.2)	81/113
Myctophidae	1.75	14/148	0.1-4.4 (2.2)	14/148	Atlantic cod	3.89	14/113	0.1-45.5 (22.8)	45/113
Pollock	1.55	1/148	0.8-10.5 (5.6)	5/148	Myctophidae	3.11	11/113	0.1-10.0 (5.0)	19/113
					Silver hake	3.02	4/113	0.1-6.7 (3.4)	15/113
					Red hake	2.91	0	0.1-2.9 (1.5)	16/113
					Pollock	2.73	4/113	0.1-10.4 (5.2)	7/113

¹Taxa were ranked within each sample on a basis of numbers of individuals. Ranks for each species were averaged over the total samples.

²Proportion of samples in which taxon was among those making up 50% of the individuals.

³Range and median (in parentheses) of number of individuals per 100 m³ in samples in which taxon was found.

⁴Proportion of total samples in which taxon was found.

on Delaware II and Albatross IV surveys.

Albatross IV 74-2					Albatross IV 74-13				
Taxon	Average Rank	Dominance	Abundance	Frequency	Taxon	Average Rank	Dominance	Abundance	Frequency
Northern sand lance	4.42	30/56	0.1-33.2 (16.6)	41/56	Atlantic herring	5.22	57/108	0.1-263.2 (131.6)	76/108
Pollock	3.17	6/56	0.1-57.0 (28.5)	30/56	Pollock	3.46	10/108	0.1-57.0 (28.5)	34/108
Atlantic herring	2.76	5/56	0.1-6.4 (3.2)	30/56	Paralepididae	3.25	12/108	0.2-12.3 (6.2)	21/108
Atlantic cod	2.68	0	0.3-12.3 (6.1)	23/56	Silver hake	3.16	4/108	0.2-5.5 (2.8)	24/108
Haddock	1.96	0	0.1-6.0 (3.0)	13/56	Atlantic cod	3.09	2/108	0.2-28.6 (14.3)	22/108
					Myctophidae	2.82	1/108	0.2-3.4 (1.7)	14/108
Delaware II 74-12					Albatross IV 75-2				
Atlantic herring	4.51	40/56	0.3-380.0 (190.1)	50/56	Northern sand lance	4.16	35/87	0.2-361.8 (181.0)	49/87
Silver hake	2.98	4/56	0.2-27.9 (14.0)	35/56	Pollock	3.69	21/87	0.2-25.6 (12.9)	51/87
Fourbeard rockling	2.34	0	0.2-85.4 (42.8)	26/56	Atlantic herring	2.73	4/87	0.2-32.2 (16.2)	38/87
Red hake	2.62	2/56	0.2-63.9 (32.0)	22/56	Atlantic cod	2.34	0	0.2-8.8 (4.5)	28/87
Witch flounder	2.06	1/56	0.2-3.4 (1.8)	19/56	Haddock	2.08	0	0.2-3.7 (1.9)	27/87

Table 3.— Station data and larval fish

Sta.	Lat.	Long.	Date	Local Time	Sample Depth (m)	Vol. Filtered (m ³)	Atl. herring	Red hake	Silver hake	Myctophidae No./100 m ³	Gulf Stream flounder	Butterfish	Window-pane
2	41°-35'	69°-20'	1/X	0747	128	836							
3	41-46	68-30	23/IX	2049	158	1096		2.9	6.7	0.1	0.1	0.3	0.1
4	41-49	68-00	23	2329	62	712		62.1	48.2		0.6		22.9
5	41-50	67-21	24/IX	0228	46	696		7.3	1.4			0.1	25.9
6	41-52	66-45	24	0510	40	589		625.3					5.6
7	41-57	66-10	24	0807	63	780		0.1					
8	42-00	65-30	24	1226	177	1415							
9	42-30	65-30	24	1500	82	710		1.4	56.2				
10	43-00	65-30	24	1851	98	907			0.2				
11	43-15	65-40	24	2306	40	548		0.2	0.4				
12	43-30	66-12	25/IX	0244	46	574		242.2					
13	43-12	66-00	25	0445	53	718		4.9					
14	43-00	66-00	25	0613	74	660			0.3				
15	42-45	66-00	25	0818	63	625			0.2				
16	43-30	66-00	25	1031	154	1053							
17	42-15	66-00	25	1316	195	1216			0.1				
18	42-00	66-00	25	1430	98	841			0.1				
19	41-45	66-00	25	1613	98	1085	0.1		0.1				
20	41-30	66-00	25	1749	99	1075		0.1					
21	41-15	66-00	25	1920	168	1405				0.3			
22	41-00	66-30	25	2220	122	948		0.2		0.7			
23	41-15	66-30	26/IX	0021	88	792		0.6	0.3				
24	41-30	66-30	26	0212	81	759		86.0					
25	41-45	66-30	26	0355	63	686		7.7					
26	42-00	66-30	26	0606	63	709		0.2					
27	42-15	66-30	26	0812	215	1219			0.2				
28	42-30	66-30	26	1046	191	1261			0.1				
29	42-45	66-30	26	1315	105	780			0.1				
30	43-00	66-30	26	1516	116	1061		0.1	0.1				
31	43-15	66-30	26	1718	53	647							
32	43-30	66-30	26	1909	84	822			0.6				
33	43-46	66-31	26	2116	85	622	143.9						
34	44-00	66-30	26	2316	76	609							
35	44-25	66-30	27/IX	0151	158	1257		0.4					
36	44-25	67-00	27	0425	64	732		2.2					
37	44-00	67-00	27	0650	123	763		17.7					
38	44-25	67-30	27	0925	187	1115							
39	43-25	67-30	27	1135	195	1279							
40	43-00	67-00	27	1424	118	1030							
41	43-00	67-00	27	1547	180	1273							
42	43-30	67-30	27	1814	201	1213							
43	43-15	67-30	27	3030	177	1134							
44	43-15	67-00	27	2258	128	1216			0.1				
45	43-00	67-00	28/IX	0044	175	1355			0.2				
46	42-45	67-00	28	0245	203	1455							
47	42-30	67-00	28	0518	191	1240		0.1	0.3				
48	42-15	67-00	28	0746	183	1309		0.2	1.8				
49	42-00	67-00	28	0944	41	582	486.1	1.2					1.7
50	41-45	67-00	28	1127	40	620		76.5	1.0				2.4
51	41-30	67-00	28	1325	46	632	50.8	0.9	12.2				2.2
52	41-15	67-00	28	1512	50	726							
53	41-00	67-00	28	1706	63	708	4.8	0.7	23.7	0.1			
54	40-45	67-00	28	1857	84	856				63.4			
55	40-30	67-00	28	2041	190	1197				112.9			0.3
56	40-30	67-30	28	2332	99	956			1.6	40.3			
57	40-45	67-30	29/IX	0122	78	739			5.8	74.3		0.1	
58	41-00	67-30	29	0302	61	663	0.6	0.5	11.6	15.1			0.2
59	41-15	67-30	29	0453	37	621	27.2	0.6	0.6				0.8
60	41-31	67-30	29	0648	41	635	2.8	0.9					17.8
61	41-45	67-30	29	0838	39	510	3.9	23.5	0.6				54.9
62	41-56	67-30	29	1011	59	665		43.0	6.2				15.2
63	42-15	67-30	29	1224	191	1388		3.0	1.4				

abundance, Delaware II Cruise 71-4.

Sta.	Lat.	Long.	Date	Local Time	Sample Depth (m)	Vol. Filtered (m ³)	Atl. herring	Red hake	Silver hake	Myctophidae	Gulf Stream flounder	Butterfish	Windowpane
										No./100 m ³			
64	42°-30'	67°-30'	29	1420	209	1533		0.3	0.4				
65	42°-30'	68°-00'	29	1736	178	1135		0.2	0.4				
66	42°-15'	68°-00'	29	1943	125	1259		0.2	0.5				
67	42°-00'	68°-00'	29	2200	146	1225		5.0	21.9	0.2		0.1	0.1
68	41°-50'	68°-30'	29	2336	47	578	1.2	25.6	23.4		0.4	0.2	1.0
70	41°-15'	67°-59'	30/IX	0320	45	521	23.8	0.2	1.0				10.8
71	41°-00'	68°-00'	30	0523	33	584	6.3		384.8		0.2		2.2
72	40°-45'	68°-00'	30	0711	46	756		37.6	110.2	53.0		2.7	0.1
73	40°-30'	68°-00'	30	0849	105	381			2.0	17.9			
74	40°-30'	68°-30'	30	1122	56	700			4.7	11.7			
75	40°-45'	68°-30'	30	1324	40	612	1.0	8.2	139.4				0.5
76	41°-02'	68°-31'	30	1517	35	467		11.4	1.5				4.5
77	41°-15'	68°-30'	30	1637	40	662	0.3	39.6	28.9		0.3	0.3	9.7
78	41°-30'	68°-30'	30	1758	64	752		50.5	25.1	0.1	1.6	2.1	
79	41°-45'	68°-30'	30	1945	125	1309		41.1	42.6			0.5	0.2
80	42°-00'	68°-30'	23/IX	1823	168	1047		0.2	0.9				
81	42°-15'	68°-30'	23	1503	142	1162		0.1					
82	42°-30'	68°-30'	23	1354	212	1421			0.2				
83	42°-30'	69°-00'	23	1115	160	1275							
84	42°-30'	69°-30'	23	0837	192	1352							
85	43°-00'	69°-29'	23	0511	106	1125							
86	43°-30'	69°-30'	23	0203	135	925							
87	43°-30'	70°-00'	22/IX	1228	108	732		0.3					
88	43°-15'	70°-00'	22	1030	113	973							
89	43°-00'	70°-00'	22	0842	104	1042							
90	43°-00'	70°-15'	22	0643	139	1257			1.9				
91	42°-45'	70°-15'	22	0447	109	903							
92	42°-45'	70°-00'	22	0256	158	1427							
93	42°-40'	70°-00'	22	0049	133	1138							
94	42°-15'	69°-54'	21/IX	2242	111	942		0.1	0.3				
95	42°-00'	69°-00'	30/IX	2306	107	961		0.1	0.3				
96	41°-45'	69°-00'	1/X	0044	161	1131			0.1				
97	41°-30'	69°-00'	1	0943	154	989							
98	41°-15'	69°-00'	1	1142	108	986		4.1	4.5			0.3	0.3
99	41°-00'	69°-00'	1	1654	61	721		26.8	130.5				0.6
100	40°-45'	69°-00'	1	2327	61	697		7.0	25.5	8.6	0.6		
101	40°-30'	69°-00'	2/X	0103	62	867		146.4	263.7	15.6	0.2		1.5
102	40°-15'	69°-00'	2	0217	76	799		0.6	104.6	37.3			
103	40°-15'	69°-30'	2	0501	59	665			9.2		0.8	0.3	
104	40°-30'	69°-30'	2	0644	55	660	0.2	12.9	75.8	0.2		0.8	0.5
105	40°-47'	69°-26'	1/X	2109	40	627		40.3	52.8		22.5	10.7	6.1
106	40°-55'	69°-32'	1	1950	40	603		138.8	0.3			3.3	2.7
107	41°-15'	69°-25'	1	1423	38	589		3.2	0.2				
108	41°-32'	69°-30'	1	0630	37	704							
109	41°-45'	69°-30'	1	0420	142	1240			0.1				
110	41°-35'	69°-40'	1	0512	35	566							
113	40°-40'	70°-00'	2/X	0913	41	690		10.7	23.0		5.4	0.2	
114	40°-30'	70°-00'	2	1027	47	671		247.2	95.1		16.7	11.9	0.3
115	40°-15'	70°-00'	2	1222	84	887		18.0	23.3		0.5		0.1
116	40°-00'	70°-00'	2	1530	151	1256		14.8	2.0	1.1	0.2	2.5	0.1
117	40°-00'	70°-30'	2	1708	174	1221	0.2	1.2		2.0	0.8		
118	40°-00'	71°-00'	2	1903	232	1155				24.7	0.3		
119	40°-30'	71°-00'	3/X	0040	46	659		90.1	13.6		5.6	1.1	
120	40°-30'	70°-30'	3	C314	55	635		5.7	6.5		1.7	0.6	
121	40°-45'	70°-30'	3	0502	38	658		82.1	96.7	0.2	3.8	1.7	
122	40°-45'	71°-00'	3	0739	42	777		79.8	112.7		54.7	3.1	
123	41°-00'	71°-00'	3	0937	32	550		5.8	2.4			0.2	
124	41°-00'	70°-48'	3	1219	34	359		1.4				0.3	0.6
125	41°-12'	70°-40'	3	1328	25	396		10.9				2.0	0.3
126	41°-15'	71°-04'	3	1513	35	518		0.2				0.2	

Table 4. Station data and larval fish

Sta.	Lat.	Long.	Date	Local Time	Sample Depth (m)	Vol. Filtered (m ³)	Atl. herring	Pollock	Myctophidae
								No./100 m ³	
1	43°-00'	65°-30'	3/XII	1936	98	440	0.5		
2	42 -45	65 -30	3	2129	85	461			
3	42 -30	65 -30	3	2315	78	336			
4	42 -15	65 -29	4/XII	0142	100	215			
5	42 -00	65 -30	4	0336	175	1052			4.4
6	41 -45	65 -30	4	0541	175	925			1.3
7	41 -30	65 -30	4	0740	180	940			
8	41 -15	65 -30	4	0955	224	979			0.3
9	41 -00	65 -30	4	1410	234	1072			0.3
10	40 -45	66 -00	4	2110	170	1165			0.5
11	41 -00	66 -00	4	2310	175	1060			0.1
12	41 -15	66 -00	5/XII	0131	175	1052			0.6
13	41 -30	66 -00	5	0410	170	785			
14	41 -45	66 -00	5	0940	76	315			
15	42 -00	66 -00	5	1150	73	453			
16	42 -15	66 -00	5	1350	150	1045			
17	42 -30	66 -00	5	1617	112	522			
18	42 -45	66 -00	5	1950	48	212			
19	43 -00	66 -00	5	2125	110	475			
21	43 -30	66 -12	6/XII	0045	55	166	9.0		
22	43 -45	66 -16	6	0212	45	253	38.3		
23	44 -00	66 -30	6	0350	50	256	50.0		
24	43 -45	66 -30	6	0508	72	207	39.6		
25	43 -25	66 -30	6	0630	67	360	0.6		
26	43 -15	66 -30	6	0750	45	245			
27	43 -00	66 -30	6	0915	90	522			
28	42 -45	66 -30	6	1100	93	525			
29	42 -30	66 -30	6	1248	175	950			
30	42 -15	66 -30	6	1441	175	1014	0.1		
31	42 -00	66 -30	6	1627	65	244	0.4		
32	41 -45	66 -30	6	1738	60	237	0.8		
33	41 -30	66 -30	6	1850	60	319	3.4		
34	41 -15	66 -30	6	2019	68	318	0.3		
35	41 -00	66 -32	6	2138	68	338			
36	40 -45	66 -30	6	2300	160	1203			2.1
37	40 -30	66 -30	7/XII	0106	93	997			1.3
38	40 -15	67 -00	7	0340	95	958			2.8
39	40 -30	67 -00	7	0526	112	1248			0.5
40	40 -45	67 -00	7	0730	85	378			0.8
41	41 -00	67 -00	7	0920	50	224	0.9		
42	41 -15	67 -00	7	1055	50	234	2.6		
43	41 -30	67 -00	7	1340	50	182	19.2		
44	41 -45	67 -00	7	1500	45	192	22.4		
45	42 -00	67 -00	7	1634	50	184	58.2		
46	42 -15	67 -00	7	1855	194	1203			
47	42 -30	67 -00	7	2115	204	1153			
48	42 -45	67 -00	7	2330	204	1207			
49	43 -00	67 -00	8/XII	0123	132	773			
50	43 -15	67 -00	8	0302	162	933			
51	43 -30	67 -00	8	0453	196	1075			
52	43 -45	67 -00	8	0715	153	941			
53	44 -00	67 -00	8	0840	128	933			
54	44 -15	66 -56	8	1022	160	685			
55	44 -15	66 -30	8	1218	41	248	0.4		
56	44 -30	66 -15	8	1340	120	506			
57	44 -30	66 -30	8	1458	130	795			
58	44 -30	67 -00	8	1705	114	374			
59	44 -26	67 -30	8	1850	53	224			
60	44 -15	67 -30	8	2010	143	952			
61	44 -00	67 -30	8	2205	175	1040			
63	43 -30	67 -30	9/XII	0116	214	1140			
65	43 -00	67 -30	9	0422	258	846	0.4		
67	42 -30	67 -30	9	0725	258	1196	0.1		
68	42 -15	67 -30	9	0910	196	1209			
69	41 -56	67 -30	9	1130	18	115	1.7		
70	41 -45	67 -30	9	1253	38	183	7.7		
71	41 -30	67 -30	9	1427	33	130	19.2		
72	41 -15	67 -25	9	1600	43	225	47.6		
73	41 -00	67 -30	9	1717	45	220	2.7		
74	40 -45	67 -30	9	1843	55	329			
75	40 -30	67 -30	9	2010	97	568			
76	40 -15	67 -30	9	2135	224	1123			1.3
78	40 -15	68 -00	10/XII	0007	214	1125			

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Sta.	Lat.	Long.	Date	Local Time	Sample Depth (m)	Vol. Filtered (m ³)	Atl. herring	Pollock	Myctophidae
79	40°-30'	68°-00'	10	0203	100	476		No./100 m ³	
80	40 -45	68 -00	10	0325	60	254	7.5		
81	41 -00	68 -00	10	0441	50	203	4.9		
82	41 -15	68 -00	10	0600	46	272	68.8		
83	41 -30	67 -55	10	0750	41	146	18.5		
84	41 -45	68 -00	10	0950	18	93	3.2		
85	42 -00	68 -00	10	1114	165	1111			
86	42 -15	68 -00	10	1253	152	869			
87	42 -30	68 -00	10	1422	152	1017			
88	43 -00	68 -00	10	1712	162	691			
89	43 -30	68 -00	10	2010	204	1116			
90	44 -00	68 -00	10	2320	90	696			
91	44 -15	68 -00	11/XII	0031	46	264	1.9		
92	44 -00	68 -30	11	0302	46	303	2.0		
93	43 -30	68 -30	11	0545	153	918			
94	43 -00	68 -30	11	0850	175	755			
95	42 -30	68 -30	11	1220	175	831			
96	42 -15	68 -30	11	1413	160	563			
97	42 -00	68 -30	11	1604	158	612			
98	41 -45	68 -30	11	1820	84	351			
99	41 -30	68 -30	11	2010	114	278	25.1		
100	41 -15	68 -30	11	2135	38	231	5.2		
101	41 -00	68 -30	11	2320	38	206	6.8		
102	40 -45	68 -30	12/XII	0045	43	244	66.0		
103	40 -30	68 -30	12	0205	55	277	1.1		
104	40 -15	68 -30	12	0352	170	966			
105	40 -00	68 -30	12	0535	175	992			
106	40 -15	69 -00	12	0935	125	787			
107	40 -30	69 -00	12	1130	47	287	1.4		
108	40 -45	69 -00	12	1300	47	265	24.5	0.8	
109	41 -00	69 -00	12	1417	55	338	10.4	2.1	
110	41 -15	69 -00	12	1530	108	615	4.6		
111	41 -30	69 -00	12	1655	120	533	0.6		
112	41 -45	69 -00	12	1830	174	565			
113	42 -00	69 -00	12	2000	174	828			
114	42 -30	69 -00	12	2333	204	1002			
115	43 -00	69 -00	13/XII	0325	100	398			
116	43 -30	69 -00	13	0605	90	514			
117	43 -45	69 -00	13	0750	80	296	0.3		
118	43 -45	69 -30	13	0950	53	241	2.5		
119	43 -30	69 -30	13	1115	125	422			
120	43 -15	69 -30	13	1305	92	607			
121	43 -00	69 -30	13	1450	120	588			
122	42 -45	69 -30	13	2135	175	747			
123	42 -30	69 -30	14/XII	0025	153	1096			
124	42 -15	69 -30	14	0238	170	905			
125	42 -30	70 -00	14	0533	170	617			
126	42 -45	70 -00	14	0720	152	680			
127	43 -00	70 -00	14	0905	83	413			
128	43 -15	70 -00	14	1149	85	607			
129	43 -30	70 -00	14	1733	80	323	0.3		
130	43 -15	70 -25	14	2005	46	221	1.8		
131	43 -00	70 -30	14	2205	33	158	3.2		
132	42 -45	70 -30	14	2338	53	244	1.2		
133	42 -30	70 -30	15/XII	0128	28	147			
134	42 -15	70 -30	15	0255	60	272	0.4		
136	42 -15	70 -00	15	0537	85	382			
137	42 -00	69 -57	15	0740	12	80	1.3		
138	42 -00	69 -45	15	0845	130	472			
139	42 -00	69 -30	15	1015	175	824			
140	41 -45	69 -30	15	1221	138	652			
141	41 -45	69 -45	15	1400	83	283	0.4		
142	41 -30	69 -35	15	1615	33	247			
143	41 -15	69 -25	15	1850	23	112			
144	40 -54	69 -14	15	2225	50	239	18.4		
145	40 -30	69 -30	16/XII	0252	47	305	1.3		
147	40 -00	69 -30	16	1050	85	447			
148	39 -47	69 -35	16	1320	170	1177			
151	40 -11	69 -54	16	0800	75	346	4.3		0.1
152	40 -05	69 -57	16	1705	47	289	4.5		
153	40 -23	70 -07	16	1900	53	219	6.4		
154	40 -34	70 -20	16	2100	47	183	76.5		
155	40 -48	70 -31	16	2300	33	174	13.8		
156	40 -58	70 -40	17/XII	0102	38	217	10.1		
157	41 -12	70 -53	17	0302	30	230	2.2		

Table 5. Station data and larval fish

Sta.	Lat.	Long.	Date	Local Time	Sample Depth (m)	Vol. Filtered (m ³)	Atl. herring	Atl. cod	Pollock	Silver hake	Red hake	Myctophidae	Para-lepididae
										No./100 m ³			
1	41°-14'	70°-59'	28/XI	1748	15	125	2.4						
2	41 -10	70 -40	28	1954	21	126	7.1			1.6			
3	41 -00	70 -40	28	2121	27	159	3.1			0.6			
4	41 -00	71 -00	28	2324	37	289	3.1		1.4	1.7		0.4	
5	41 -00	71 -30	29/XI	0259	48	294				2.0	0.3		
6	40 -45	71 -00	29	0529	45	263				1.5			
7	40 -30	71 -01	29	0712	53	356	0.6			5.1		0.3	0.3
8	40 -15	71 -30	29	1125	58	399				1.8	0.5		
9	39 -59	70 -59	29	1430	85	675	0.2				0.2	0.2	0.2
10	40 -00	70 -30	29	1817	103	661					0.5		0.2
11	40 -15	70 -29	29	2022	106	679	0.6			0.2		0.2	
12	40 -15	70 -00	2/XII	2000	82	524	1.2			0.6		0.2	
13	40 -00	70 -01	2	2141	114	559				0.2			
14	40 -15	69 -31	3/XII	0120	65	417	1.7		3.6	1.9			
15	40 -15	69 -01	3	0350	84	670							
16	40 -30	69 -00	3	0633	60	379	0.5		5.0				
17	40 -29	69 -31	3	0900	47	345	0.9			2.3			
18	40 -29	70 -00	2/XII	1733	59	368	7.6		2.2	3.3			
19	40 -31	70 -31	29/XI	2208	56	313	2.6		2.2				
20	40 -46	70 -32	30/XI	0005	40	243	3.3	0.8		2.1	0.4		
21	40 -40	70 -00	2/XII	1546	35	231	33.8			0.9	0.9		
22	40 -55	69 -40	3/XII	1153	25	151	35.8						
23	40 -46	69 -32	3	1319	32	167	24.6	7.2	2.4		0.6		
24	40 -45	69 -00	3	1644	50	351	23.9	3.7		0.3			
25	41 -00	69 -00	3	1923	68	445	107.2						
26	41 -00	69 -16	3	2051	43	268	17.9	0.8					
27	41 -15	69 -21	3	2221	48	225	2.7						
28	41 -14	69 -01	4/XII	0003	95	674	2.4		0.3				
29	41 -29	69 -01	4	0241	105	684	0.9						
30	41 -30	69 -22	4	0448	57	393	0.3						
31	41 -44	69 -30	4	0619	101	686	0.3						
32	41 -44	69 -00	4	0852	106	670							
33	41 -59	68 -59	4	1125	95	714							
34	42 -15	69 -31	4	1432	102	682							
35	41 -55	69 -51	4	1747	53	392	3.7		1.0				
36	42 -15	70 -00	4	1948	88	733	1.1		0.3				
37	42 -30	70 -00	4	2217	117	629	0.2						
38	42 -44	70 -01	5/XII	0114	112	660							
39	42 -45	70 -15	5	0402	87	604	0.5						
40	42 -59	70 -15	5	1510	103	550	1.1						
41	43 -00	70 -00	5	1757	106	685							
42	43 -14	70 -00	5	1953	91	742	1.1						
43	43 -30	70 -00	5	2208	84	477	3.6						
44	43 -29	69 -32	6	0026	95	695	0.4						
44A	43 -15	68 -46	9/XII	0007	95	670							
45	43 -01	69 -30	6/XII	0327	97	648							
46	42 -30	69 -30	6	0645	101	770							
47	42 -32	68 -30	6	1108	101	679							
48	42 -16	68 -30	6	1247	105	631							
49	42 -01	68 -30	6	1438	95	700	0.3						
50	41 -46	68 -30	6/XII	1618	95	754	1.2						
51	41 -30	68 -30	6	1831	92	612	1.8			0.2			
52	41 -15	68 -31	6	2100	36	280	6.4		2.5				
53	41 -00	68 -30	6	2310	37	260	9.2	2.7		0.4	0.4		
54	40 -46	68 -29	7/XII	0127	38	212	0.9	5.2					
55	40 -30	68 -30	7	1813	40	228		0.9		0.9			
56	40 -15	68 -30	7	2007	92	762							
57	40 -15	68 -01	7	2231	90	779						0.8	0.1
58	40 -29	68 -00	8/XII	0103	103	733							0.3
59	40 -42	68 -00	8	0234	60	432		6.9					
60	41 -00	68 -00	8	0520	33	246	4.1	16.7					
61	41 -15	68 -00	8	0649	18	120	4.2	24.2					
62	41 -28	68 -09	8	0830	31	211	12.3	35.5					
63	41 -50	68 -01	8	1052	28	191		0.5	0.5				

abundance, Albatross IV Cruise 72-9.

Sta.	Lat.	Long.	Date	Local Time	Sample Depth (m)	Vol. Filtered (m ³)	Atl. herring	Atl. cod	Pollock	Silver hake	Red hake	Myctophidae	Para lepididae
										No./100 m ³			
64	42°-00	68°-00	8	1218	100	732	0.3						
65	42 -14	68 -02	8	1403	95	749	0.1						
66	42 -30	68 -00	8	1643	97	720	0.1						
67	42 -45	68 -00	8	1833	102	783	0.1						
68	42 -45	67 -30	10/XII	0224	93	690							
69	42 -30	67 -30	10	0414	100	759							
70	42 -15	67 -30	10	0603	95	710							
71	42 -00	67 -35	10	0746	31	209							
72	41 -44	67 -30	10	1009	27	190	1.1	6.8					
73	41 -31	67 -30	10	1153	25	194	2.1	30.9					
74	41 -16	67 -21	10	1330	30	183	13.1	27.3					
75	41 -02	67 -30	10	1501	52	412	2.9	3.6		0.2			
76	40 -45	67 -30	10	1636	77	556	0.4	9.7					
77	40 -30	67 -30	10	1806	95	791	0.1						0.8
78	40 -31	67 -00	10	2047	97	882					0.5		0.7
79	40 -45	67 -01	10	2353	87	645					0.9		4.5
80	40 -59	66 -58	11/XII	0139	66	526	1.1	1.3					
81	40 -15	67 -00	11	0409	52	434	1.6			0.2			
82	41 -29	66 -58	11	0920	53	367	25.3		7.6				
83	41 -45	67 -01	11	1130	55	364	8.5						
84	41 -59	66 -59	11	1348	43	330	4.8	3.0		0.3			
85	42 -15	67 -00	11	1605	100	689							
86	42 -29	67 -00	11	1826	103	739							
87	42 -30	66 -30	11	2146	104	708	0.1						
88	42 -15	66 -30	11	2326	88	650							
89	42 -00	66 -30	12/XII	0113	70	501	0.2						
90	41 -44	66 -30	12	0332	60	435	2.8						
91	41 -30	66 -30	12	0512	80	590	0.3		0.3				
92	41 -15	66 -30	12	0648	76	530	0.2						
93	41 -00	66 -31	12	0830	48	397					0.3		1.5
94	41 -14	60 -05	12	1109	106	751	0.1			0.1	0.7		3.1
95	41 -29	66 -00	12	1337	90	688							
96	41 -43	66 -00	12	1512	86	757	0.3						
97	42 -00	65 -30	12	1824	114	559					2.9		0.2
98	42 -00	66 -00	12	2104	68	500							
99	42 -13	66 -00	12	2220	93	784							0.3
100	42 -51	66 -30	15/XII	1807	98	696							
101	42 -28	66 -00	13/XII	0028	101	696							
102	42 -43	66 -00	13	0207	51	368							
103	42 -45	66 -30	13	0519	119	619							
104	42 -45	67 -00	13	0748	90	671							
105	43 -01	66 -58	13	0955	118	773							
105A	43 -15	67 -45	9/XII	2245	91	642							
106	43 -19	67 -00	14/XII	0310	97	725							
107	43 -29	67 -00	14	0503	102	806	0.1						
107A	43 -45	67 -45	9/XII	1853	119	735							
108	43 -45	67 -00	14/XII	0720	87	645							
109	43 -57	67 -00	14	0857	99	737							
110	44 -19	67 -29	14	1233	86	771							
111	44 -19	66 -59	14	1450	101	779							
112	44 -20	66 -40	14	1632	97	783	1.3						
113	44 -00	66 -30	14	1835	55	412	2.2						
114	43 -45	66 -30	14	1956	73	594	23.1						
115	43 -30	66 -30	14	2130	87	531	1.9	0.2					
116	43 -29	66 -17	14	2253	62	470	5.5						
117	43 -14	66 -30	15/XII	0044	68	532	7.5						
118	42 -59	66 -29	15	0249	97	720							
119	43 -00	66 -01	15	0529	93	726	1.7						
120	43 -10	66 -00	15	0645	77	499	1.0						
121	43 -14	65 -33	15	0915	33	235	1.3						
122	43 -00	65 -30	15	1648	97	771							
123	43 -10	65 -01	15	1415	106	785							
124	43 -29	65 -01	15	1205	92	722							

Table 6.— Station data and larval fish

Sta.	Lat.	Long.	Date	Local Time	Sample Depth (m)	Volume Filtered (m ³)	Atl. herring	Atl. cod	Silver hake	Pollock	Red hake	Myctophidae
									No./100 m ³			
1	41°-15'	71°-00'	4/XII	1225	28	202	2.0				1.0	
2	41 -15	70 -40	4	1426	14	102	2.9	13.7			2.9	
3	41 -00	70 -40	4	1649	41	231	2.2		1.3			
4	41 -00	71 -00	4	1831	35	239		0.7	0.8			
5	40 -59	71 -28	4	2130	35	239	0.4	0.4			0.4	
6	40 -45	71 -00	5/XII	0010	54	345	5.5		0.3		0.3	
7	40 -29	71 -01	5	0245	71	496	8.5	1.0	6.7		0.4	
8	40 -15	71 -30	5	0530	77	501	4.0		5.4		1.2	0.2
9	40 -01	71 -00	5	1017	95	744	0.1				0.3	0.3
9A	39 -45	71 -00	5	1205	109	814	0.1	0.1	0.2		0.5	0.1
9B	39 -45	70 -30	5	1540	113	801	2.8	0.6	3.1		0.4	
10	40 -00	70 -30	5	1840	122	915	1.1	0.1	3.2			0.1
11	40 -14	70 -30	5	2120	80	543	0.9		0.2			1.1
12	40 -15	70 -00	6/XII	0105	95	710	0.6		0.1			
13	40 -00	70 -00	6	0620	92	736	0.3					2.4
13A	39 -45	69 -59	6	1103	98	735	0.9				0.1	2.7
13B	39 -45	69 -30	6	1917	100	750						1.7
13C	39 -59	69 -30	6	2100	93	695	0.9			0.1		0.7
14	40 -13	69 -30	6	2250	74	545	0.6	0.2				
14A	40 -00	69 -00	7/XII	0149	100	807	2.5	0.4		0.1		0.7
15	40 -15	69 -00	7	0442	107	727	1.1	0.1	0.3			0.1
16	40 -30	69 -00	7	0632	68	520	33.1		0.2			
17	40 -29	69 -30	7	0942	68	558	5.7					
19	40 -30	70 -30	7	1439	62	425	21.2	8.5	1.2		0.2	
20	40 -45	70 -30	7	1621	53	350	21.4		0.6		0.6	
21	40 -45	70 -00	7	1847	30	204	81.9	7.8				
22	40 -53	69 -39	7	2100	30	216	0.5	2.8				
23	40 -45	69 -30	7	2215	47	335	129.5	2.1				
24	40 -45	69 -00	8/XII	0143	56	385	113.5	0.5	0.5			
25	41 -01	69 -01	8	0401	80	532	30.6					
26	41 -01	69 -15	8	0558	60	344	27.3	2.9				
27	41 -15	69 -25	8	0758	35	249	0.8	0.4				
28	41 -15	69 -01	8	1025	95	765	1.4					
29	41 -30	69 -00	8	1246	102	756	0.9					
30	41 -30	69 -25	8	1534	57	330	1.2					
31	41 -45	69 -30	8	1743	105	800	0.1	0.1	0.1			
32	41 -45	69 -00	11/XII	0835	63	460	7.6					
33	41 -59	68 -59	11	0600	101	752	0.3					
34	42 -15	69 -30	10/XII	1445	104	818	0.4	0.5				
35	41 -55	69 -30	8/XII	1946	73	427	0.9	0.9		8.2		
36	42 -15	69 -59	8	1135	95	742		0.4				
37	42 -30	70 -00	20/XII	0636	110	793	0.1					
37A	42 -30	70 -15	20	0805	83	615	0.3	1.3				
37B	42 -15	70 -30	20	1030	65	439				2.5		
37C	42 -00	70 -26	20	1238	35	251	2.0			12.4	0.4	
37D	41 -55	70 -21	20	1336	22	175	2.3	37.1			0.6	
38	42 -45	70 -00	20	0442	107	739	0.1					
39	42 -45	70 -15	20	0317	42	330				2.1		
40	43 -00	70 -15	20	0136	100	762						
41	43 -00	70 -00	20	0005	101	776		0.1	0.3			
45	43 -00	69 -30	19/XII	2120	110	753				0.2		
46	42 -30	69 -30	10/XII	1740	116	752	0.4					
47	42 -30	68 -30	10	2243	86	640	0.2					
48	42 -15	68 -30	11/XII	0036	95	710	0.1					
49	42 -00	68 -30	11	0328	99	826	0.1					

abundance, Albatross IV Cruise 73-9.

Sta.	Lat.	Long.	Date	Local Time	Sample Depth (m)	Volume Filtered (m ³)	Atl. herring	Atl. cod	Silver hake	Pollock	Red hake	Myctophidae
									No./100 m ³			
50	41°-45	68°-30	11	1135	107	805	8.0				0.3	
51	41 -30	68 -30	11	1432	102	590	24.2	0.2				
52	41 -15	68 -30	11	1600	48	341	4.7	1.5				
53	41 -00	68 -30	11	1730	38	206	75.7					
54	40 -45	68 -30	11	1920	42	307	310.4	0.3				
55	40 -30	68 -29	11	2105	98	770	0.3	0.1				0.3
56	40 -15	68 -30	12/XII	0028	103	775						0.5
56A	40 -00	68 -30	12	0300	120	895	0.1					1.7
57	40 -15	68 -00	12	0655	110	909						0.2
58	40 -29	68 -00	12	0905	89	660	0.3					
59	40 -45	68 -00	12	1304	62	510	1.8	0.2				0.2
60	41 -00	68 -00	12	1520	48	380	55.0					
61	41 -14	68 -00	12	1744	26	145	91.8	45.5				
62	41 -24	68 -04	12	1917	32	256	49.6	39.1				
63	41 -49	68 -02	12	2220	54	457	0.7	0.2				
64	42 -00	68 -00	13/XII	0006	106	827	0.2					
65	42 -15	68 -00	13	0228	104	766	0.3					
66	42 -30	68 -00	13	0419	104	738						
67	42 -46	68 -00	13	0715	102	770						
68	42 -45	67 -30	13	0936	95	710						
69	42 -30	67 -30	13	1230	101	765	0.1					
70	42 -15	67 -30	13	1420	100	786						
71	42 -00	67 -35	13	1610	35	239	0.4					
72	41 -45	67 -30	13	1754	42	293	28.7	28.7				
73	41 -30	67 -30	13	1920	43	339	57.8	15.9				
74	41 -15	67 -32	13	2125	40	294	338.4					
75	41 -06	67 -30	14/XII	0012	55	408	4.2	0.5				
76	40 -45	67 -30	14	0224	80	625	1.3					0.2
77	40 -30	67 -30	14	0442	99	740	0.3					
77A	40 -15	67 -30	14	2030	102	771					0.3	2.1
78	40 -30	67 -00	15/XII	0058	117	885					0.2	2.0
79	40 -45	67 -01	15	0311	102	715						0.1
80	40 -59	67 -00	15	0521	72	592	1.5	1.7				0.2
81	41 -15	67 -01	15	0745	69	404	14.6	5.2				
82	41 -30	67 -00	15	0935	67	463	45.6	0.9				
83	41 -45	67 -00	15	1348	32	215	107.0	10.7				
84	42 -00	66 -59	15	1538	48	340	28.8	32.4				
85	42 -16	66 -59	15	1847	97	725	0.1					
86	42 -29	66 -59	15	2110	116	870						
87	42 -30	66 -30	16/XII	0558	104	805	0.3					
88	42 -16	66 -30	16	0745	114	719						
89	42 -01	66 -30	16	0942	84	613	8.2	5.7				
90	41 -45	66 -30	16	1116	83	659	5.5	0.5				
91	41 -30	66 -30	16	1335	73	594	2.9	15.7				
92	41 -15	66 -31	16	1613	83	598	1.2	7.5				
93	41 -00	66 -30	16/XII	1830	107	757						
93A	40 -45	66 -30	16	2055	86	730						
93B	41 -00	66 -00	17/XII	0122	113	759		0.1			0.1	10.0
94	41 -15	66 -00	17	0411	100	810						3.3
94A	41 -30	65 -30	17	0830	120	910						1.1
95	41 -30	66 -00	17	1311	112	813	0.1	0.4				
96	41 -45	66 -00	18/XII	0103	82	605	6.0					
97	42 -00	65 -30	18	0535	97	759						
98	42 -00	66 -00	18	2316	105	819		0.1				
99	42 -15	66 -01	19/XII	0210	123	930	1.2					
101	42 -30	66 -00	19	0502	123	827	0.1					
103	42 -45	66 -30	16/XII	0315	95	798						
104	42 -46	67 -00	16	0009	97	812						

Table 7.— Station data and larval fish abundance, Albatross IV Cruise 74-2.

Sta.	Lat.	Long.	Date	Local Time	Sample Depth (m)	Volume Filtered (m ³)	Atl. herring	Northern sandlance	Pollock No./100 m ³	Atl. cod	Haddock
3	41°-00'	70°-40'	11/II	1930	32	208		33.2		2.4	
4	41 -00	71 -00	22/II	0437	41	247	0.8	4.9		3.6	
6	40 -45	71 -00	22	0305	48	353	0.8	10.5	39.9	2.5	1.1
16	40 -30	69 -00	21/II	1555	63	448		1.1	0.2		0.7
17	40 -30	69 -30	21	1906	53	342	0.3	14.6	0.9	12.3	
18	40 -30	70 -02	21	2129	55	400		1.0	7.5	8.3	5.0
19	40 -30	70 -30	22/II	0011	65	435		9.7	16.6	7.4	6.0
20	40 -45	70 -30	11/II	2120	43	291	3.8	6.9	57.0	2.4	0.3
21	40 -45	70 -00	12/II	0040	25	160	2.5	13.1	0.7		
22	40 -55	69 -38	12	0250	25	227	3.1	4.0	5.3		
23	40 -45	69 -30	12	0435	33	274		0.4	6.9		
24	40 -44	69 -00	12	0714	63	461	0.2	0.4	1.1		0.2
25	41 -00	69 -00	12	1058	85	630		13.8	6.8	0.8	0.2
26	41 -00	69 -16	12	1350	47	376		7.5	0.5		
27	41 -12	69 -24	12	1540	37	275		1.1			
28	41 -15	69 -00	12	1745	104	780	0.4	0.3	0.1		
29	41 -31	69 -01	12	2001	100	791	0.1	0.9	0.1		
30	41 -31	69 -25	12	2225	60	434			0.2		
32	41 -45	69 -00	13/II	0100	112	759					
49	42 -00	68 -32	13	0405	99	788	0.4				
50	41 -45	68 -29	13	0633	110	724	0.4				
51	41 -30	68 -30	13	0829	83	680	1.3	8.5	1.2		0.2
52	41 -15	68 -30	13	1008	50	441	0.2	3.9	0.7		0.9
53	41 -00	68 -30	13	1307	37	194	0.5	3.6		1.0	
54	40 -46	68 -30	13	1537	54	348	5.1	2.0			
55	40 -30	68 -30	13	1900	84	622		1.3	0.8		0.5
56	40 -15	68 -30	13	2103	98	789		0.4			
58	40 -30	68 -00	14/II	0042	97	753		0.1	0.1		0.1
59	40 -44	68 -00	14	0229	88	650	4.2	9.5		0.8	
60	41 -00	68 -00	14	0407	50	293					
61	41 -15	68 -00	14	0711	25	223	4.5	14.8		5.2	
62	41 -24	68 -02	14	1004	35	221	1.4	26.2	8.1	8.6	
63	41 -45	68 -00	15/II	0200	27	225	0.4	2.2	0.9		
64	42 -00	68 -00	15	0315	106	745					
70	42 -16	67 -30	15	0630	120	900					
71	42 -01	67 -30	15	0818	35	234	2.6	2.6	1.7		
72	41 -45	67 -30	15	1035	40	236	0.8	19.1	3.8	1.3	
73	41 -30	67 -30	15	1221	29	248	2.8	12.9	1.2	4.0	
74	41 -16	67 -31	15	1419	35	249	3.2	16.9		3.6	
75	41 -00	67 -29	15	1716	59	472	6.4	12.7		1.3	
76	40 -45	67 -30	15	2040	80	556	1.3	4.9		1.6	
80	41 -00	67 -00	16/II	0011	72	479		2.7		2.9	0.6
81	41 -14	67 -00	16	0211	67	402	6.0	8.7	1.2	0.3	
83	41 -44	67 -00	16	0800	53	322		3.4	0.3	1.6	
84	42 -00	67 -00	16	1023	55	345	0.6	9.9	4.9	1.7	
85	42 -15	67 -00	16	1229	104	771	0.5				
88	42 -15	66 -25	16	1703	104	699		0.6			
89	42 -01	66 -31	16	1900	73	530	0.2	1.7	0.4		
90	41 -45	66 -30	16	2048	70	500	0.2	2.2	0.8	0.4	
91	41 -30	66 -30	16	2245	80	549			0.6	0.4	

Table 8.— Station data and larval fish abundance, Delaware II Cruise 74-12.

Sta.	Lat.	Long.	Date	Local Time	Sample Depth (m)	Volume Filtered (m ³)	Atl. herring	Fourbeard rockling	Red hake	Silver hake	Witch fld.
										No./100 m ³	
2	42°-13'	70°-14'	12/X	2236	29	206	3.9	1.5	1.0	6.5	0.5
3	42 -10	70 -27	12	2126	35	205	0.5	85.4	63.9	27.9	3.4
4	42 -15	70 -36	12	2031	45	281	0.4		1.4	0.7	
5A	42 -28	70 -23	12	1640	77	339	55.8	19.5	6.2	9.7	
5	42 -23	70 -19	8/X	--	29	149	38.3	40.3	22.8	4.7	1.3
6	42 -20	70 -30	12/X	1733	67	362	0.6	3.3	4.4	0.6	0.6
7	42 -27	70 -44	12	2003	55	412	1.9	3.6	6.1	0.7	1.7
8	42 -32	70 -37	12	1840	65	359	3.1	1.7	8.9	1.4	
9A	42 -35	70 -25	12	1507	107	428	12.4	0.5	0.2	0.7	
9	42 -41	70 -24	11/X	1134	45	233	67.4	0.4	0.9		0.4
10	42 -44	70 -23	11	1041	85	429	2.3		0.9		
11	42 -47	70 -19	8/X	2125	110	645	5.9		1.7		0.2
12	42 -49	70 -23	11/X	0947	113	549	34.2		0.2	0.2	
13	42 -52	70 -29	11	0855	110	634				0.5	
14	42 -52	70 -34	11	0800	88	481			0.2	0.4	0.8
15	42 -51	70 -41	11	0709	59	342	0.3	1.8		6.4	1.5
16	43 -00	70 -20	8/X	2300	103	413					
17	43 -04	70 -33	11/X	0530	40	343	0.3		3.8	7.6	0.3
18	43 -11	70 -16	9/X	0025	100	435	0.7	0.5		0.2	
19	43 -10	70 -24	11/X	0410	85	500	4.6		0.4	10.4	0.6
20	43 -21	70 -22	11	0246	51	278	14.0	4.7	1.1	1.4	1.1
21	43 -20	70 -16	11	0202	70	320	8.4		1.3	0.3	0.3
22	43 -19	70 -06	9/X	0202	104	618	1.0				
23	43 -25	70 -15	11/X	0115	65	380	62.9		5.5	7.4	0.8
24	43 -30	70 -07	11	0009	40	236	16.5	1.3		0.4	
25	43 -26	69 -53	9/X	0345	120	703					
26	43 -31	69 -57	10/X	2302	95	556	0.4	0.2			
27	43 -39	69 -59	10	2201	59	350	131.1	6.3		2.6	
28	43 -30	69 -39	9/X	0512	94	558	3.2	0.4		0.2	
29	43 -39	69 -44	10/X	2044	50	356	30.3	4.5		0.8	
30	43 -46	69 -42	10	1950	53	411	8.3		0.5	0.2	
31	43 -48	69 -29	10	1817	82	478	16.1	7.3	4.2	1.7	0.8
32	43 -43	69 -25	10	1722	90	417	9.1	1.4		0.5	
33	43 -37	69 -22	9/X	0710	109	583	11.8	0.3		0.2	
34	43 -39	69 -07	10/X	1336	115	456	3.7	0.4		0.2	
35	43 -46	69 -06	10	1428	90	402	22.4			0.3	
36	43 -50	69 -07	10	1330	75	407	9.8	1.7	0.5		
37	43 -45	68 -50	9/X	0955	83	607	57.7	0.3		0.8	0.3
39	43 -57	68 -42	10/X	0921	65	444	14.6			0.5	0.2
40	43 -51	68 -38	10	1043	106	620	11.3	0.8			0.3
41	43 -46	68 -37	9/X	1130	92	540	5.4			0.6	
42	43 -53	68 -22	9	1310	86	501	4.0				
43	43 -59	68 -26	10/X	0826	95	493	80.1		0.2		
44	44 -04	68 -24	10	0742	68	293	81.6	0.3	0.7	0.3	0.3
45	43 -49	68 -09	9/X	1434	40	252	5.6				
46	44 -06	68 -00	9	1528	100	577	4.0	0.2			
47	44 -13	68 -04	10/X	0432	35	269	63.6			1.1	
48	44 -19	68 -08	10	0537	45	337	77.2	0.9			
49	44 -24	67 -40	10	0150	45	360	380.0				
50	44 -20	67 -41	10/X	0227	75	369	366.7				
51	44 -15	67 -40	9/X	1738	96	612	4.9			0.3	
52	44 -21	67 -15	9	1935	95	552	2.7			0.7	
53	44 -30	67 -20	10/X	0003	47	322	169.9				
54	44 -33	67 -17	9/X	2310	70	359	205.0				
55	44 -36	67 -09	9	2226	88	518	147.3				
56	44 -28	67 -09	9	2110	50	320	30.6				

Table 9.— Station data and larval fish

Sta.	Lat.	Long.	Date	Local Time	Sample Depth (m)	Volume Filtered (m ³)	Atl. herring	Pollock	Atl. cod	No./100 m ³		
										Silver hake	Paralepididae	Myctophidae
1	41 -13'	71 -01'	4/XII	1320	35	167				0.6		
2	41 -10	70 -04	4	1645	35	140	2.4		2.9			
3	41 -00	70 -40	4	1906	49	281	1.4			0.7		
4	41 -02	71 -00	4	2153	38	245			0.8			
5	41 -01	71 -26	5/XII	0112	55	301						
6	40 -45	71 -00	5	0413	60	369	21.1			0.5		
7	40 -30	71 -00	5	0715	81	494	14.2		1.4	1.0		0.4
8	40 -14	71 -31	5	1029	87	528				5.5	0.8	0.8
8.1	39 -55	71 -29	5	1320	109	684					2.8	1.2
9.1	40 -16	71 -00	5	1630	110	616	18.0	1.1		2.9	2.3	0.3
9	39 -59	71 -00	5	1905	107	625					12.3	2.2
10	40 -01	70 -30	5	2200	93	534	1.0			0.7	6.4	3.4
11	40 -16	70 -30	6/XII	0056	90	525	3.4			5.5	5.5	1.3
12	40 -16	70 -00	6	0352	90	481	14.6		0.2	2.5	0.6	
13	40 -01	70 -00	6	0629	115	667	0.1			0.7		0.3
14	40 -15	69 -29	6	1225	80	464	0.4			5.2	0.6	2.2
14.1	40 -01	69 -30	6	0950	113	648						
15	40 -15	69 -01	6	1548	115	515				1.6	2.7	0.2
16	40 -30	69 -00	6	1821	75	479	41.1		0.2	0.2		
17	40 -30	69 -31	6	2124	62	349	40.1					
18	40 -30	69 -58	6	2348	75	419	86.2	4.8	3.8			
19	40 -31	70 -29	7/XII	0255	70	377	40.8	1.6		0.5		
20	40 -44	70 -31	7	0419	55	278	65.8			0.4		
21	40 -40	70 -00	7	0718	53	270	74.1					
22	40 -55	69 -39	7	0929	38	214	3.7	6.3				
23	40 -45	69 -31	7	1051	53	234	14.5	41.0	0.9			
24	40 -45	69 -00	7	1343	85	447	21.9	11.9	0.2			
25	41 -00	69 -00	7	1547	79	430	1.6	10.2				
26	41 -00	69 -16	7	1810	44	275	7.6	50.9				
27	41 -15	69 -24	7	1947	45	237	0.4	40.5				
28	41 -16	69 -02	7	2222	108	701	0.1	0.1				
29	41 -31	69 -00	8/XII	0056	100	662	0.2			0.2		
30	41 -32	69 -24	8	0355	60	296		9.1				
31	41 -45	69 -30	8	0555	115	625	0.5	0.6				
32	41 -45	69 -00	8	0914	113	635						
33	41 -59	69 -00	8	1159	113	656						
34	42 -14	69 -29	8	1556	119	614						
35	41 -55	69 -49	8	2045	72	350	8.6	1.1				
36	42 -18	70 -00	8	2354	112	663	0.8			0.2		
37	42 -28	70 -00	9/XII	0200	112	581	0.2					
38	42 -45	70 -00	9	0433	95	541	1.7					
39	42 -46	70 -15	9	0558	50	271	0.7					
40	43 -00	70 -16	9	0809	117	588	0.3					
41	42 -59	69 -59	9	0956	100	578	0.7					
42	43 -15	70 -02	9	1239	100	642	1.9					
43	43 -30	69 -59	9	1433	95	532	3.9	0.2				
44	43 -30	69 -30	9	1756	110	532	2.6					
45	43 -00	69 -30	9	2130	98	631	1.3					
46	42 -30	69 -32	10/XII	0050	100	641	0.2					
47	42 -30	68 -30	10	0555	107	577	0.2					
48	42 -15	68 -30	10/XII	0752	105	558						
49	42 -00	68 -30	10	0935	92	620	0.2					
50	41 -45	68 -31	10	1148	110	618	0.2					
51	41 -30	68 -32	10	1344	100	539	9.5	0.4				

abundance, Albatross IV Cruise 74-13.

Sta.	Lat.	Long.	Date	Local Time	Sample Depth (m)	Volume Filtered (m ³)	Atl. herring	Pollock	Atl. cod	Silver hake	Paralepididae	Myetophidae
										No./100 m ³		
52	41°-16'	68°-31'	10	1614	50	282	85.8	2.8	1.1			
53	41 -00	68 -30	10	1908	54	268	86.9	0.4		0.4		
54	40 -45	68 -29	10	2138	40	216	97.2			1.4		
55	40 -30	68 -30	10	2319	78	498	23.9	0.4	1.2	0.6	2.2	
56	40 -16	68 -30	11/XII	0144	79	389	3.6					
57	40 -15	68 -00	11	0626	102	631	0.2				0.6	0.5
58	40 -30	68 -00	11	0936	107	640	0.3			0.2	0.8	
59	40 -44	68 -00	11	1344	75	494						
60	41 -00	68 -00	11	1706	44	242	263.2					
61	41 -16	67 -54	11	1839	39	204	138.7		2.5			
62	41 -26	68 -06	11	1946	35	222	251.8		3.2			
63	41 -49	68 -00	11	2146	45	247	43.3	0.4	8.9			
64	42 -00	68 -00	11	2332	95	645	0.6					
65	42 -14	68 -00	12/XII	0201	95	606	0.2					
66	42 -30	68 -00	12	0445	110	595	0.2	0.2				
67	42 -45	68 -00	12	0710	100	628						
68	42 -45	67 -30	12	0932	105	588						
69	42 -29	67 -28	12	1207	100	673						
70	42 -15	67 -29	12	1527	98	552						
71	42 -00	67 -33	12	1829	38	228	3.5		2.6			
72	41 -46	67 -30	12	2051	38	196	49.0	20.4	28.6			
73	41 -30	67 -29	12	2227	41	210	32.4	1.9	13.8			
74	41 -14	67 -29	13/XII	1245	35	253	105.1					
75	40 -58	67 -28	13	0258	62	373	201.9	0.3	1.2	0.3		
76	40 -45	67 -31	13	0419	80	476	25.0		0.6	0.8	1.3	
77	40 -30	67 -31	13	0646	95	571	0.2	0.4		0.2	1.2	0.2
77.1	40 -16	67 -30	13	0952	104	653					0.6	
78	40 -29	66 -59	13	1440	100	556					0.9	
79	40 -44	67 -00	13	1745	110	501	1.2	0.2				
80	41 -00	67 -00	13	2003	73	384	62.8	2.6	6.8			
81	41 -16	66 -59	13	2214	65	331	81.0	1.2	3.3			
82	41 -30	67 -01	14/XII	0014	64	353	34.0					
83	41 -43	66 -58	14	0206	59	332	63.6	0.3	3.0			
84	42 -00	67 -01	14	0504	68	398	1.8	1.0	1.8			
85	42 -15	67 -00	14	0741	97	642	0.1					
86	42 -30	67 -00	14	1039	104	563						
87	42 -30	66 -31	15/XII	1440	104	528						
88	42 -16	66 -29	15	1923	97	579						
89	42 -00	66 -30	15	2238	85	409	0.5					
90	41 -47	66 -30	16/XII	0112	83	446	1.3					
91	41 -31	66 -30	16	0355	93	495	6.3	1.0				
92	41 -15	66 -31	16	0614	90	516	6.8					
93	41 -00	66 -30	16	0828	95	584		0.2			0.2	0.2
94	41 -15	66 -01	16	1340	98	538					0.2	0.4
95	41 -29	66 -00	16	1755	98	516					0.2	
96	41 -44	66 -01	16	2135	95	559					0.4	
99	42 -14	65 -58	17/XII	1119	105	654	0.2	0.2				
101	42 -29	65 -59	17	1441	98	632						
103	42 -45	66 -30	17	1952	98	624						
104	42 -46	67 -01	17	2320	98	529		0.2		0.2	0.3	
125	42 -59	67 -29	18/XII	0325	98	526						
130	43 -00	68 -00	18	0642	105	550						
131	43 -00	68 -30	18	1015	105	515	0.2					
135	42 -59	69 -00	18	1604	98	577	0.2					

Table 10.—Station data and larval fish

Sta.	Lat.	Long.	Date	Local Time	Sample Depth (m)	Volume Filtered (m ³)	Northern sandlance	Pollock	No./100 m ³		
									Atl. cod	Atl. herring	Haddock
3	41°-00'	70°-40'	27/II	0839	55	303	13.2		1.3	2.0	
4	41-00	70-59	27/II	1130	62	280	2.9			0.4	
5	41-00	71-20	28/II	0400	47	197	3.6			0.5	
5.1	40-45	71-30	28	0219	59	312	4.2				
5.2	40-30	71-30	28	0019	22	135	11.1	5.2		0.7	0.7
6	40-46	71-00	27/II	1313	58	345	3.5	0.6	1.5	0.4	
7	40-30	71-01	27	1518	75	472	38.8	3.4			0.4
8	40-15	71-30	27	2155	75	472	2.8	1.1			0.2
8.1	40-00	71-30	27	2022	90	619	4.2	0.3	0.2		0.5
9.1	40-15	71-00	27	1700	92	593	5.4	1.4	0.2		1.2
10	40-00	70-30	26/II	2133	100	666	0.6				
11	40-15	70-31	27/II	0042	95	633	28.0	2.7	1.1		0.6
12	40-15	70-00	26/II	0222	100	559	2.3	7.2			0.7
13	40-00	70-00	26	0515	97	602		0.3			
14	40-15	69-30	25/II	0546	62	504	2.4	10.3	1.6		0.6
14.1	40-00	69-29	25	0644	90	551					
15	40-15	69-00	24/II	0246	93	641	2.8	3.1	0.3	0.2	0.2
16	40-30	69-00	25/II	0101	62	381	12.3	3.4	0.8	1.3	0.5
17	40-30	69-30	25	1037	70	343	23.0	15.7	8.2		1.5
18	40-30	70-00	25	2240	59	324	71.9	25.6	6.2	0.6	3.7
19	40-30	70-30	27/II	0252	67	427	51.8	1.2	1.9		0.5
20	40-45	70-30	27	0544	52	282	9.2	1.4		4.3	
21	40-40	70-00	25/II	2002	41	240	44.2		0.4	9.2	
22	40-54	69-40	25	1450	42	206	12.6	2.9	1.9		
23	40-45	69-30	25	1233	42	243	10.7	18.9	0.8	0.4	0.4
24	40-45	69-00	24/II	2258	64	369	11.6	1.6	2.2	2.7	1.1
25	41-00	69-00	24	2027	67	407	24.1	7.4	1.0	0.2	0.7
26	41-00	69-17	24	1832	45	236	41.5	18.2		0.4	0.4
27	41-15	69-25	24	1543	42	204	2.0	4.4	0.5		
28	41-15	68-60	24	1333	98	559	11.3	1.6			
29	41-30	69-00	24	1050	96	664		0.5		0.2	
30	41-30	69-24	24	0904	66	339		1.5			
31	41-44	69-30	24	0706	105	629		0.2			
32	41-45	69-00	24	0400	85	699					
33	42-00	69-01	15/II	1744	108	694					
34	42-15	69-29	15	1409	25	150					
35	41-55	69-50	15	1120	21	377		2.1			
36	42-10	70-00	15	0815	103	473		0.2			
47	42-13	68-30	16/II	1440	128	755					
48	42-16	68-30	15/II	2135	105	725					
51	42-48	68-29	24/II	0212	90	659				0.2	
52	42-30	68-30	24	0010	93	692	1.0			0.4	
53	42-15	68-30	23/II	2236	45	275	4.3	0.7		0.7	0.4
54	42-15	68-30	23	2113	47	329	20.4		5.2	1.5	1.5

abundance, Albatross IV Cruise 75-2.

Sta.	Lat.	Long.	Date	Local Time	Sample Depth (m)	Volume Filtered (m ³)	Northern sandlance	Pollock	No./100 m ³		
									Atl. cod	Atl. herring	Haddock
54	40°-45'	68°-30'	23	1917	53	289	80.3	0.7	0.4	32.2	
55	40 -30	68 -30	23	1714	30	183	237.2	0.6	0.6	1.1	0.6
56	40 -15	68 -30	23	1521	98	651	0.2	3.1	0.6		0.6
58	40 -31	67 -59	23	1130	95	573					
59	40 -45	67 -59	23	1002	71	467	16.1	3.4	6.0		0.9
60	41 -00	68 -00	23	0808	53	216	181.5	6.9	6.5	9.3	
61	41 -16	67 -53	23/II	0618	25	160	361.8		8.8	21.2	
62	41 -25	68 -06	19/II	1820	25	156	59.0	0.6	6.4	27.6	
63	41 -50	67 -60	19	1523	43	292				0.3	
64	42 -00	68 -00	19	1357	95	698					
65	42 -15	67 -60	19	1116	112	700					
66	42 -30	68 -00	16/II	0249	110	629					
69	42 -30	67 -32	16	0607	108	728					
70	42 -15	67 -30	19/II	0857	89	713					
71	42 -00	67 -34	19	0705	28	277	4.7				
72	41 -45	67 -30	19	0505	36	286	12.6	9.4	3.5	0.7	
73	41 -30	67 -30	19	0445	34	221	10.4	2.7	2.7	3.2	
74	41 -15	67 -30	19	0222	35	226	10.2		0.4	22.1	
75	41 -00	67 -31	19	0054	48	447	27.7	4.5		10.7	0.2
76	40 -45	67 -30	18/II	2317	75	553		15.2			2.2
77	40 -31	67 -31	18	2141	85	742					
79A	40 -44	67 -01	18	1809	36	260					
79B	40 -46	67 -02	18	1822	79	662					
80	41 -01	67 -01	18	1515	60	338		4.4		0.6	
81	41 -15	67 -01	18	1254	67	362	3.9	20.2		0.8	3.6
82	41 -30	67 -00	18	1025	58	331	15.7	2.7		0.3	0.6
83	41 -45	66 -60	18	0819	55	320	16.2	4.7			
84	41 -59	67 -00	18	0632	59	337	17.5	1.8			
85	42 -15	67 -01	18	0333	100	628	6.8			0.2	
86	42 -30	67 -00	16	0826	105	658					
87	42 -30	66 -31	16	1250	120	618				0.2	
88	42 -15	66 -31	18	0008	95	669	0.4	0.3			0.2
89	41 -60	66 -30	17	2152	85	419	2.2	2.9		0.5	0.2
90	41 -45	66 -30	17	2001	90	390	2.0	4.6		0.5	
91	41 -30	66 -30	17	1821	83	577	0.4	10.6		0.7	
92	41 -15	66 -31	17	1534	85	574					
93	41 -00	66 -31	17	1302	100	652					
95	41 -30	66 -00	17	0825	103	669		0.5		0.2	
96	41 -45	66 -00	17	0613	98	624		0.3		0.3	
97	42 -00	65 -31	17	0138	105	675					
98	42 -00	65 -60	16	2200	105	635		0.9			
99	42 -15	66 -00	16	1910	120	652					
101	42 -30	66 -00	16	1630	115	679		0.2			

Table 11.— Length frequencies, Delaware II Cruise 71-4 and Albatross IV Cruise 71-7.

Standard Length(mm)	Delaware II 71-4						Albatross IV 71-7	
	Silver hake	Atl. herring	Red hake	Window-pane	Gulf Stream fld.	Butter-fish	Atl. herring	Pollock
2	1162		1594	80	132	44		
3	2553		2553	187	280	78		3
4	4903		2772	385	141	75		10
5	3336	412	1043	278	77	50		9
6	1302	1149	547	108	71	21	1	10
7	598	3047	326	54	61	3		6
8	250	2156	169	35	37	9	2	2
9	157	830	168	7	14	7	8	
10	85	1095	81	15	12	14	19	2
11	77	397	58	1	12	4	16	1
12	62	380	23	13	1	3	34	
13	4	357	47	1			58	
14	16	389	38		1		65	
15	14	381	20	4	2		64	
16	4	184	18			4	143	
17	7	65	8				255	
18	2	49	2				281	
19	3	12	15	3			253	
20	47	2	19				173	
21	45	8	2				124	
22	5	16	2				66	
23			1				39	
24	11	1	2				27	
25		1					7	
26							2	
27	9		2			1	4	
28	1						2	
29	1						1	
30						4	3	
31							1	
32	1							
33	1							
34							1	
35								
36							1	
Total	14656	10931	9510	1171	841	317	1650	43

Table 12.— Length frequencies, Albatross IV Cruises 72-9 and 73-91

Standard Length(mm)	Albatross IV 72-9					Albatross IV 73-91				
	Atl. herring	Atl. cod	Pollock	Silver hake	Red hake	Atl. herring	Atl. cod	Silver hake	Pollock	Red hake
2		69	7	2	1		101	1	1	
3		253	27	6			398	9	47	3
4	10	102	27	7	2	9	207	16	28	12
5	12	30	15	22	2	113	87	41	4	3
6	20	6	11	26		179	50	31		1
7	9	2	6	12		103	13	17	1	3
8	7	1	1	7	1	113	5	4		2
9	13	1		1		123	1	4		
10	33		1	1	2	102	1	7	2	1
11	118		1	1		86		1		1
12	158			1	1	156		1		3
13	109					211		2		1
14	77					256	1			2
15	78					435				1
16	123				1	697				
17	134					609				
18	130				1	612		2		1
19	117				1	516				
20	96					716				
21	87				1	486				1
22	67					319		1		
23	52					153				1
24	21					68				
25	18					10				
26	15					14				1
27	5					11				
28	5					12				
29	2					9				
30	1					2				
31	2									
32	2									
33						2				
34	1									
Total	1522	464	96	86	13	6123	864	137	83	37

Table 13.—Length frequencies, Albatross IV Cruise 74-2 and Delaware II Cruise 74-12.

Standard Length(mm)	<u>Albatross IV</u> 74-2					<u>Delaware II</u> 74-12				
	Northern sand lance	Pollock	Atl. herring	Atl. cod	Haddock	Atl. herring	Fourbeard rockling	Red hake	Silver hake	Witch flounder
2				3						
3	1	25		59	7		94	8	20	
4	18	152		93	33		270	143	89	2
5	51	162	1	61	16	9	112	123	118	6
6	71	95	1	17	10	100	8	50	49	8
7	66	55		7	4	663		16	22	7
8	78	51		5		2561	1	5	8	2
9	102	27		2		1663	2	1	5	5
10	120	10	2	1	1	312	2	4	1	2
11	71	4		1	1	456		3	3	5
12	59	1				439			3	6
13	63	1	1			352		1		2
14	51					440		1	2	
15	51		1			456				1
16	37		5			249	1			
17	22		13			111		1	1	
18	18		7			122			1	
19	9		11			176			1	
20	24		17			174			1	
21	8		21			153	1		3	
22	9		29			51			1	
23	10		14			44				
24	5		37			30				
25	3		29			21				
26	3		25			11	1			
27	4		14			7	1		1	
28	5		16			1				
29	5		16							
30	4		12							
31	2		1							1
32	2		2							
33			4							1
34	1									1
35	1									1
36										1
37										1
38										1
Total	974	583	279	249	72	8601	493	356	329	51

Table 14.— Length frequencies, Albatross IV Cruises 74-13 and 75-2.

Standard Length(mm)	Albatross IV 74-13				Albatross IV 75-2				
	Atl. herring	Pollock	Atl. cod	Silver hake	Northern sand lance	Pollock	Atl. cod	Atl. herring	Haddock
2		25	2	7		1	5		
3		346	129	18	1	92	88		12
4		241	84	26	6	222	203		54
5		60	10	16	14	193	87		33
6	10	27	2	21	67	175	43		11
7	8	12		16	137	99	14		10
8	11	11	1	5	193	59	3		4
9	54	1		7	308	26			1
10	204			7	488	27	2		1
11	418	1		5	468	11	2		
12	595	2		7	391	9	1		
13	687			4	387	9	1		
14	732	1		5	244	1			
15	665	1		2	203	2			
16	516			3	144	1		2	
17	480				101			2	
18	513				88	1		1	
19	513				63			3	
20	387			1	74			1	
21	290				31	1		10	
22	201				24			17	
23	110				28			25	
24	84				16			41	
25	52				7			37	
26	17			1	6			53	
27	27				5			37	
28	4				4			46	
29	8				2			37	
30	4							35	
31					1			22	
32								8	
33	1							8	
34								6	
35								5	
36									
37									
38									
39									
40									
41								1	
Total	6591	728	228	134	3501	929	449	397	126

672. Seasonal occurrence of young Guld menhaden and other fishes in a northwestern Florida estuary. By Marlin E. Tagatz and E. Peter H. Wilkins. August 1973, iii + 14 p., 1 fig., 4 tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
673. Abundance and distribution of inshore benthic fauna off southwestern Long Island, N.Y. By Frank W. Steimle, Jr. and Richard B. Stone. December 1973, iii + 50 p., 2 figs., 5 app. tables.
674. Lake Erie bottom trawl explorations, 1962-66. By Edgar W. Bowman. January 1974, iv + 21 p., 9 figs., 1 table, 7 app. tables.
675. Proceedings of the International Billfish Symposium, Kailua-Kona, Hawaii, 9-12 August 1972. Part 1. Report of the Symposium. March 1975, iii + 33 p.; Part 2. Review and contributed papers. July 1974, iv + 355 p. (38 papers); Part 3. Species synopses. June 1975, iii + 159 p. (8 papers). Richard S. Shomura and Francis Williams (editors). For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
676. Price spreads and cost analyses for finfish and shellfish products at different marketing levels. By Erwin S. Penn. March 1974, vi + 74 p., 15 figs., 12 tables, 12 app. figs., 14 app. tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
677. Abundance of benthic macroinvertebrates in natural and altered estuarine areas. By Gill Gilmore and Lee Trent. April 1974, iii + 13 p., 11 figs., 3 tables, 2 app. tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
678. Distribution, abundance, and growth of juvenile sockeye salmon, *Oncorhynchus nerka*, and associated species in the Naknek River system, 1961-64. By Robert J. Ellis. September 1974, v + 53 p., 27 figs., 26 tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
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NOAA Technical Report NMFS SSRF-718

Surface Currents as Determined by Drift Card Releases Over the Continental Shelf Off Central and Southern California

James L. Squire, Jr.

December 1977



U.S. DEPARTMENT OF COMMERCE
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NOAA Technical Report NMFS SSRF- 718

**Surface Currents as
Determined by Drift Card
Releases Over the
Continental Shelf Off Central
and Southern California**

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December 1977

U.S. DEPARTMENT OF COMMERCE

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Surface Currents as Determined by Drift Card Releases Over the Continental Shelf Off Central and Southern California

JAMES L. SQUIRE, Jr.¹

ABSTRACT

During March 1964 through February 1966, 8,320 plastic drift cards were released at selected points from an aircraft to measure surface current drift over two areas: from the coast to about 48 n.mi. off central California between Point Arena and Point Sur; and from the coast to about 90 n.mi. off southern California between Point Arguello and Punta Salsipuedes, Baja California, Mexico. The recovery rate was 3.5% in the central area and 5.7% in the southern area. An average 79.4% of the recoveries were found within 2 wk following the date of release. Results lend support to studies concluded by earlier investigators. The distribution of the directions from which drift cards were returned increased the evidence for the presence of an eddy off the coast between San Francisco and Monterey Bay during May through July, and of the large gyre and associated southern California countercurrent south of Point Conception during April through August and to a lesser extent in October and December.

INTRODUCTION

Dispersal and survival of the planktonic eggs and larvae of marine fishes in the ocean euphotic zone is affected by surface currents. The purpose of this study was to develop additional information on the drift patterns to which surface planktonic forms are subjected over the continental shelf of the west coast of the United States. The general direction of surface drift was determined and is compared with wind velocity during the survey period to expose any general relationship between wind direction and inshore surface currents. Johnson and Squire (1970) published the results found along the northwestern coast of the United States. This paper covers the central area from Point Arena to Point Sur, Calif., and the southern area from Point Arguello, Calif., to Punta Salsipuedes, Baja California, Mexico.

Field work for the study was carried out concurrently with an airborne infrared sea surface temperature survey of the continental shelf conducted with the cooperation of the U.S. Coast Guard (Squire 1971).

Increased interest in coastal surface currents as they may pertain to the drift of surface pollutants, such as petroleum, has prompted the documentation of this drift study.

METHODS

Talbot (1964) showed that specially prepared drift bottles could be successfully dropped from an aircraft; however, drift cards were chosen for this study due to the

ease of handling and the limited space available in the aircraft. The individual drift cards are identical to those described by Johnson and Squire (1970) and were a 4 × 5¼-in, numbered, postage paid, self-addressed, fluorescent red postcard. A plain fluorescent red card was used as backing, and both were sealed in a clear plastic envelope with a steel washer as ballast. This study was conducted from March 1964 through February 1966, during which period 16 drift card releases were made off southern California and central California. From March 1964 through February 1965, airborne releases of drift cards were made once each 3 mo. Beginning in March 1965 and continuing until the end of the study, the frequency of drift card releases increased to one per month. Ten cards were released at each drop station.

The U.S. Coast Guard aircraft were flown at an average altitude of 500 ft over a prescribed pattern covering the central area to about 48 n.mi. offshore and the southern area to about 90 n.mi. offshore. Twenty-five release stations were located on the flight transects over the central area, and 27 release stations over the southern area. Dead-reckoning techniques, aided by the aircraft's tacan, loran, and radar navigation equipment were used to locate release points.

For visual comparison of wind direction, average wind speed, and the direction of surface drift, a wind rose symbol developed by Tabata (1961) was used on each drift chart (Figs. 1, 2). The symbols give the percent frequencies for the prevailing winds and calms (wind velocity 1 kn) based on eight points of the compass and the average wind speed in knots for a 2-wk period—1 wk before release and 1 wk after (drift cards were released on the last day of the first week of the 2-wk period). Wind data were obtained for geographical locations as near the

¹Southwest Fisheries Center La Jolla Laboratory, National Marine Fisheries Service, NOAA, La Jolla, CA 92038.

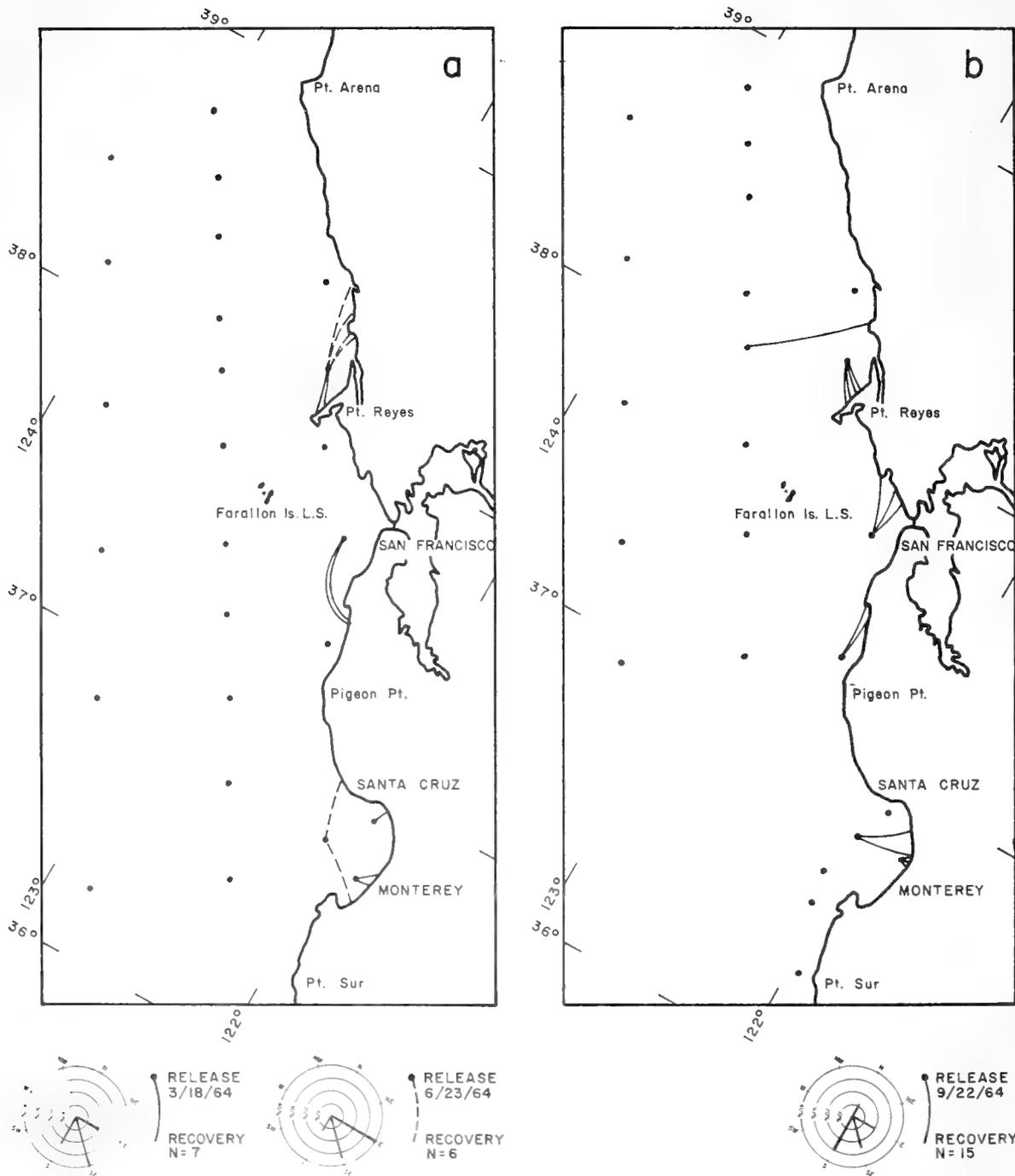
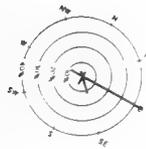
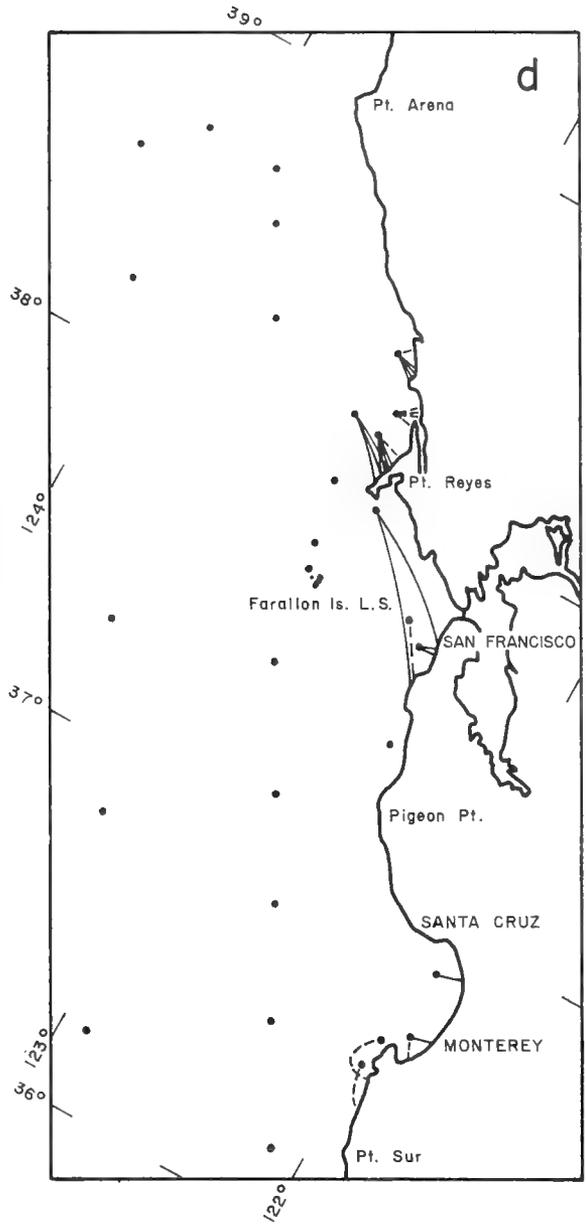
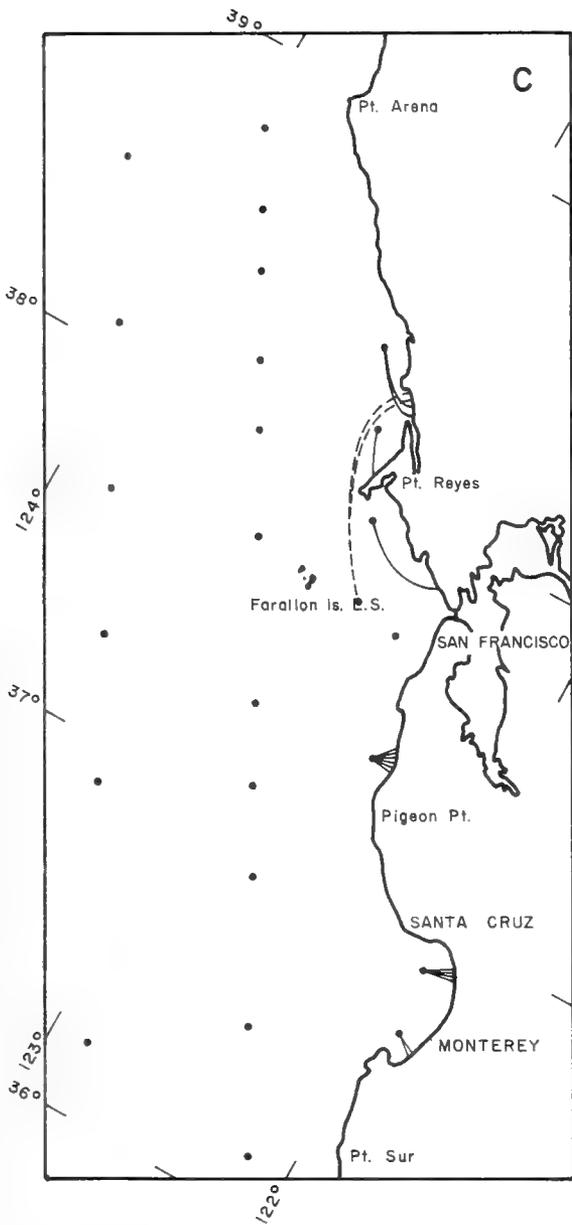
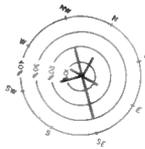


Figure 1.—Drift card release and recovery points off the central area of California: a) March and June 1964; b) September 1964; c) December 1964 and March 1965; d) April and May 1965; e) June and July 1965; f) August and September 1965; g) October and November 1965; h) December 1965 and February 1966.



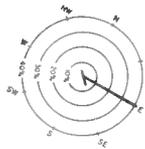
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RECOVERY
N = 16



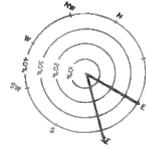
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RECOVERY
N = 2



RELEASE
5/17/65

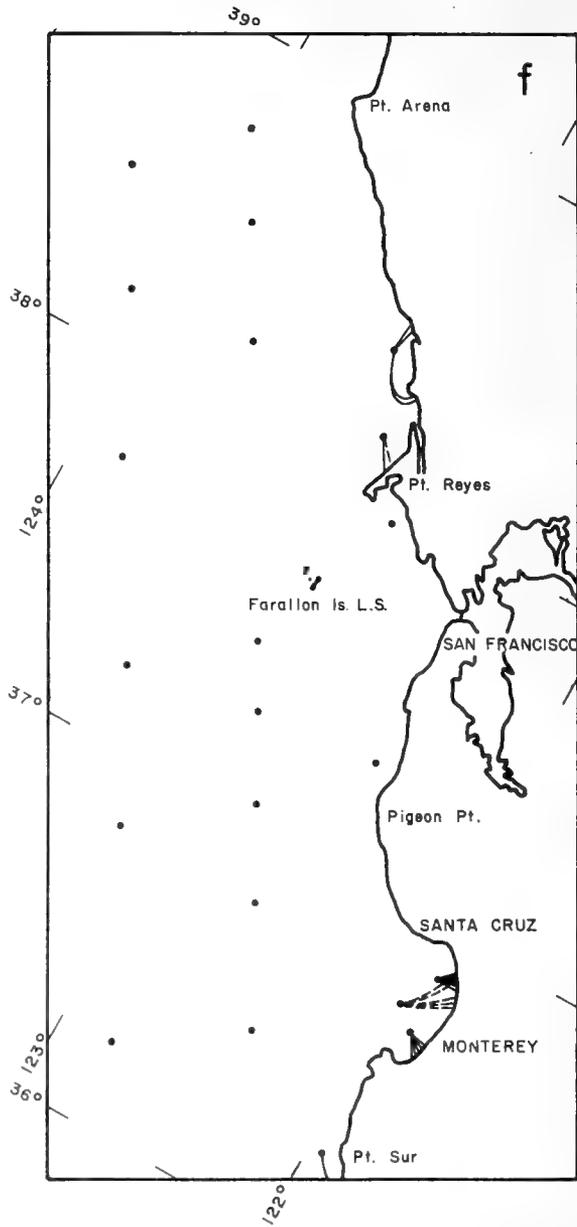
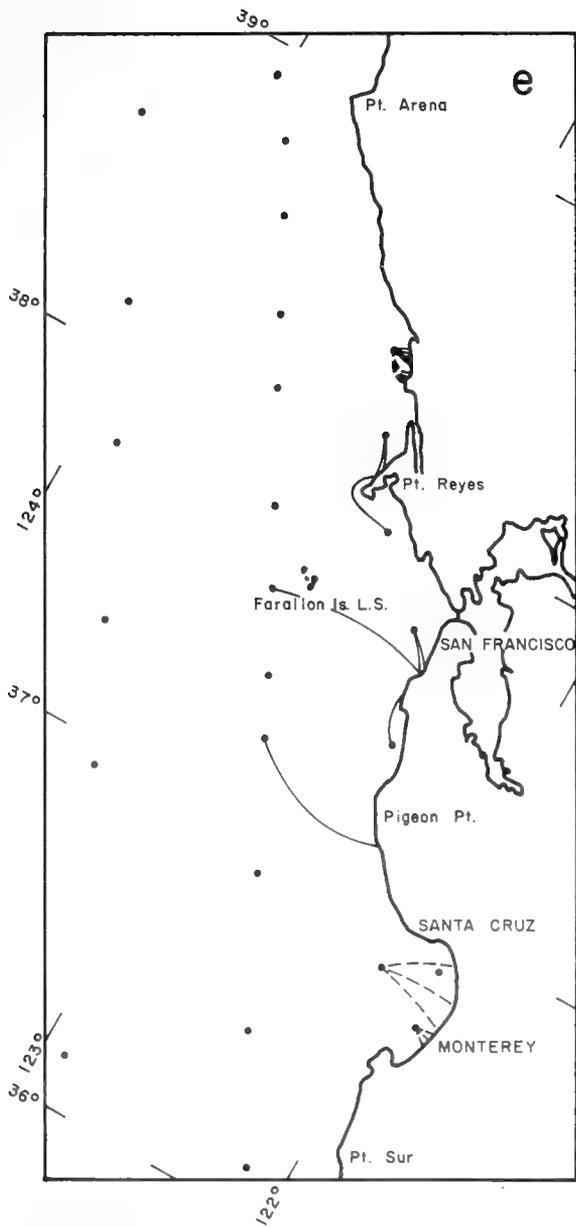
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N = 17



RELEASE
4/26/65

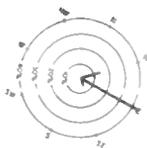
RECOVERY
N = 10

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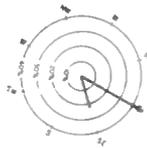
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RECOVERY
N=12



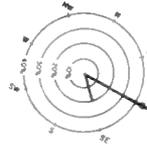
RELEASE
6/9/65

RECOVERY
N=10



RELEASE
9/17/65

RECOVERY
N=17



RELEASE
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RECOVERY
N=6

Figure 1.—Continued.

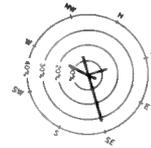
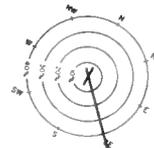
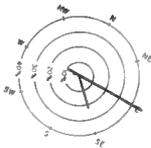
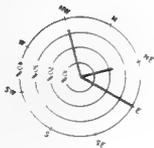
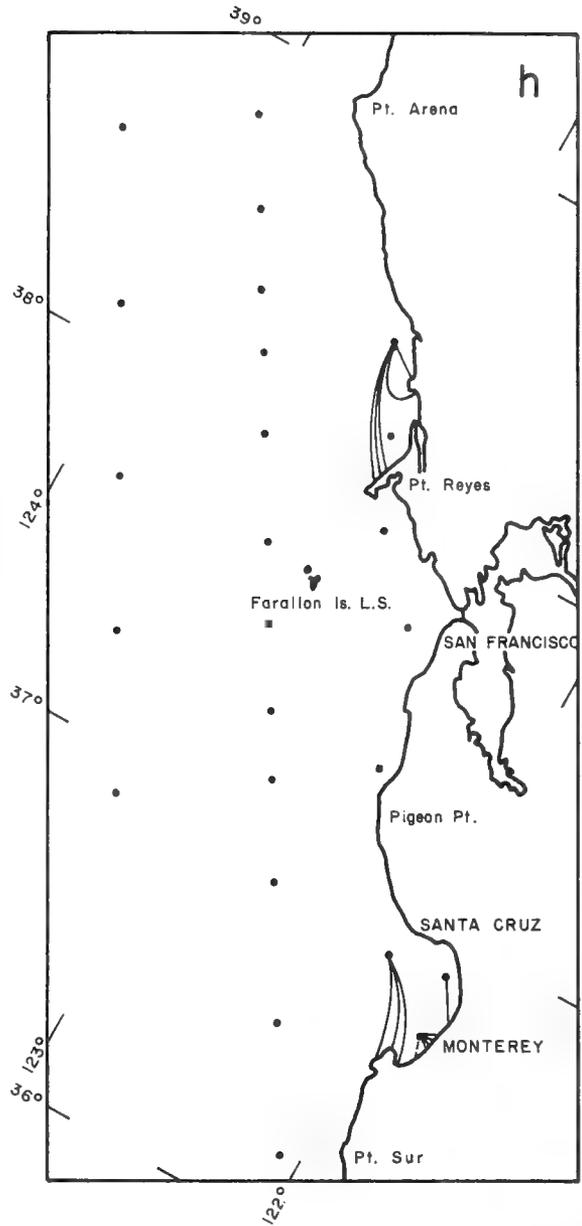
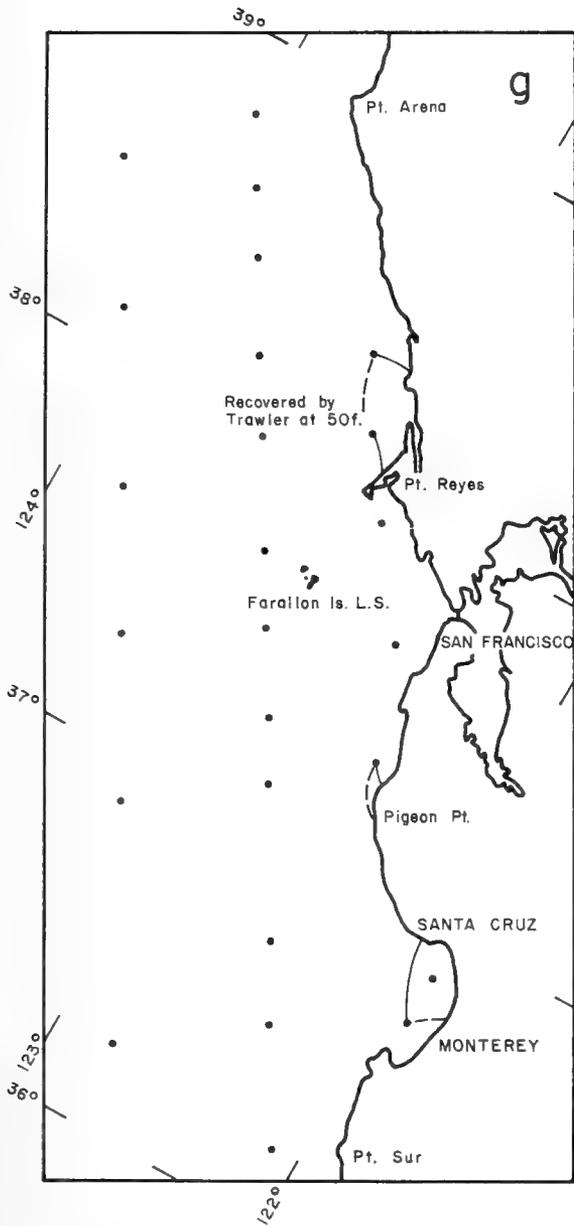


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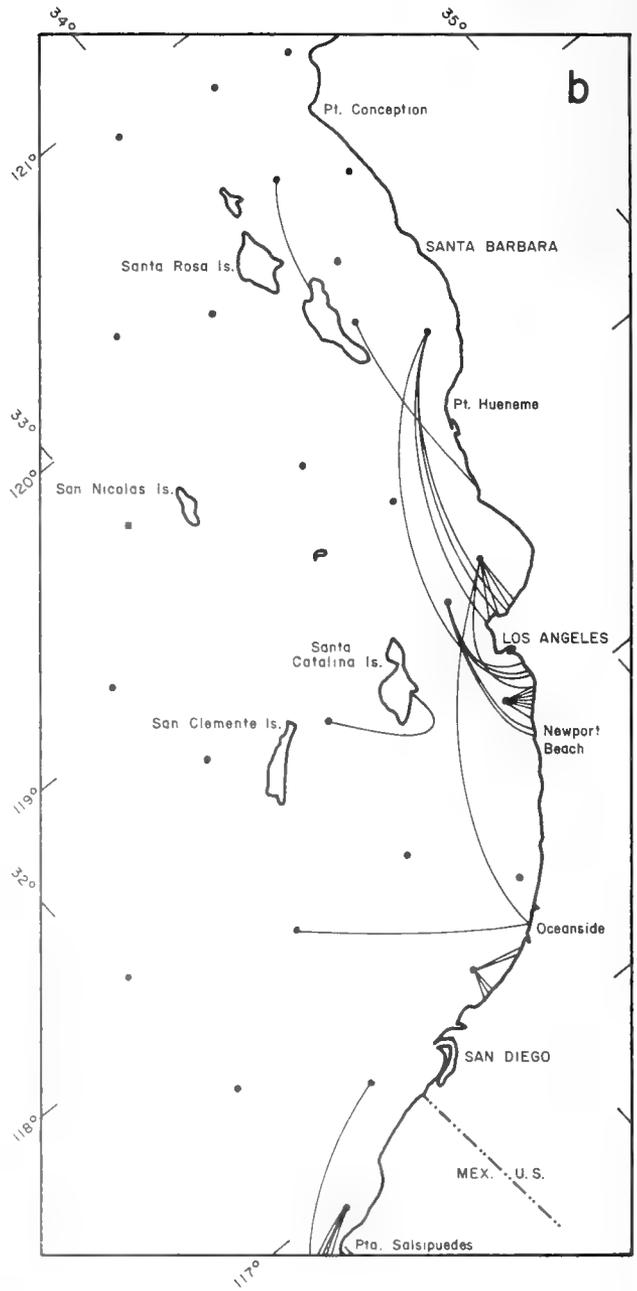
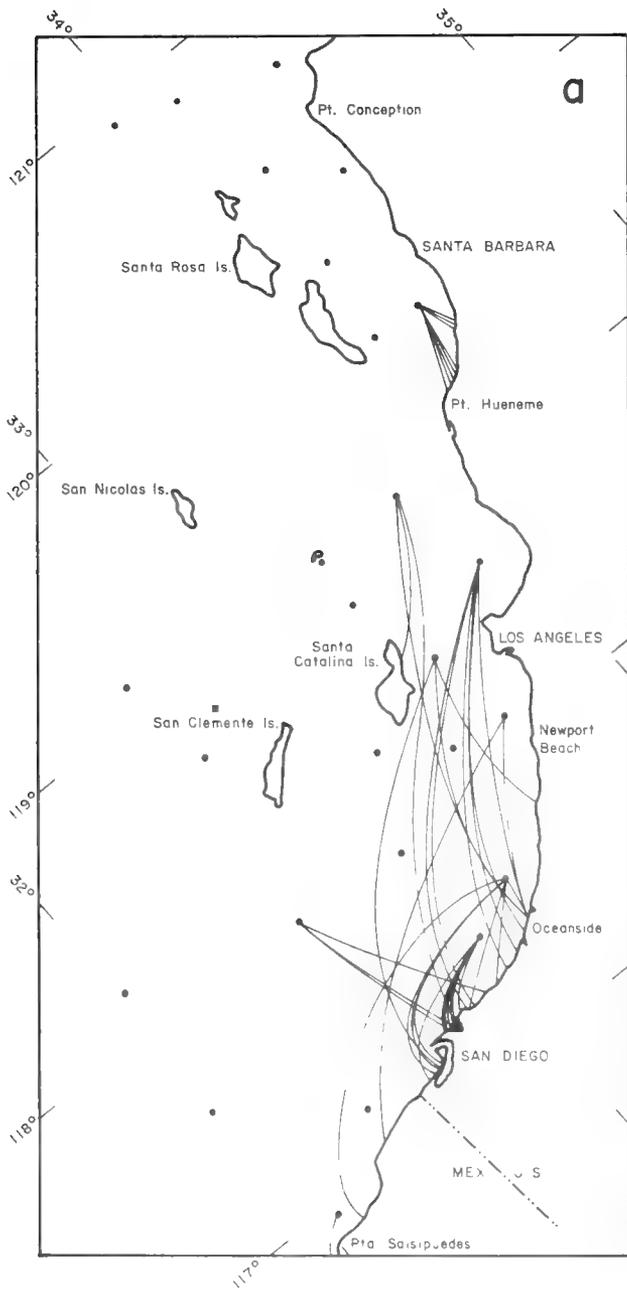
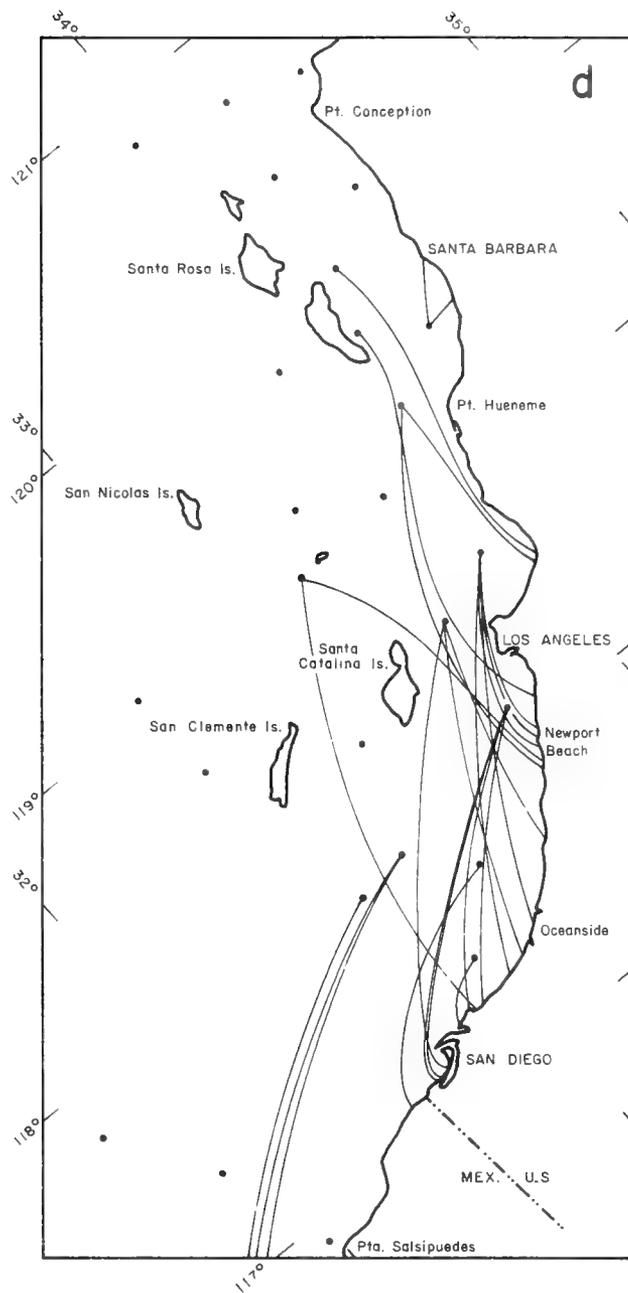
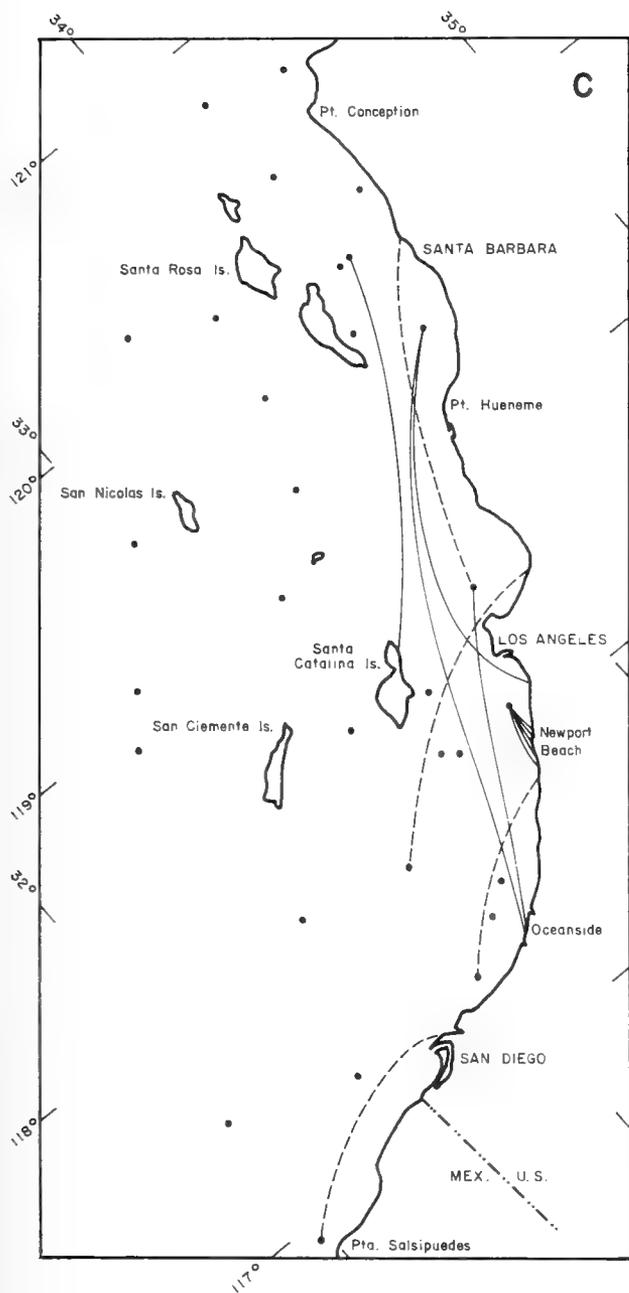
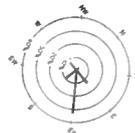


Figure 2.—Drift card release and recovery points off southern California: a) March 1964; b) June 1964; c) October and December 1964; d) March 1965; e) April 1965; f) May 1965; g) June 1965; i) August 1965; j) September and October 1965.



RELEASE
10/13/64

RECOVERY
N=9



RELEASE
12/7/64

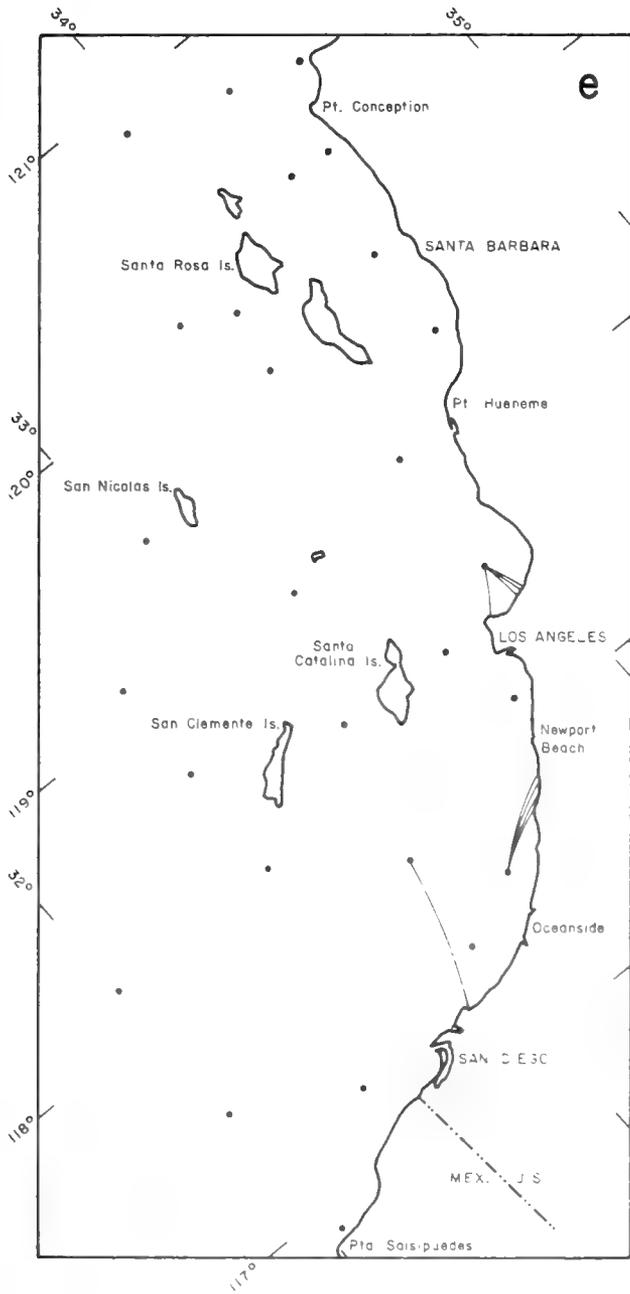
RECOVERY
N=4



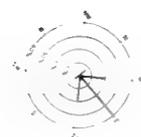
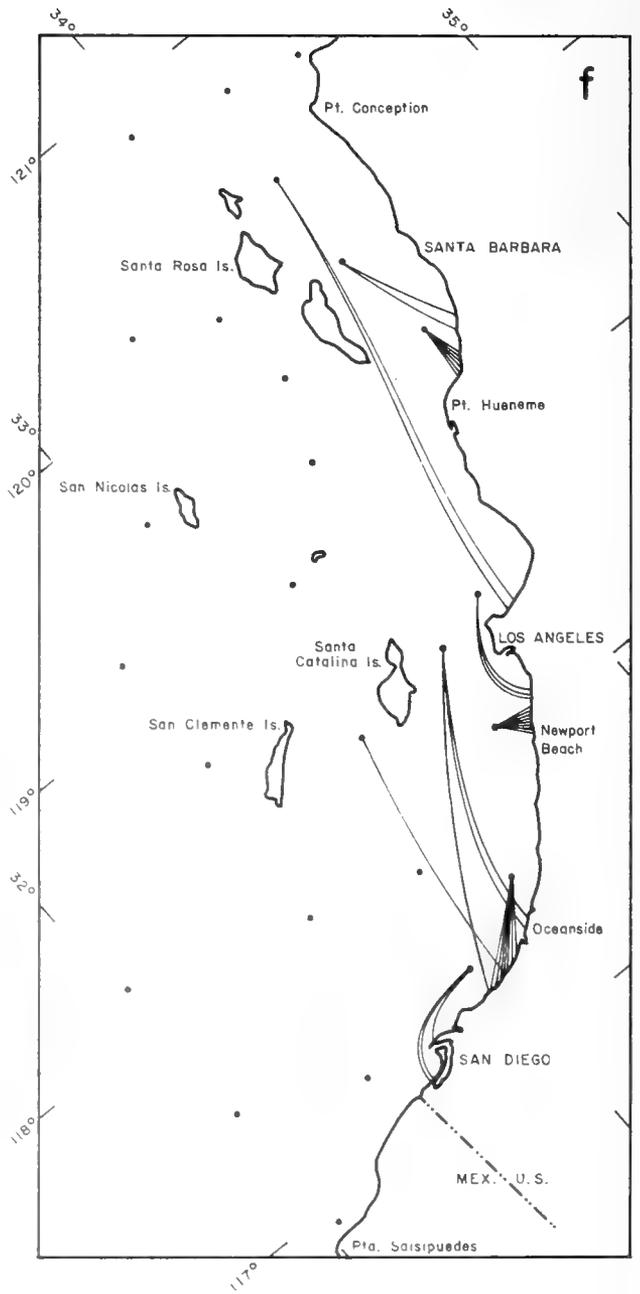
RELEASE
3/16/65

RECOVERY
N=25

Figure 2.—Continued.



● RELEASE
4/6/65
RECOVERY
N=9



● RELEASE
5/11/65
RECOVERY
N=35

Figure 2.—Continued.

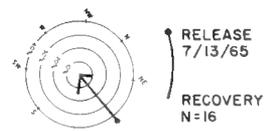
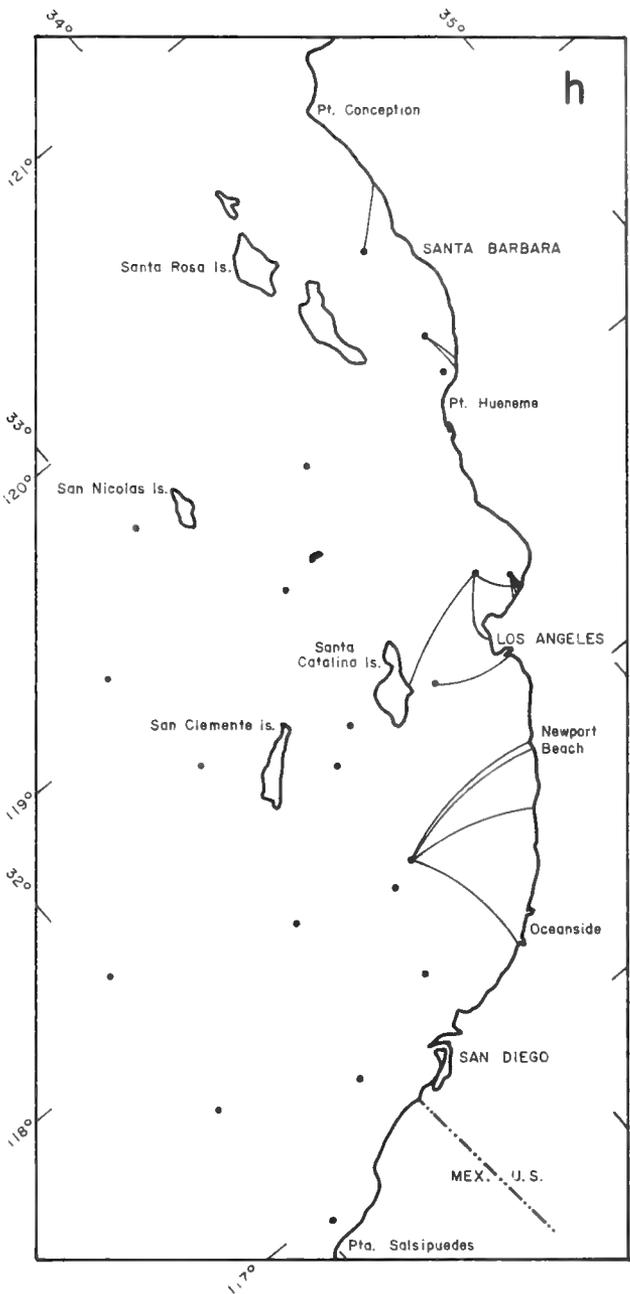
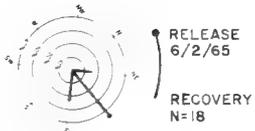
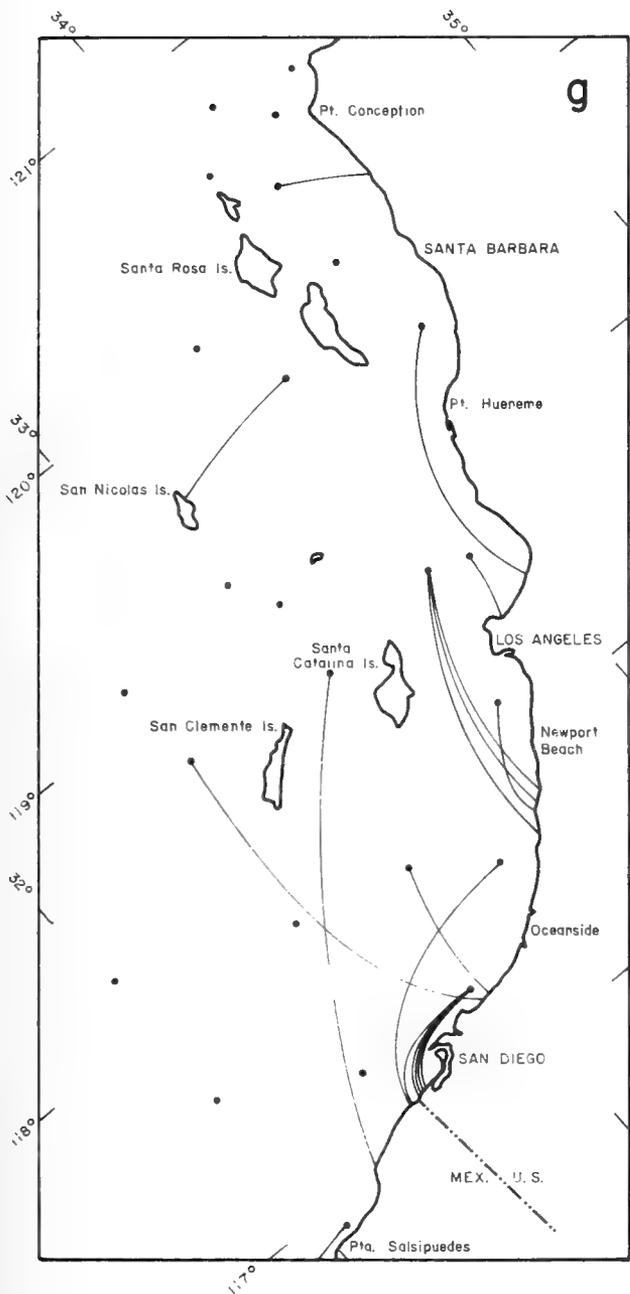
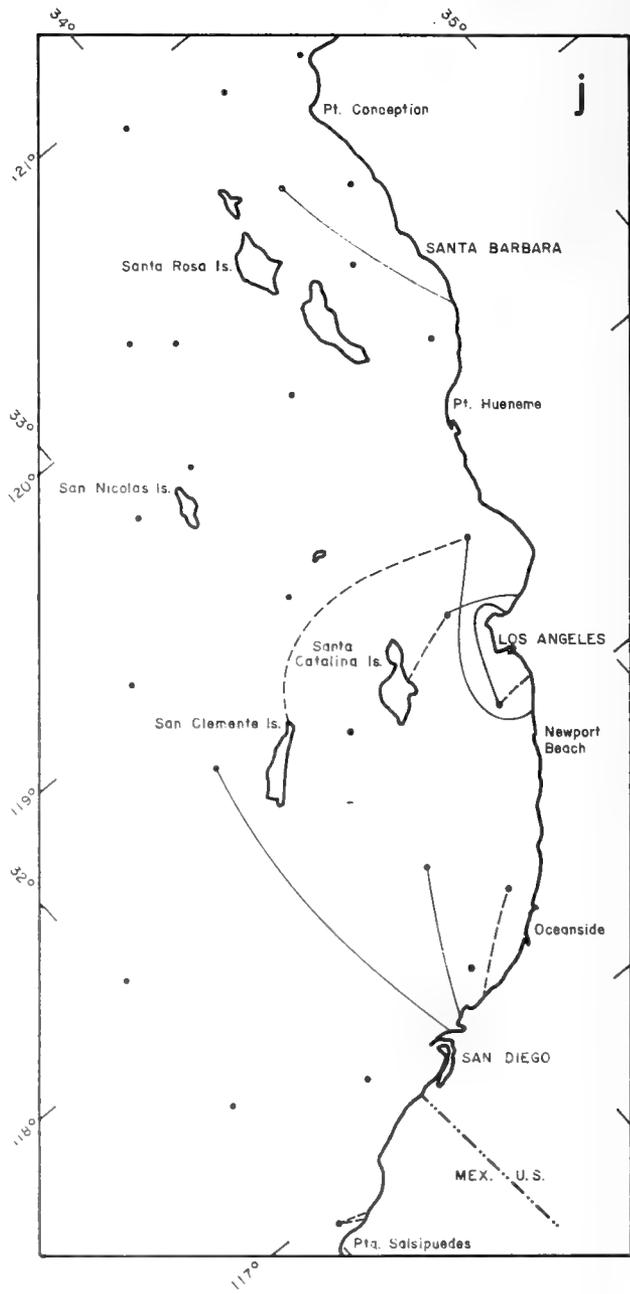
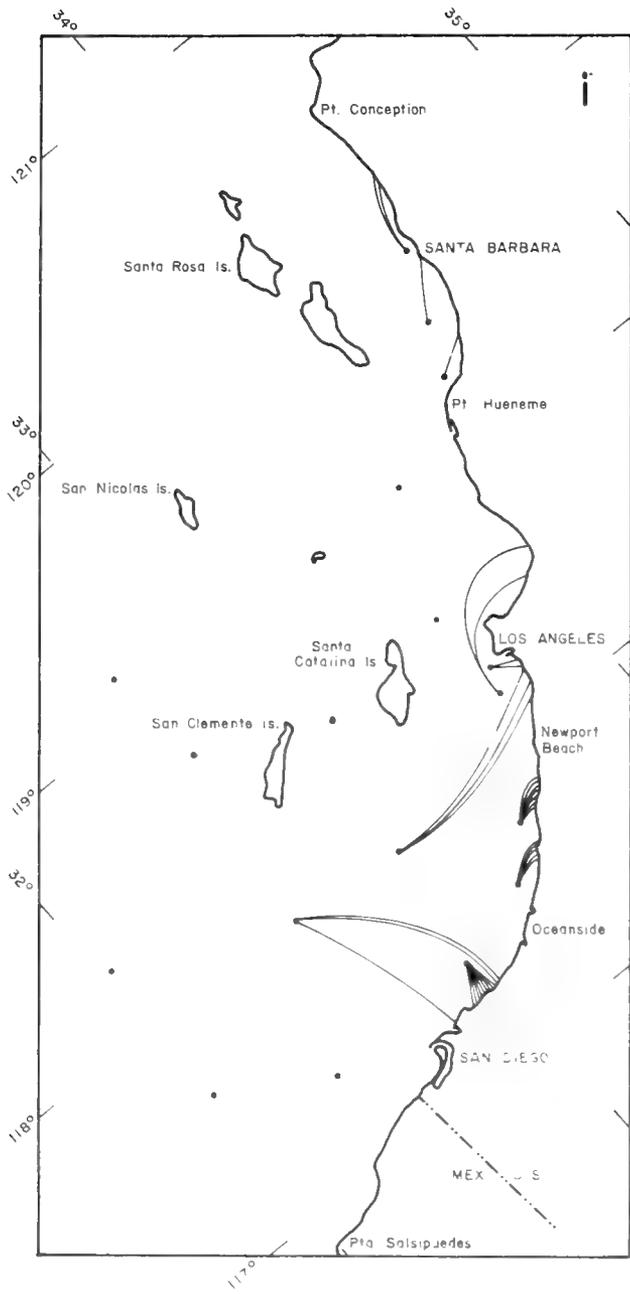
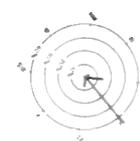


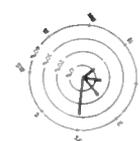
Figure 2.—Continued.



RELEASE
8/3/65
RECOVERY
N=35



RELEASE
9/8/65
RECOVERY
N=6



RELEASE
10/13/65
RECOVERY
N=6

Figure 2.—Continued.

center of each survey area as possible. Data for the central area was obtained for the U.S. Coast Guard Farallon Island Light Station, 28 mi west of the entrance to San Francisco Bay, and in the southern area for the U.S. Navy San Clemente Island Naval Air Station. These data were made available by the National Weather Records Center, Asheville, N.C.

RESULTS

Of the 8,320 cards released over both study areas, 4.5% (377) were recovered. This recovery rate compares closely with those found by previous investigators using drift bottles and drift cards along the west coast of the United States (Tibby 1939; Schwartzlose 1964) and near Hawaii (Barkley et al. 1964). In the central area, 3.5% of the cards were returned, whereas 5.7% of the cards were recovered in the southern area. An average 59.8% of all cards recovered were found within 1 wk following the date of release, and 79.4% were found within 2 wk. The percentage of recoveries made during the first week after the drop in the central area was 72.1%, and in the southern area 52.7%. By the end of 2 wk, the percentage of recoveries in the central area was 86.8% and in the southern area 75.1%.

Charts (Fig. 1a to 1h central area, Fig. 2a to 2j southern area) giving the date and location of release and recovery and the average wind velocity were prepared for each quarterly and monthly drifter releases. The average wind speed was derived by averaging all values recorded during the 2-wk period. The rate of drift and trajectory of the card cannot be determined from the recoveries because of the lack of information between time of release and recovery. Original data to determine the time between release and recovery is not available. No recoveries were made and no charts were drawn for southern area releases in November and December 1965 and January and February 1966; nor for the central area during January 1966.

DISCUSSION AND CONCLUSIONS

The patterns of current flow associated with the California Current along the North American west coast have been examined by a number of scientists (e.g., Tibby 1939; Sverdrup et al. 1942; Reid et al. 1958; Burt and Wyatt 1964; Schwartzlose 1964; Tully 1964). We would expect the surface drift in the nearshore areas generally to be in agreement with the findings of these scientists.

Drift card recovery rates probably bear a relationship to the amount of shore activity by people. Many areas of the coast in the central area are rocky and not easily accessible. This, and the fact that the coastal population is small, would account for reduced returns when compared with southern California. The southern California coast is easily accessible, except for the island areas, and there is a high population level along most of the coast and from this a higher recovery rate would be expected.

Most of the recoveries in the central area were from drop stations relatively close to shore. Only three

recoveries were from the line of drop stations located about 25 mi offshore, and none were recovered from the outer line of stations, about 50 mi offshore.

Southern California recoveries were mostly from stations near the coast, between the coast and Catalina, and the Santa Barbara Channel Islands; few recoveries were from the offshore drop stations.

Drift cards recovered along the coasts of central and southern California gave evidence of some surface drift toward the east and/or southeast through most of the year. Only in December 1966 did neither area have at least one return from either direction. Five of the 15 mo in the central area and 6 of the 12 mo in the southern area had a significantly greater proportion of the recoveries from the east and/or southeast than from all other directions combined.

Off the central area, little evidence of a strong Davidson Current can be observed along the open coast during the late fall, winter, or early spring months [Fig. 1a, 1c (March), 1g (November), 1h (December, February)]. Only in December 1964 (Fig. 1c) does evidence of the coastal countercurrent exist, with recoveries from off Bodega Bay from drift cards dropped near the San Francisco light vessel. Schwartzlose (1964) had indications from his work that an eddy flowed counterclockwise during the summer between San Francisco and the north edge of Monterey Bay. In July 1965 (Fig. 1e), off Halfmoon Bay and south of Point Reyes, some of the recoveries indicated a northward flowing coastal current during this period. During the remainder of the year, most of the recoveries showed drift to the east and/or southeast.

In the southern area between Point Conception and northern Baja California, an average 69% of the drift cards recovered had moved in an east and/or southeast direction. These observations reflect the combined influence of northwest winds and the relatively permanent southerly flowing current reported by Schwartzlose (1964) off the southern California and Baja California coasts.

Evidence for the gyre south off southern California was found during the late spring and summer (Fig. 2b, 2e, 2h, 2i). Some of the returns from coastal areas were recovered northeast to northwest of release points and these recoveries were most evident along the coast from San Diego northward and offshore to the San Clemente and Catalina Islands and the Los Angeles area. During these months Tibby (1939) reported that south flowing offshore currents return along shore as the north flowing Southern California Countercurrent. Forty percent of the returns from the August 1965 (Fig. 2i) releases drifted north or northwest nearly 90° from the prevailing winds flowing toward the east-northeast. Returns from the December 1964 (Fig. 2c) drift cards lend support to the conclusion by Reid et al. (1958), that the northerly flowing countercurrent associated with the large eddy off southern California is present in some measure through the late fall and winter.

ACKNOWLEDGMENTS

I thank Stuart N. Luttich, Gerald B. Talbot, and Sven I. Johnson for assistance in the study and to express appreciation to the U.S. Coast Guard Air Stations at San Francisco and San Diego, Calif., whose cooperation helped make this study possible.

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Sea Surface Temperature Distributions Obtained Off San Diego, California, Using an Airborne Infrared Radiometer

James L. Squire, Jr.

March 1978

U.S. DEPARTMENT OF COMMERCE
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NOAA Technical Report NMFS SSRF-720

**Sea Surface Temperature
Distributions Obtained
Off San Diego, California,
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James L. Squire, Jr.

March 1978

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Sea Surface Temperature Distributions Obtained Off San Diego, California, Using an Airborne Infrared Radiometer

JAMES L. SQUIRE, JR.¹

ABSTRACT

Sea surface temperature surveys were conducted weekly off San Diego, Calif., using an airborne infrared radiometer during the months of April through October 1972-74. A total of 90 surveys were made over the 320-mile flight track. The analog chart record of temperature was keyed to a "ground truth" temperature measurement and read to determine 1 min average temperatures which were plotted on the flight track and 1°F (0.56°C) isotherms were contoured from the data. The trend of sea surface temperatures during the 3-yr period showed warmer temperatures in 1972, which was an "El Niño" year, cooler in 1973, warmer than 1973 in 1974, but not as warm as 1972. In early July 1974, an anomalous warming period occurred and highest average temperatures of 73°F (22.7°C) were recorded in 19 July 1974. Lowest average temperature of 54°F (12.2°C) was recorded on 2 April 1973.

The 1972-74 survey temperatures taken over the "ground truth" calibration site were compared with a time series of temperature observations taken during the same months from 1963 to 1968. The average temperature during 1963-68 was 63.4°F (17.4°C) and for 1972-74, 64.1°F (17.8°C), a difference of less than 1°F (0.56°C). Average monthly temperature differences, 1963-68 compared with 1972-74, shows April the same, warmer 2°F (1.12°C) for May, 3°F (1.68°C) for June, 1°F (0.56°C) for July, same for August, 1°F (0.56°C) less for September, and 2°F (1.12°C) less for October.

INTRODUCTION

Synoptic sea surface temperature surveys with an airborne infrared radiometer were first conducted off the Pacific coast in August 1963 over the coastal waters of Washington, Oregon, and California by the National Marine Fisheries Service's (NMFS) Tiburon Fisheries Laboratory at Tiburon, Calif. Surveys over three areas were conducted in cooperation with the U.S. Coast Guard, and these surveys are being continued as part of the U.S. Coast Guard oceanographic program. The first 5 yr of surveys (1963-68) were reviewed by the author (Squire 1971). The objective of the coastal program was to increase the general knowledge about the nearshore temperature structure, to define areas of nearshore upwelling, and to develop temperature data that may be useful in relating the distribution and relative abundance of major coastal species of fishes to sea surface temperature and its changes.

The initial surveys, conducted monthly, were broad in geographical scope and in time. The data have been useful in computing average catch temperatures for salmon off central California, and for a number of pelagic species common to southern California waters (Squire unpubl. manuscr.). However, this broad-based survey did not cover some of the more important coastal fishing areas in

sufficient detail and at short enough time intervals to permit the determination of the relation of changes in catch composition and catch rates to short-term temperature fluctuations.

To determine short-term temperature effects, an area having a heavy amount of fishing effort and catch was selected for detailed study. This area covered the southern California coastal waters from near Del Mar, Calif., to south of the United States-Mexico border, and to about 22.3 km (12 n.mi.) offshore. The area, known by the project name of "San Diego Test Area" encompasses the major sportfishing grounds off La Jolla, Point Loma, and about the Coronado Islands off Mexico.

The airborne temperature surveys used a "ladder-type" search pattern, modified to accommodate navigational aids. These surveys were flown once each week, 1 April through 31 October during 1972 to 1974. A total of 90 surveys was made, each requiring about 2 h to complete.

OPERATIONAL PROCEDURES

The airborne sea surface temperature sensing unit used in the study was a Barnes research radiometer (PRT-5) modified with a special lens filter system to restrict the viewing range in the infrared spectrum to 10.5 to 12.5 μ m. This spectral range approximates the infrared range that is used in the ITOS (NOAA, National Environmental Satellite Service) series weather satellite.

¹Southwest Fisheries Center La Jolla Laboratory, National Marine Fisheries Service, NOAA, La Jolla, CA 92038.

The PRT-5 was piloted by the author in a NMFS twin-engine aircraft over the survey flight track (Fig. 1) at elevations between 152 and 304 m (500 and 1,000 ft). Low stratus bases at 243 and 304 m (800 to 1,000 ft) common to the coastal areas were encountered on most flights during the 3-yr period. On numerous occasions, flights were rescheduled due to very low stratus or fog conditions. Only on rare occasions was there an absence of haze or low stratus, middle and high clouds, the type of conditions that would allow direct comparison of satellite data with the low altitude temperature surveys.

Calibration measurements, or "ground truth," were obtained from surface sources for each flight either from observations taken at the end of the Scripps Institution of Oceanography pier, La Jolla, Calif., or from the U.S. Naval Undersea Center's (NUC) oceanographic tower located approximately 2.8 km (1½ n.mi.) off Mission Beach, San Diego, Calif. Most comparative observations were taken over the oceanographic tower as it is located offshore, and the temperature of surrounding surface waters are relatively stable when compared with those near the outer surf zone at Scripps pier. Simultaneous sea surface temperature observations were made with either a surface bucket thermometer off Scripps pier, or a surface thermistor temperature reading from the NUC oceanographic tower. To obtain a comparative reading, the aircraft was flown over the pier or tower at an elevation of about 45.7 m (150 ft). At the moment the aircraft passed over the pier or tower, the radiative surface of the structures, being much warmer than the sea surface, would produce a response from the infrared detector to make a synchronous mark on the temperature analog recorder chart. The analog recorder chart was driven at a speed of 2.54 cm (1 in) per minute.

The temperature analog chart was keyed to the "ground truth" temperature measurement, and the chart was read to determine a 1-min average temperature, with a slide rule averaging readout device developed by the author (Squire 1971). The 1-min temperature averages were plotted on the flight track, and 1°F (0.56°C) isotherms were contoured from the data. The weekly isotherm charts were given limited distribution to a list of interested fishing and scientific organizations and their personnel.

Isotherm charts are shown in the Appendix for all surveys in 1972, 1973, and 1974 (1972, Figs. 1-28; 1973, Figs. 29-61; 1974, Figs. 62-90). For conversion of °F to °C see comparative temperature data on each figure.

RESULTS

Isotherm charts were developed for each of the 90 survey flights. Distribution of survey flight effort by month for the 3-yr period is as follows:

<i>Month</i>	<i>Flights</i>
April	12
May	13
June	10

July	15
August	14
September	12
October	14

June has the least number (10) of flights during the survey period, reflecting the problems of conducting aerial surveys during a period when persistent low stratus is most present over the coastal waters off San Diego.

The general trend of sea surface temperature during the 3-yr period showed that 1973 was cooler than 1972, which was an "El Niño" year with above-normal warming along the west coast of North and South America (Miller and Laurs 1975). Temperatures in 1974 were warmer than those observed in 1973, but not as warm as those experienced in 1972. However, in 1974, an anomalous warming period occurred in early July off southern California, and the highest temperatures were recorded at that time. Examples of isotherm patterns observed during surveys having the lowest average temperature (2 April 1973) and the highest average temperature (19 July 1974) are shown in the Appendix, Figures 31 and 76.

Semimonthly isotherm charts of the northeastern Pacific, developed from ship data, are issued by the NMFS Southwest Fisheries Center. To develop data for comparative purposes, weekly temperatures were then averaged by semimonthly periods for each month, 1 through 15 days and 16 through 30/31 days, for the 3 yr of data from temperatures observed at locations along the survey flight track, as shown in Figure 1. Isotherm charts in 1°F with °C equivalents drawn to these semimonthly data are presented in Figures 2 to 15.

The only time series of infrared sea surface temperature data available for comparison with the 1972 to 1974 data off San Diego is the 1963-68 data resulting from the cooperative program with the U.S. Coast Guard. During these surveys, ground truth calibration checks were also made over the NUC oceanographic tower. Comparing 1963-68 monthly average temperatures (to the nearest whole °F) for the area off Mission Beach (NUC tower area) with those observed in the same location during the 1972-74 surveys, we note an average difference of less than 1°F (0.56°C). The average temperature for 1963-68 was 63.4°F (17.4°C) and for 1972-74 was 64.1°F (17.8°C). Average monthly temperatures rounded to the nearest °F for the 3-yr period were observed (Table 1) to be the same for April, warmer 2°F (1.12°C) for May, 3°F (1.68°C) for June, 1°F (0.56°C) for July, the same for August, 1°F (0.56°C) less for September, and 2°F (1.12°C) less for October.

A general description of sea surface temperature patterns that would be typical of those usually observed off San Diego during the weekly surveys is as follows: Temperatures that are greater than any other locations in the survey area are usually found north offshore and to the northwest of La Jolla. From off La Jolla Point to Pacific Beach and continuing southwest and offshore to the southwest is an area of upwelling with generally lower temperatures than those to the north. Evidences of this

Table 1.—Comparative temperatures—U.S. Naval Undersea Oceanographic Tower for airborne infrared sea surface temperature surveys, 1963-68/1972-74.

Month	1972-74 monthly mean temperature		1963-68 monthly mean temperature	
	°C	°F	°C	°F
April	14.6	58.2	14.4	58.0
May	16.8	62.3	15.6	60.0
June	18.4	65.3	16.7	62.0
July	19.7	67.4	18.9	66.0
August	20.0	68.0	20.0	68.0
September	17.3	63.3	18.3	65.0
October	17.3	63.3	18.3	65.0

upwelling area was also observed when a temperature decline, sometimes sharp, was frequently present west of Mission Beach and the NUC tower when proceeding toward the coast. The kelp bed area west of Point Loma appears to be slightly warmer than the area to the north off Mission Beach. Near the area south of Point Loma and about the San Diego harbor entrance channel, a significant drop in temperature is usually observed, this resulting from upwelling near the south end of the Point. Temperatures tend to remain lower than those found west of the Point Loma peninsula and they remain lower to the southeast of Point Loma, off the Coronado Strand, and increase slightly off Imperial Beach. Immediately south of the International Border of Mexico is frequently

found the northern edge of an extensive coastal upwelling zone. The effects of this upwelling increase to the south and extend further offshore. Warmer temperatures than those found near the coast of Mexico are encountered offshore about the Coronado Islands, and temperatures in this area are more typical of those found offshore in the northern portion of the survey area.

ACKNOWLEDGMENTS

The interest and cooperation of E. C. LeFond, Dale Good, Paul Hansen, and the staff associated with the NUC oceanographic tower in making sea surface calibration observations is appreciated. To a number of personnel from the Southwest Fisheries Center, NMFS, NOAA, and to Clyde Melendy of the National Weather Service, NOAA, who took time from their activities to assist in the airborne surveys, I express my appreciation.

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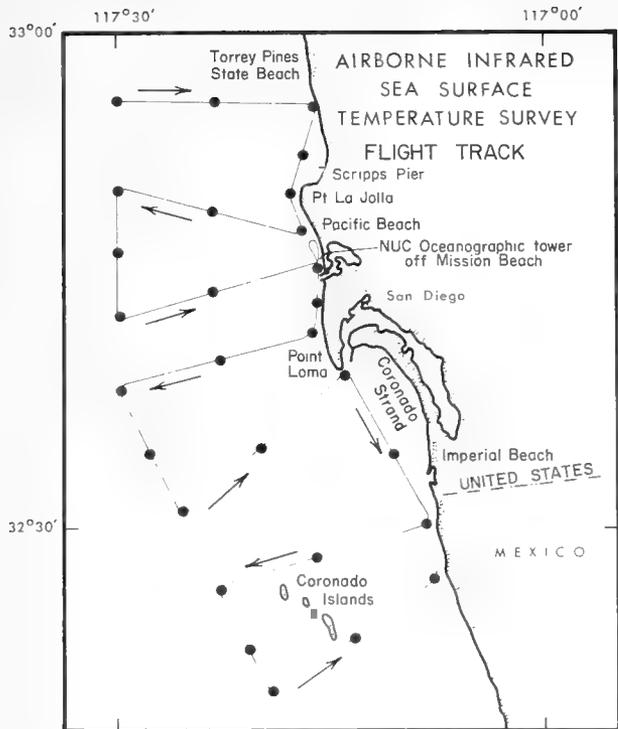


Figure 1.—Survey flight track pattern flown during the 3-yr study. Dots indicate points where temperatures were taken for the development of biweekly average isotherm charts.

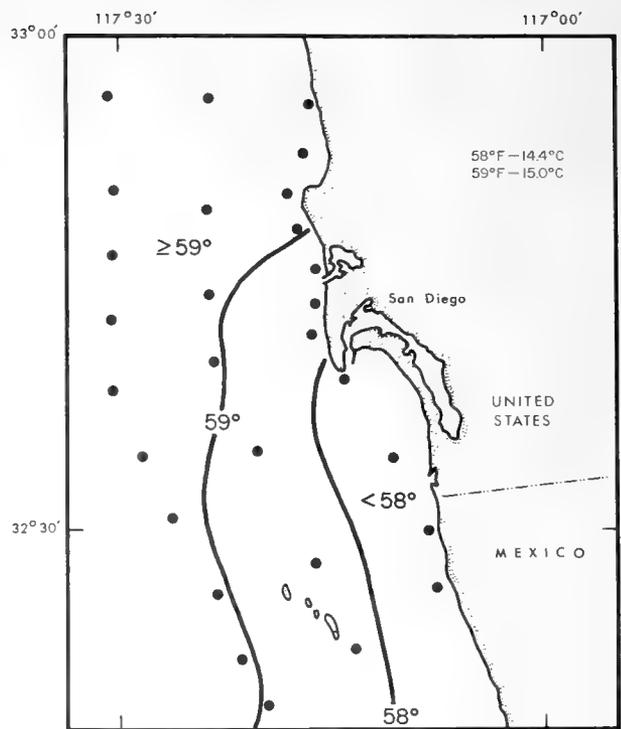


Figure 3.—Average isotherm patterns observed off San Diego in °F with °C equivalents for the 3-yr period, 16 to 30 April 1972-74.

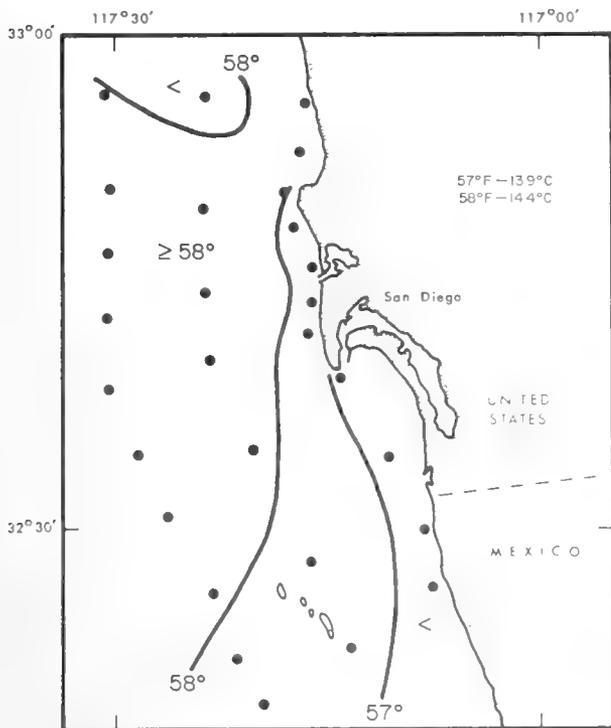


Figure 2.—Average isotherm patterns observed off San Diego in °F with °C equivalents for the 3-yr period, 1 to 15 April 1972-74.

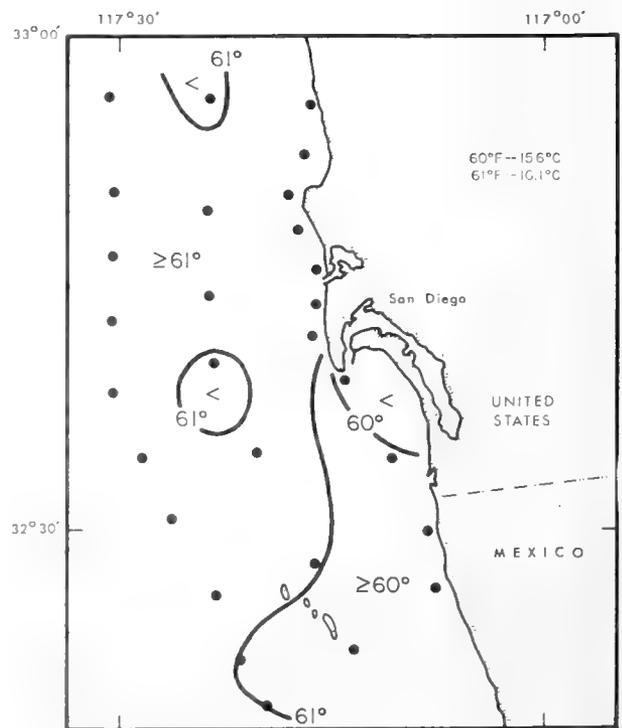


Figure 4.—Average isotherm patterns observed off San Diego in °F with °C equivalents for the 3-yr period, 1 to 15 May 1972-74.

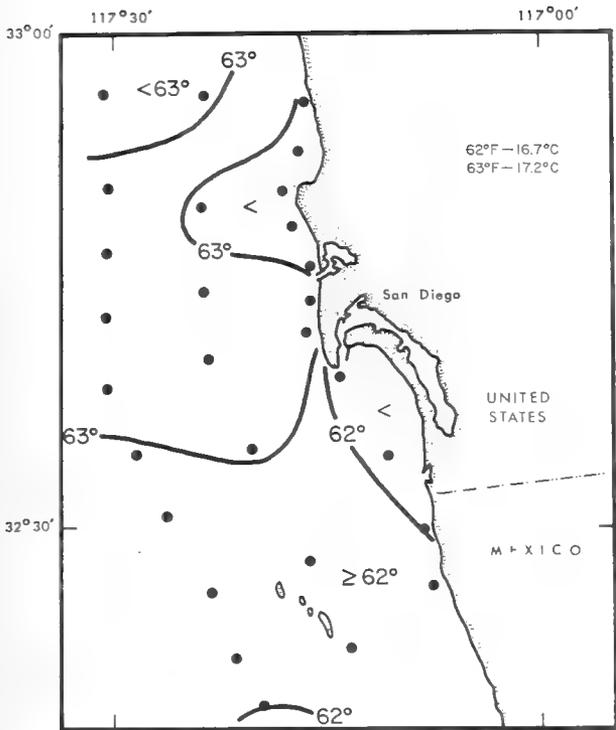


Figure 5.—Average isotherm patterns observed off San Diego in °F with °C equivalents for the 3-yr period, 16 to 31 May 1972-74.

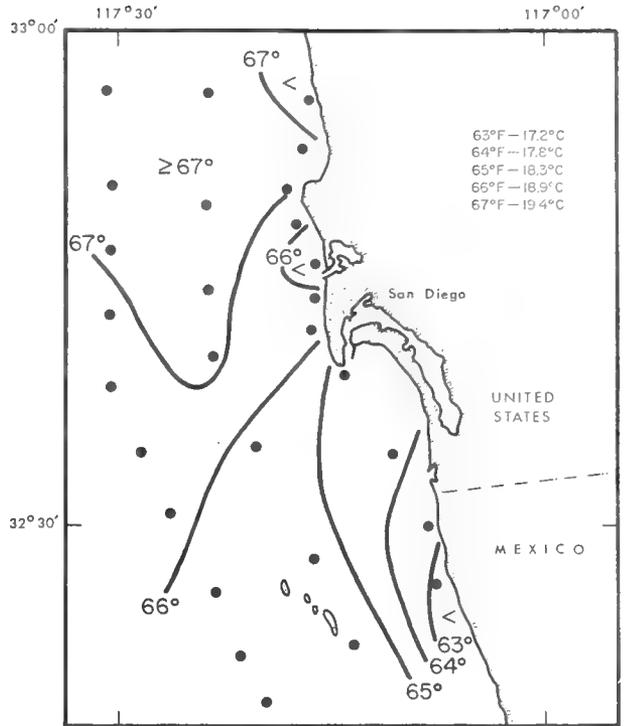


Figure 7.—Average isotherm patterns observed off San Diego in °F with °C equivalents for the 3-yr period, 16 to 30 June 1972-74.

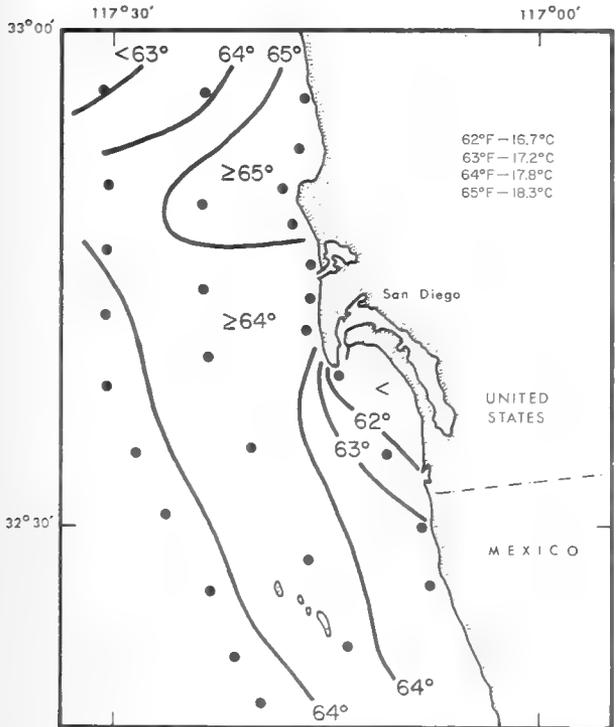


Figure 6.—Average isotherm patterns observed off San Diego in °F with °C equivalents for the 3-yr period, 1 to 15 June 1972-74.

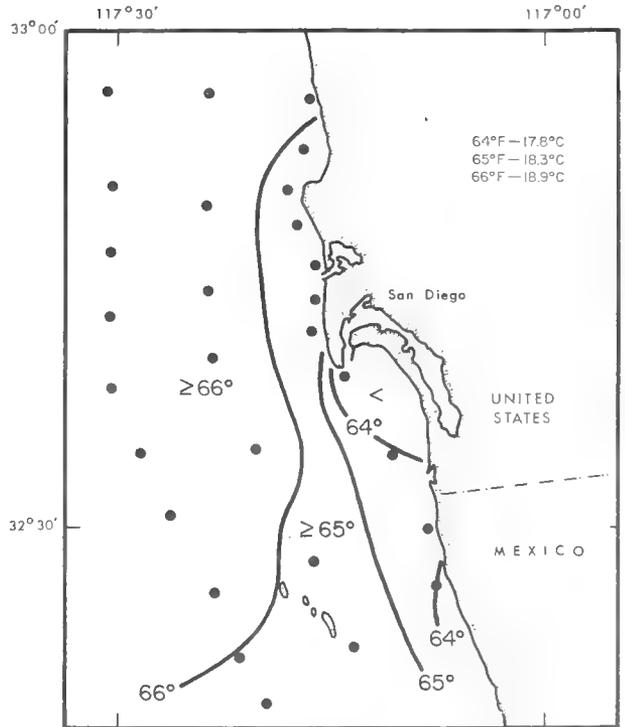


Figure 8.—Average isotherm patterns observed off San Diego in °F with °C equivalents for the 3-yr period, 1 to 15 July 1972-74.

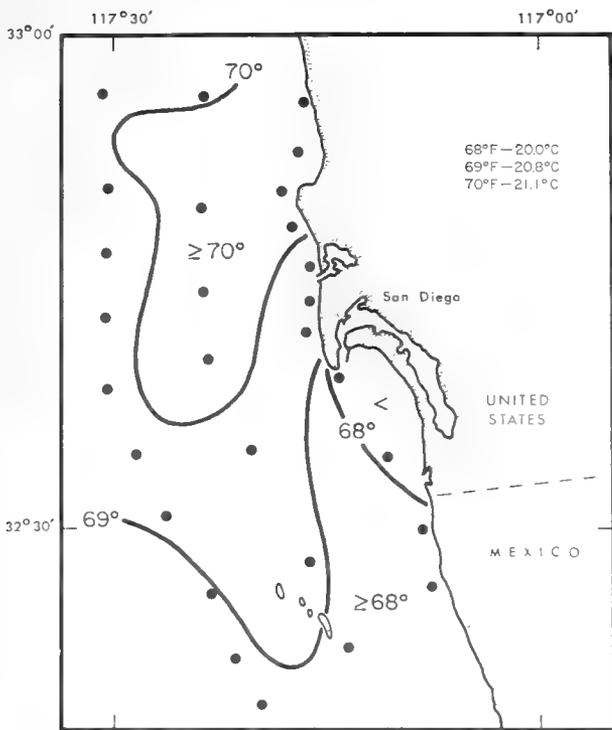


Figure 9.—Average isotherm patterns observed off San Diego in °F with °C equivalents for the 3-yr period, 16 to 31 July 1972-74.

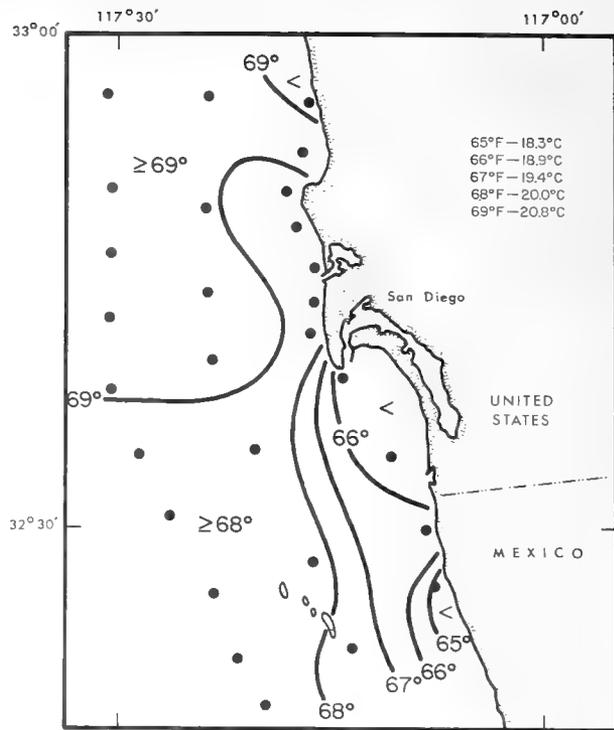


Figure 11.—Average isotherm patterns observed off San Diego in °F with °C equivalents for the 3-yr period, 16 to 31 August 1972-74.

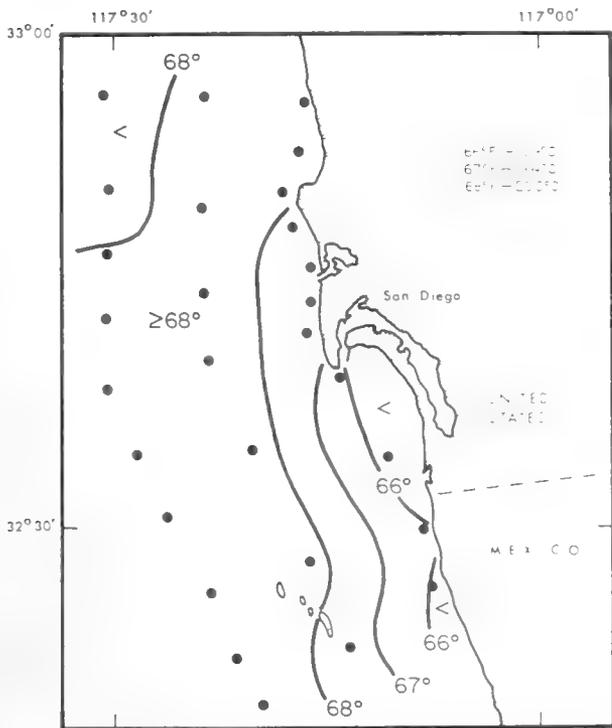


Figure 10.—Average isotherm patterns observed off San Diego in °F with °C equivalents for the 3-yr period, 1 to 15 August 1972-74.

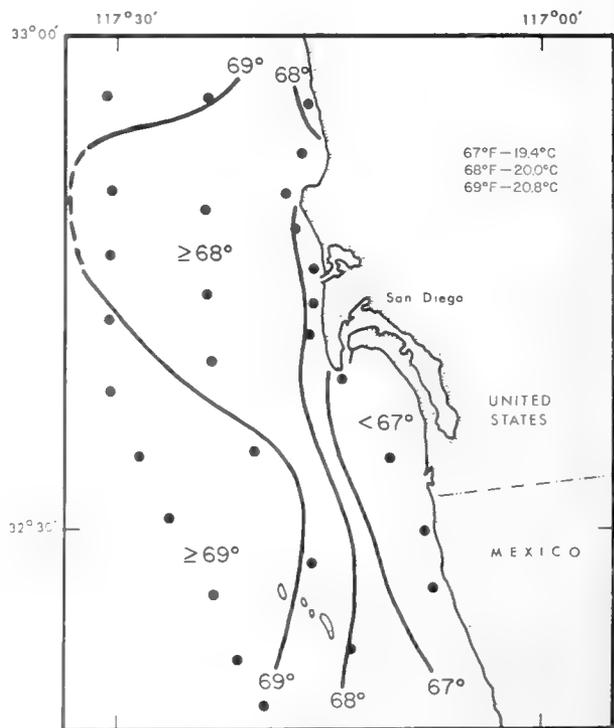


Figure 12.—Average isotherm patterns observed off San Diego in °F with °C equivalents for the 3-yr period, 1 to 15 September 1972-74.

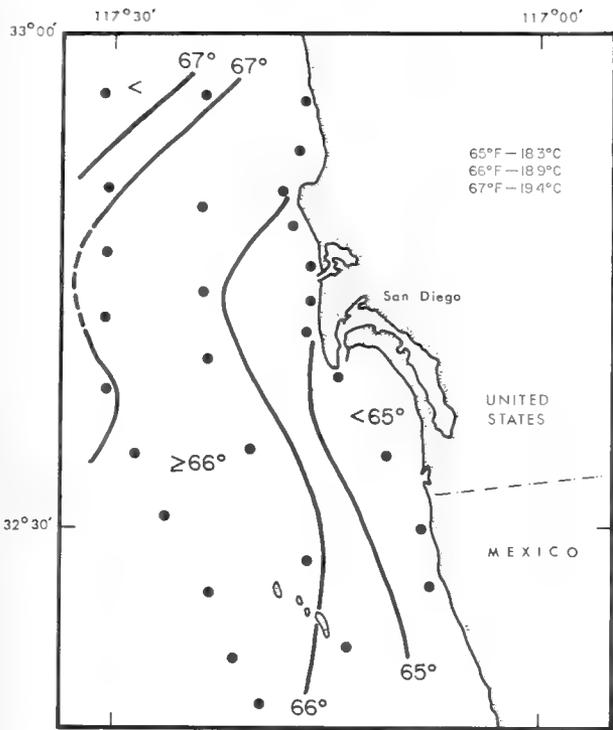


Figure 13.—Average isotherm patterns observed off San Diego in °F with °C equivalents for the 3-yr period, 16 to 30 September 1972-74.

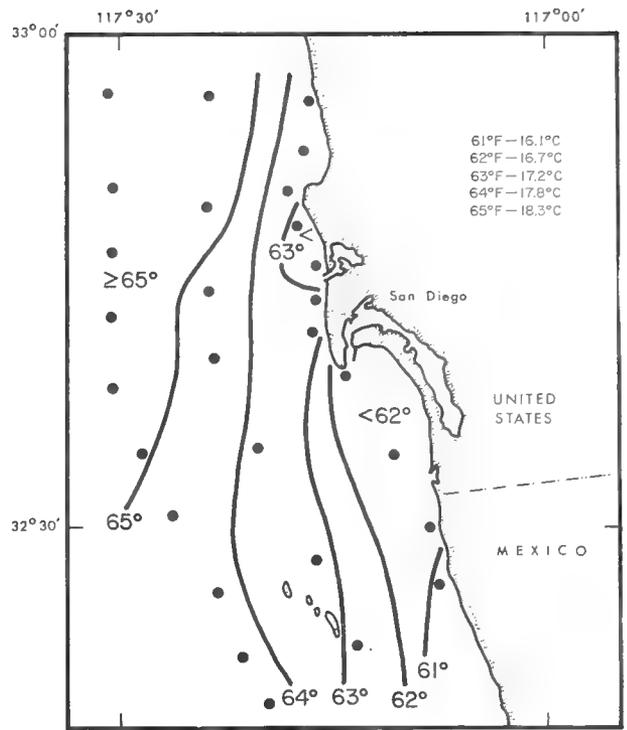


Figure 15.—Average isotherm patterns observed off San Diego in °F with °C equivalents for the 3-yr period, 16 to 31 October 1972-74.

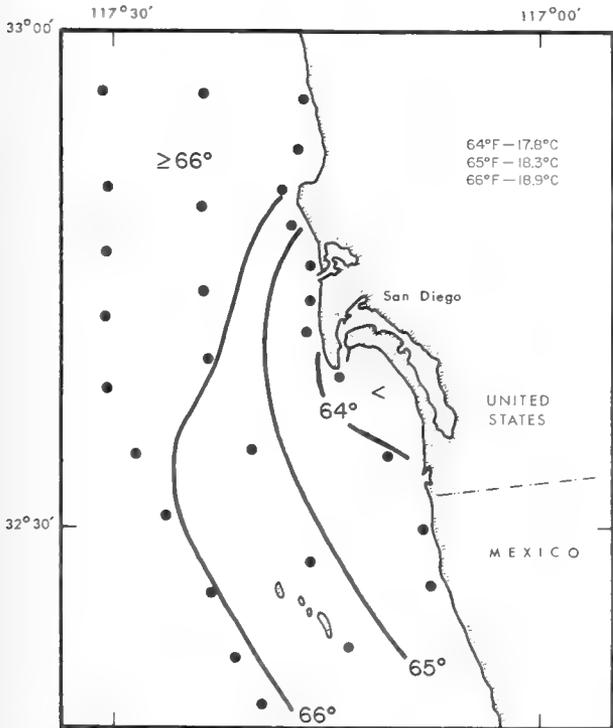
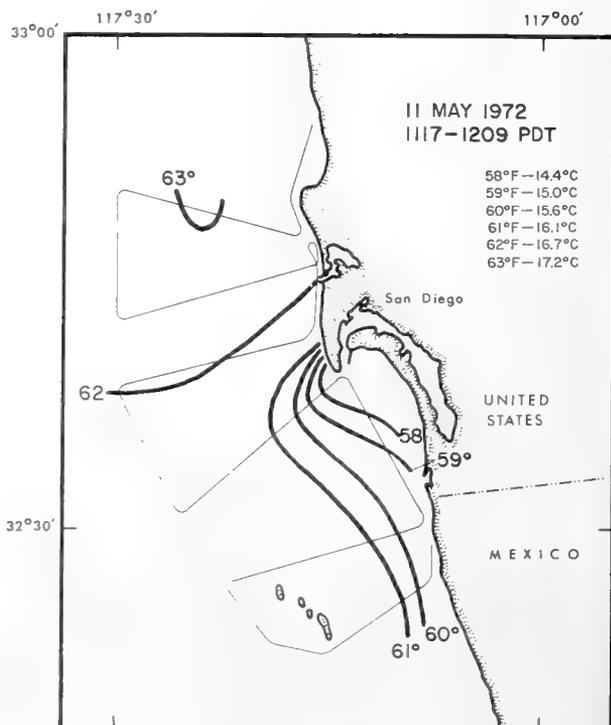
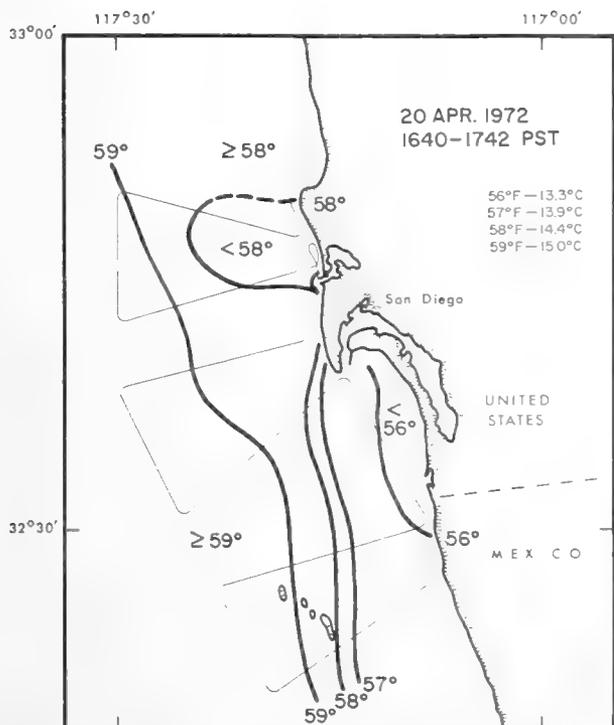
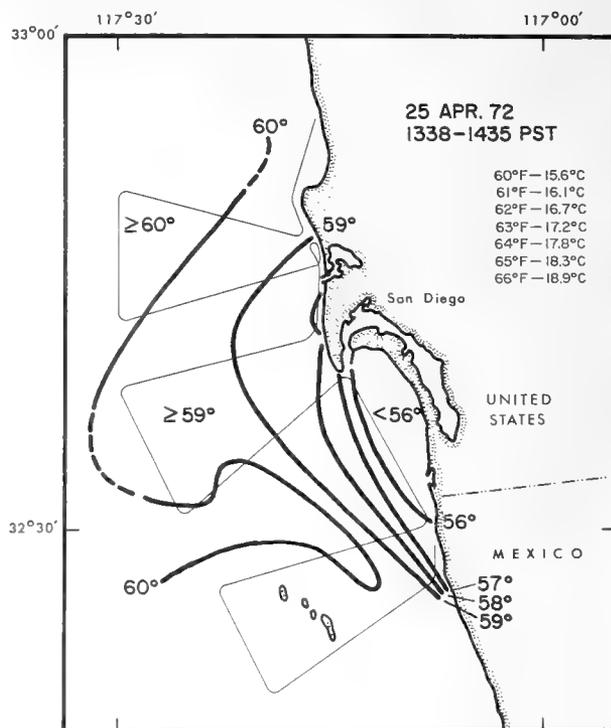
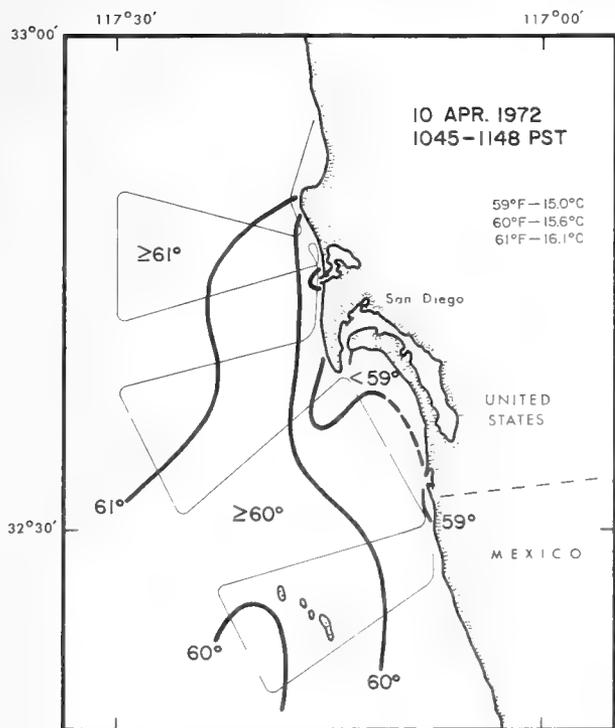
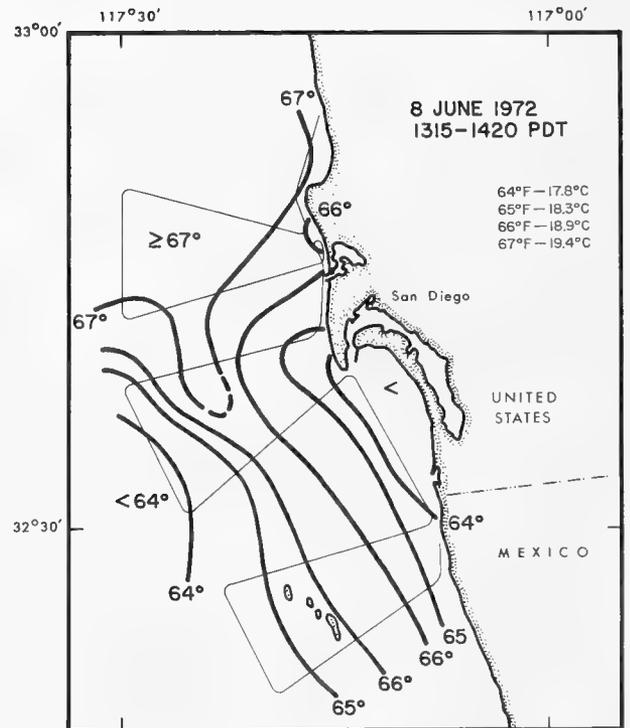
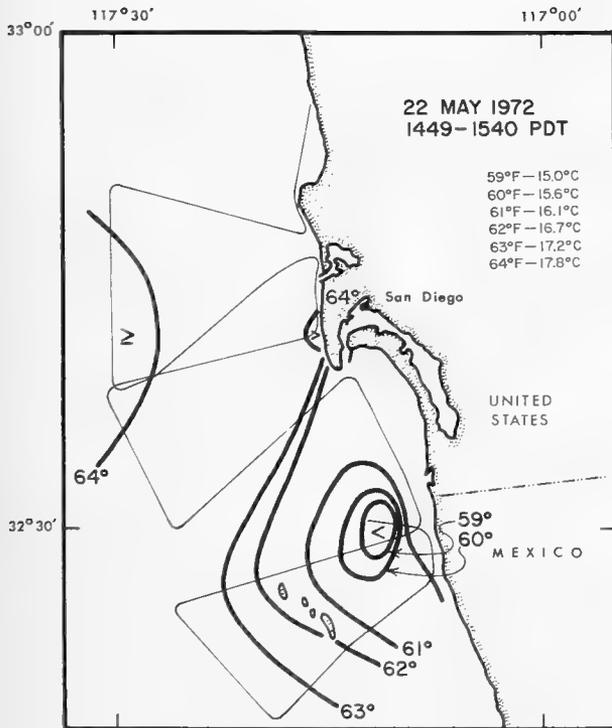
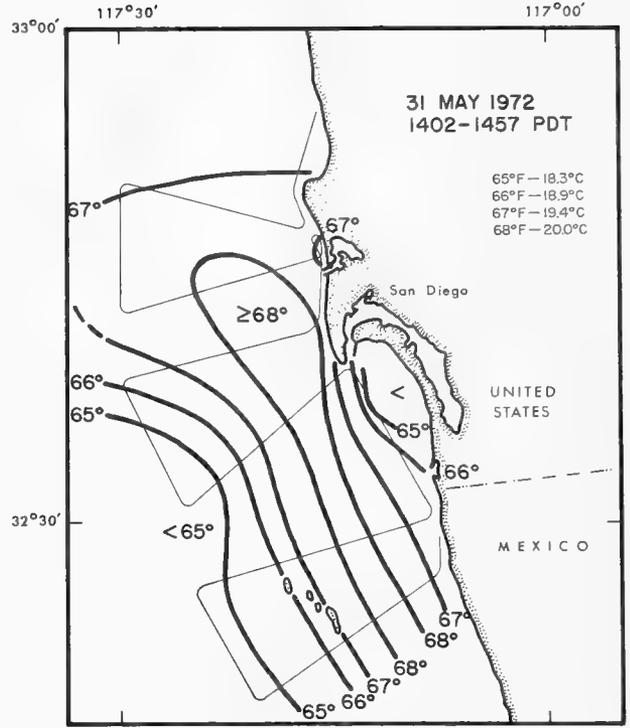
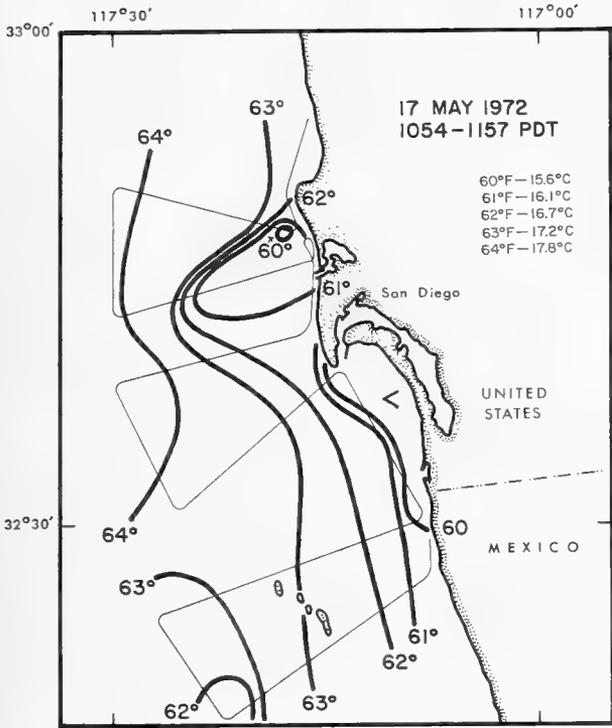


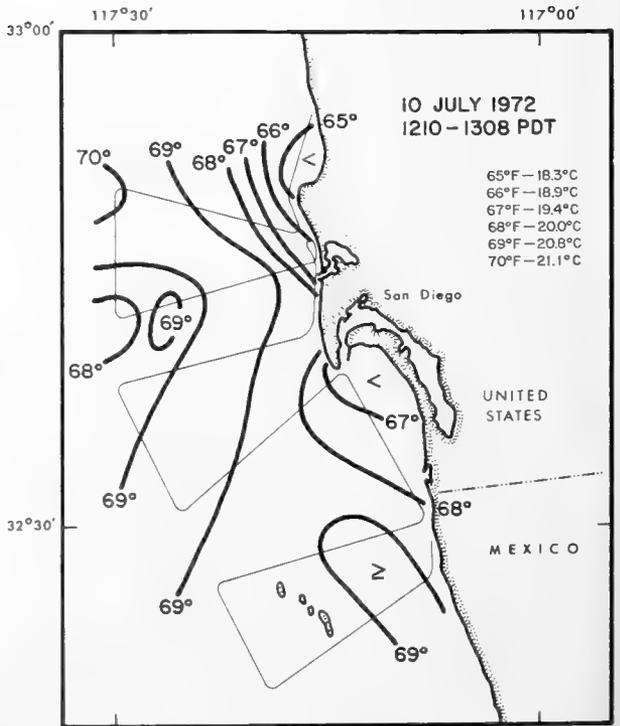
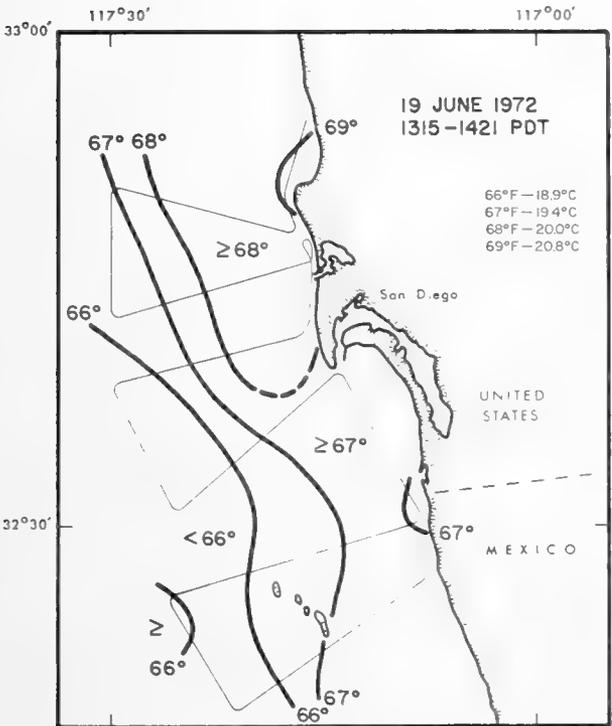
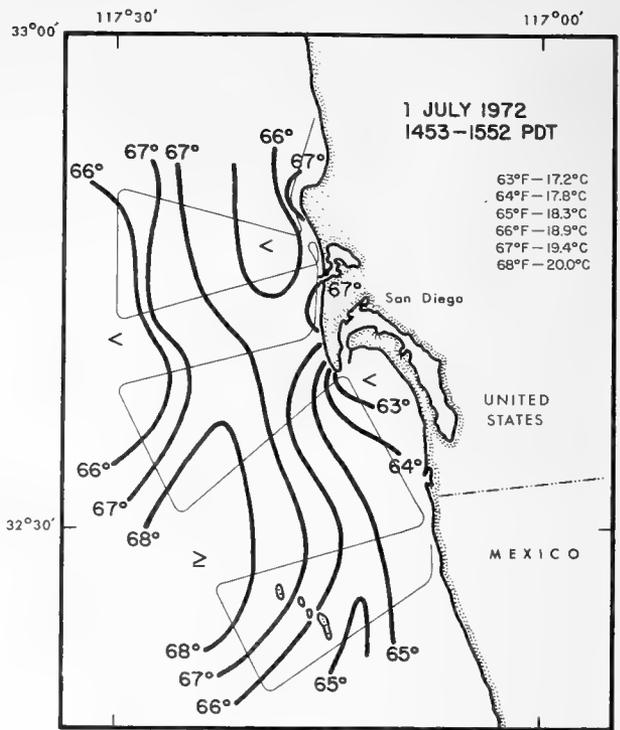
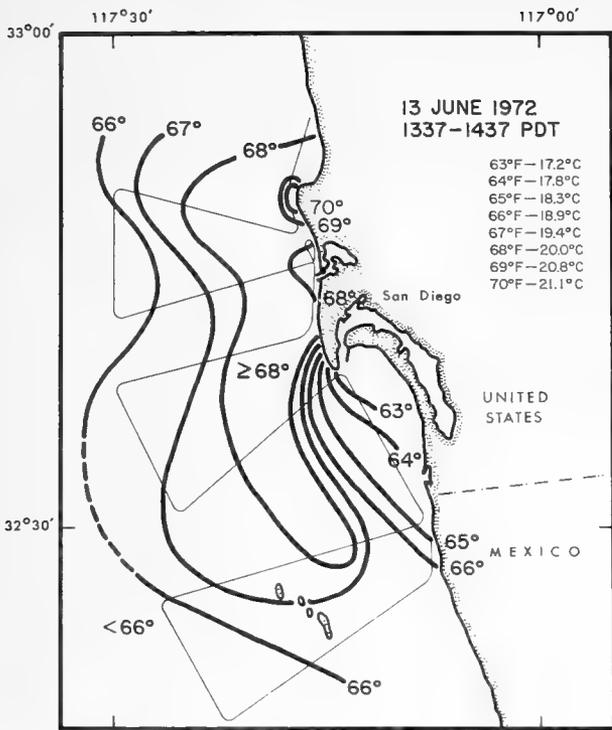
Figure 14.—Average isotherm patterns observed off San Diego in °F with °C equivalents for the 3-yr period, 1 to 15 October 1972-74.

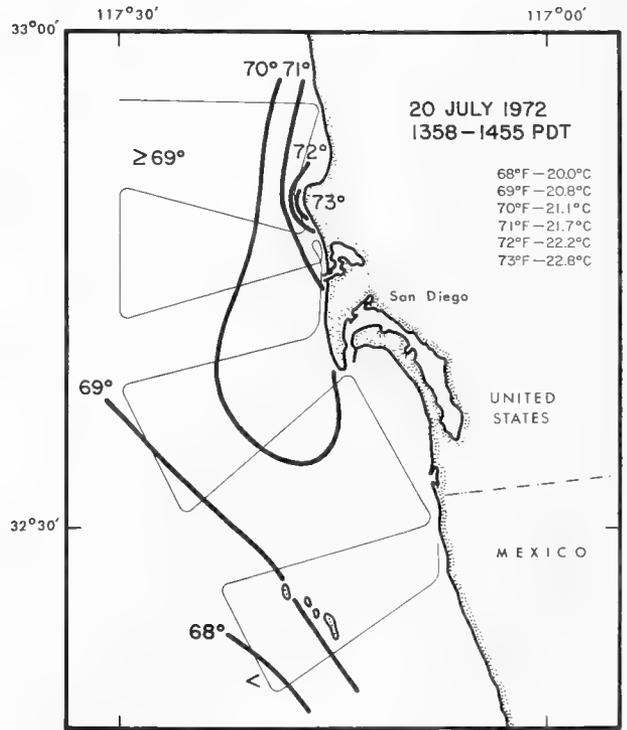
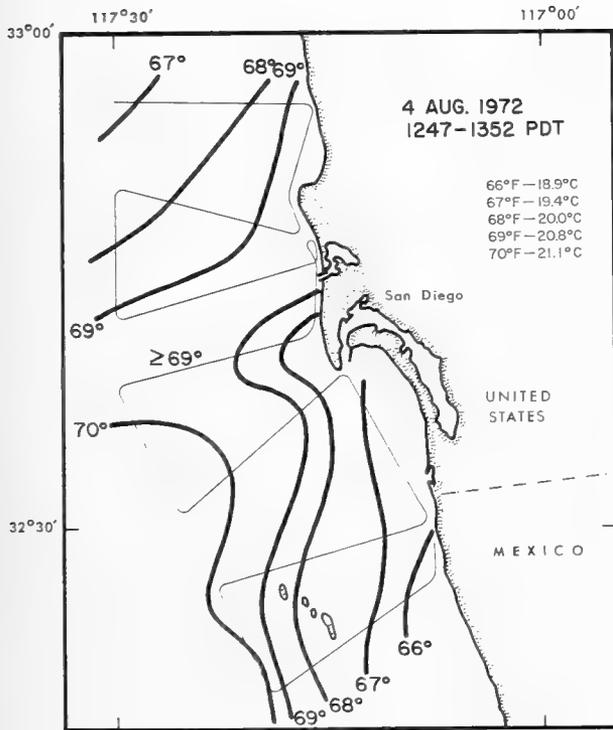
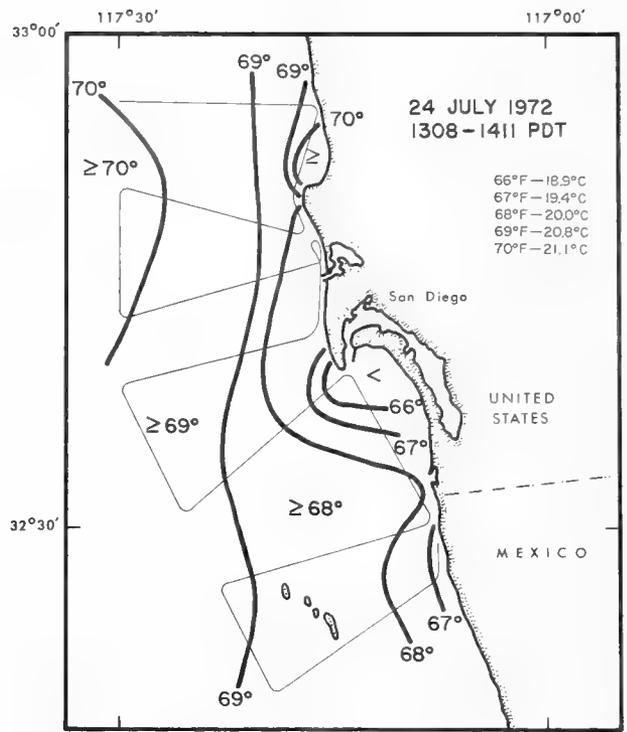
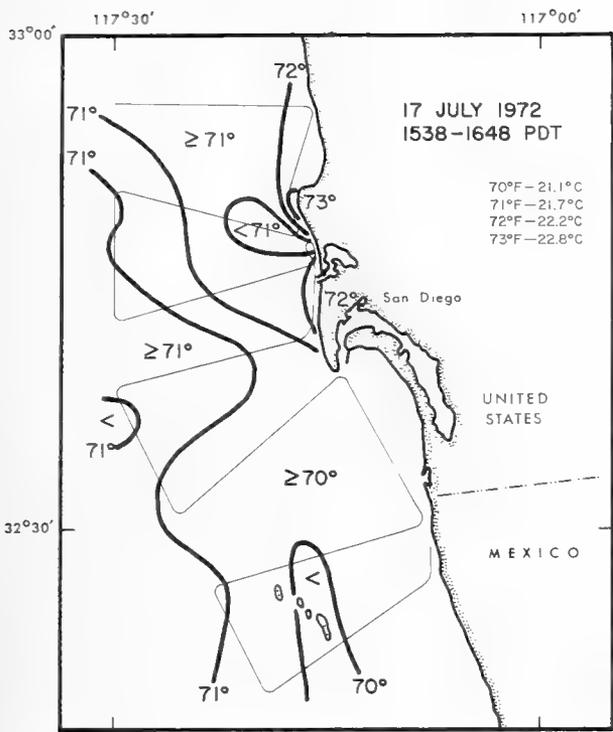
APPENDIX

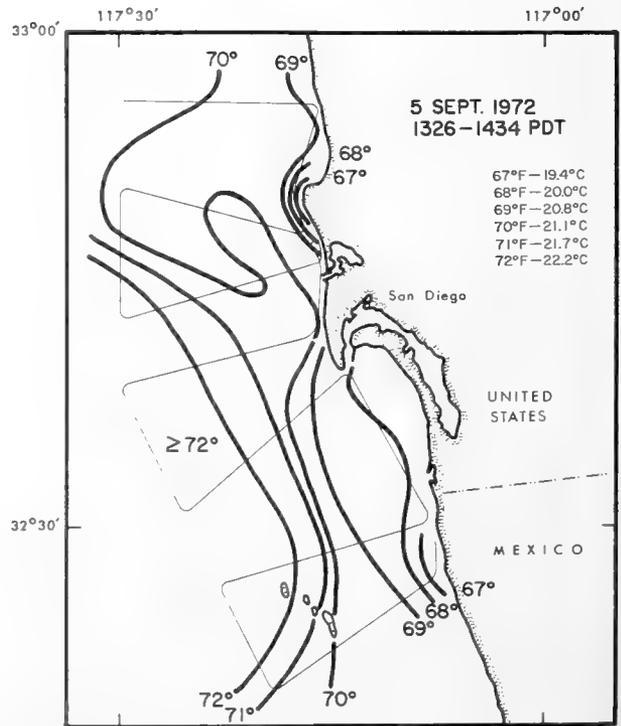
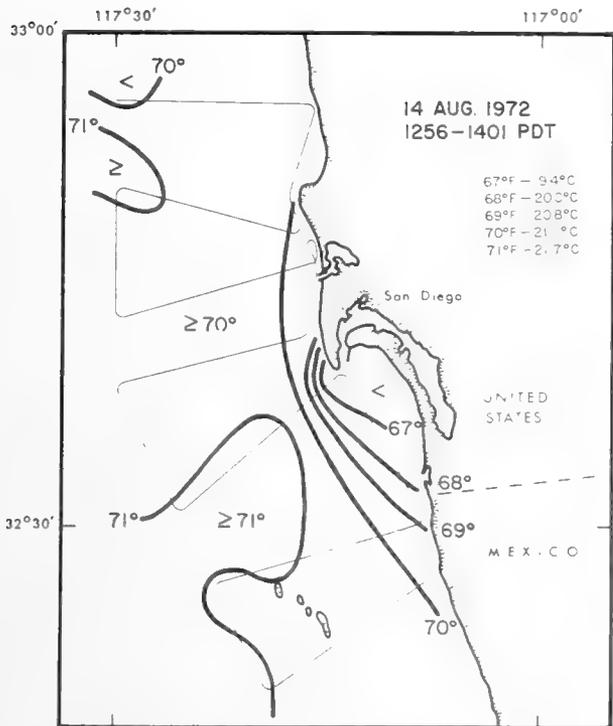
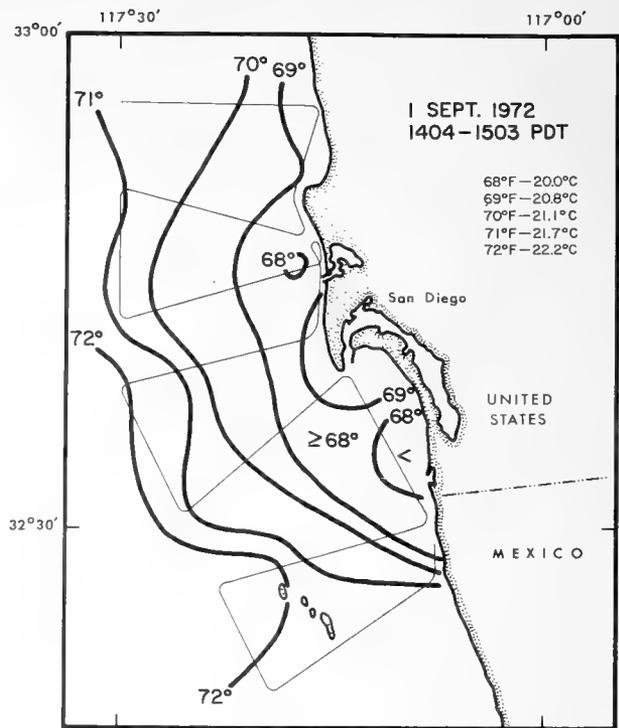
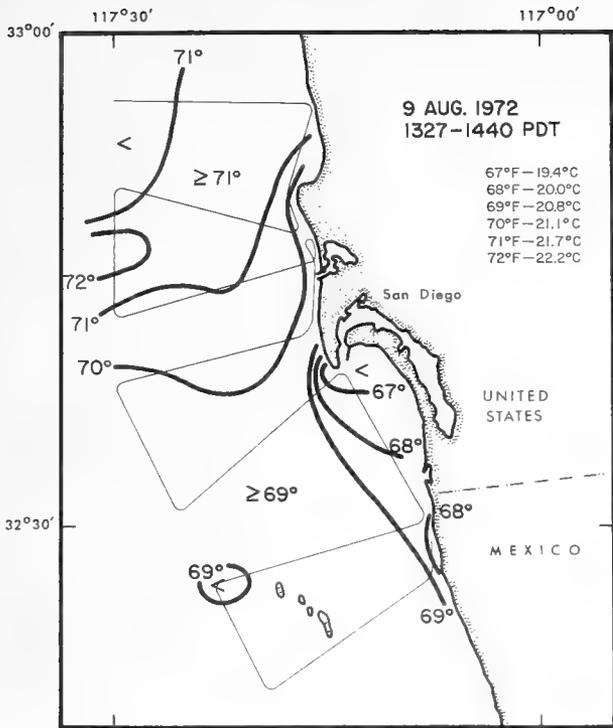
Sea surface temperature isotherms observed during survey flights off San Diego. Figure 1 to 90.

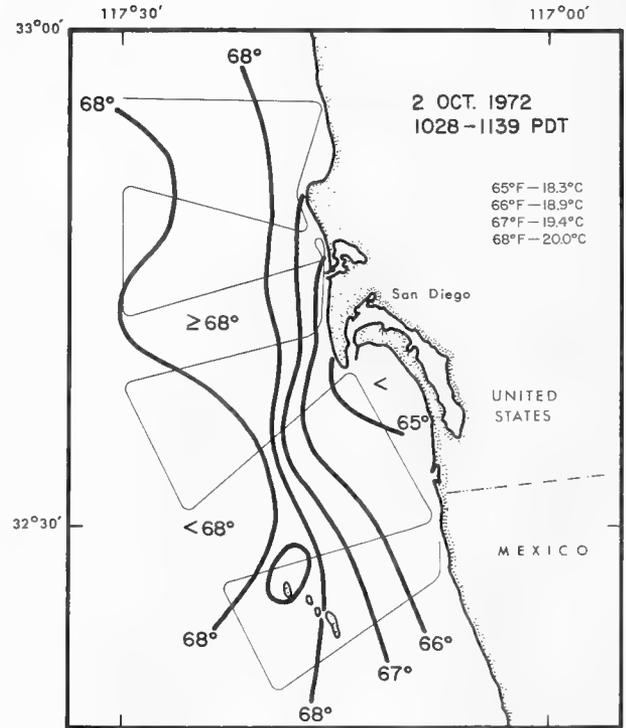
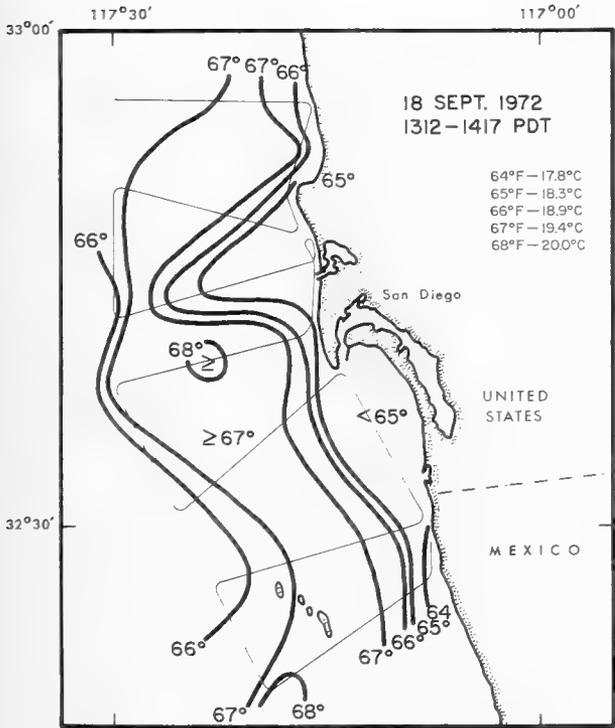
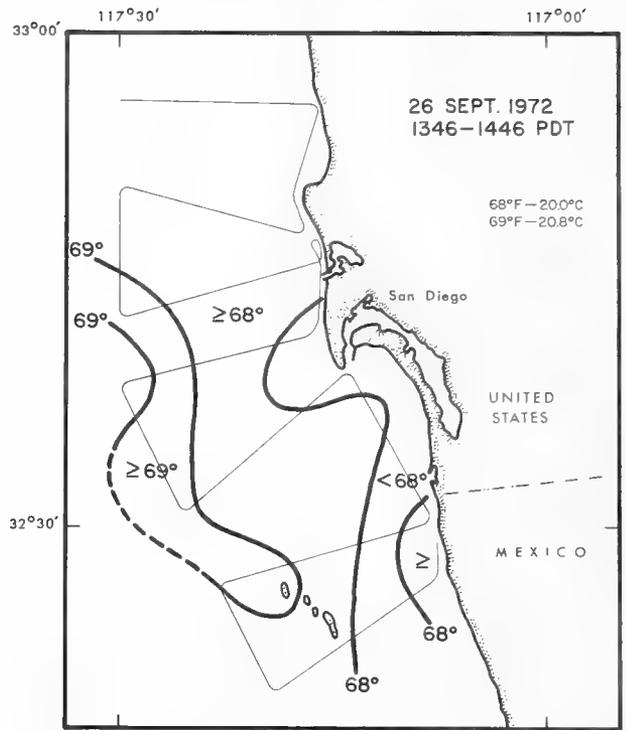
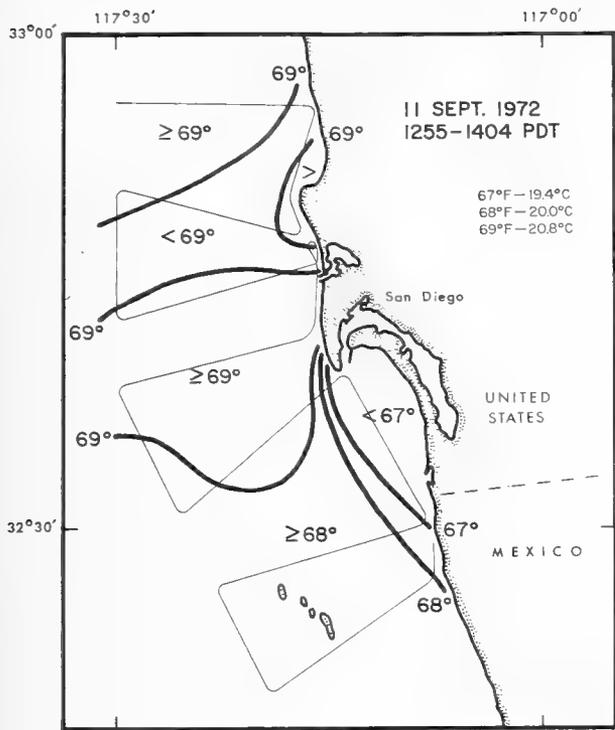


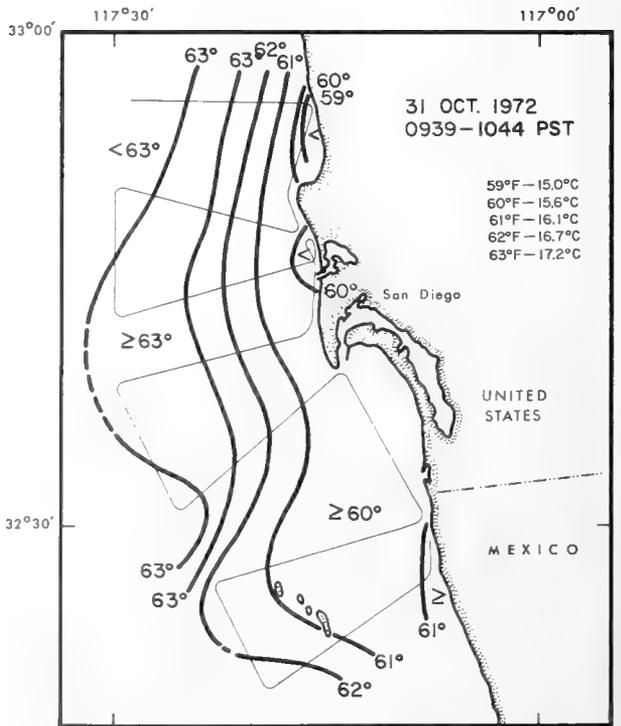
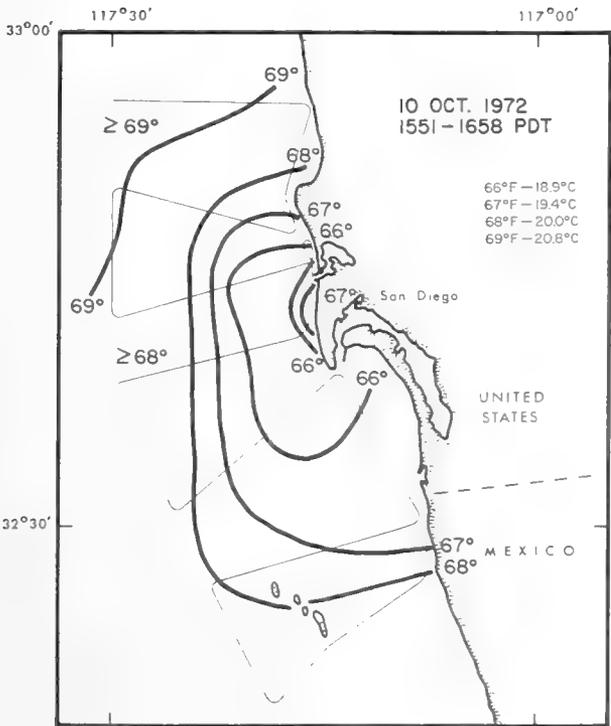
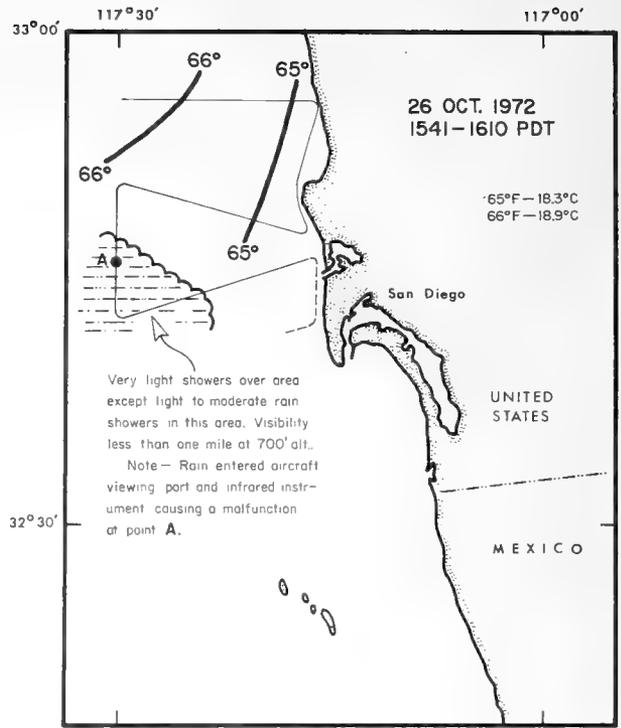
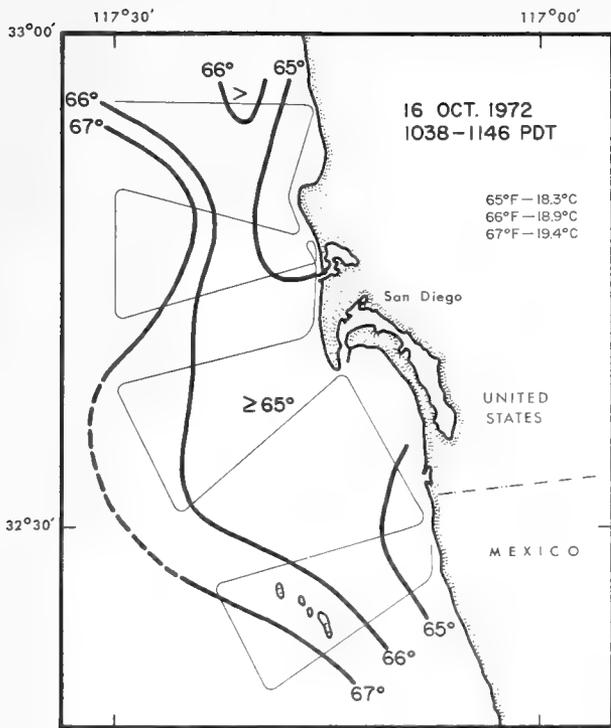


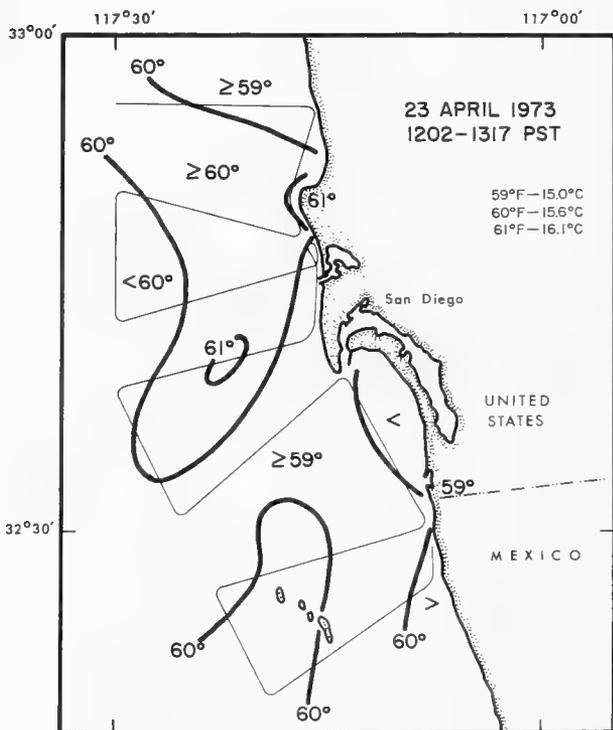
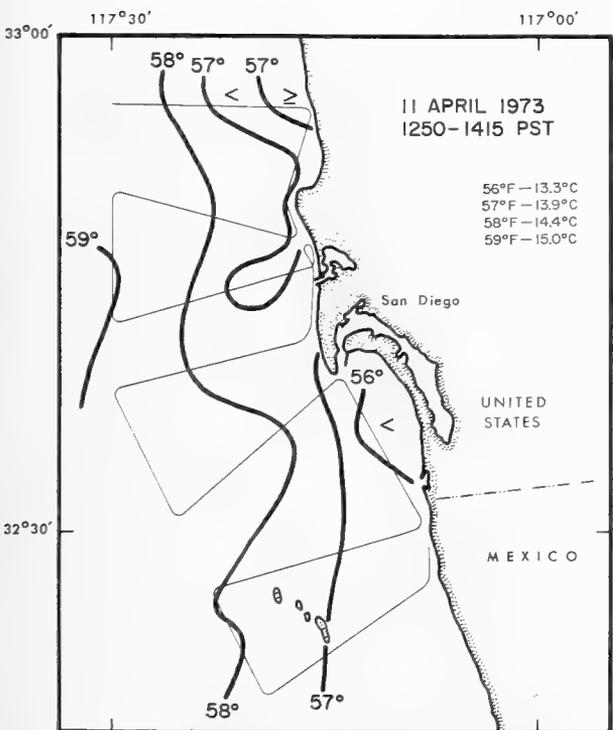
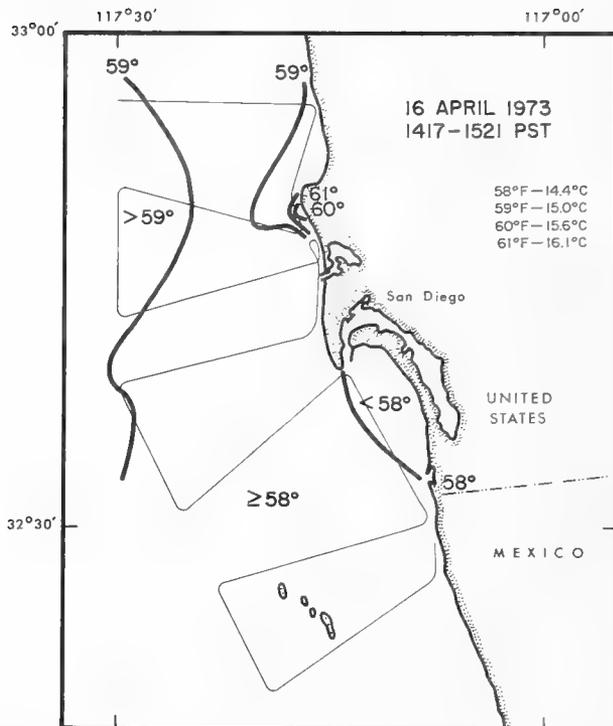
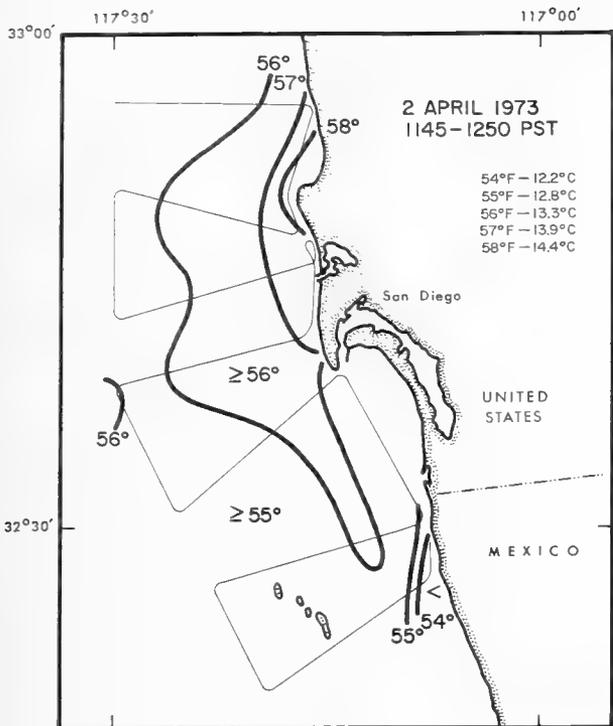


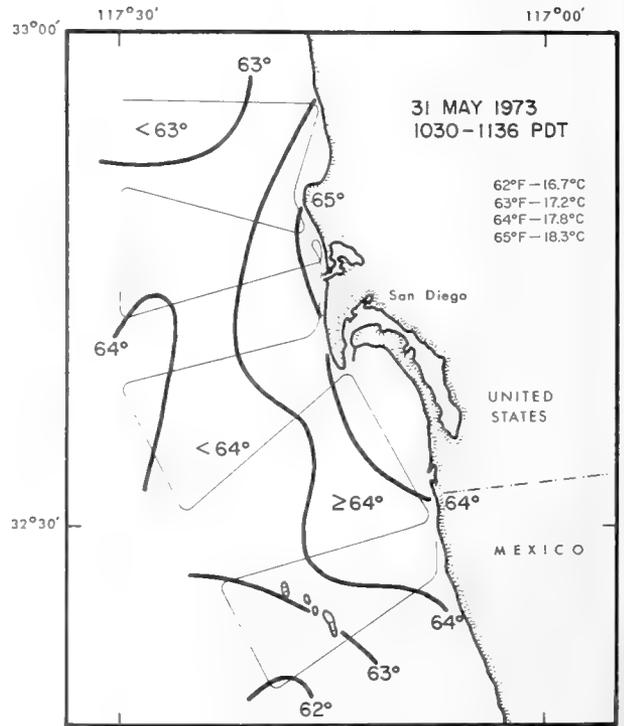
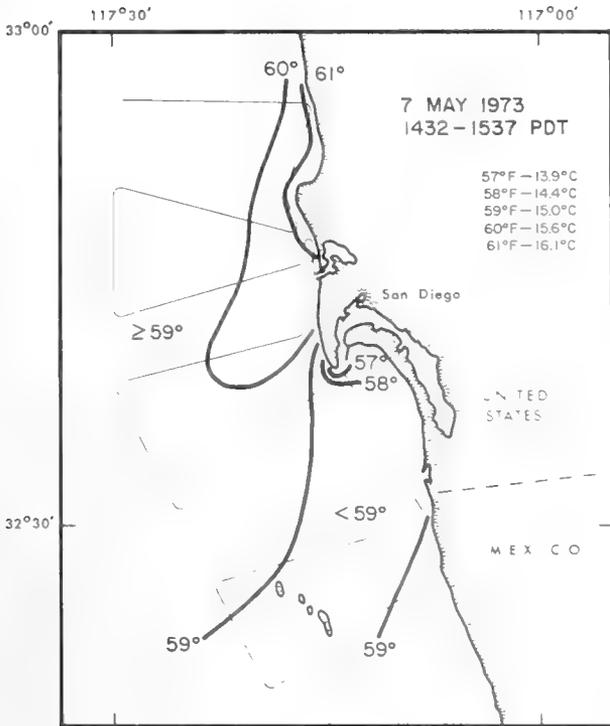
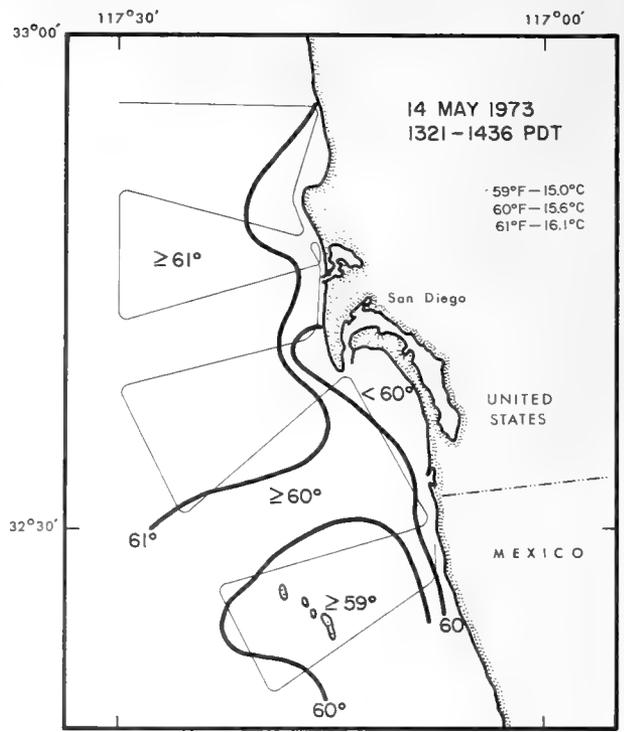
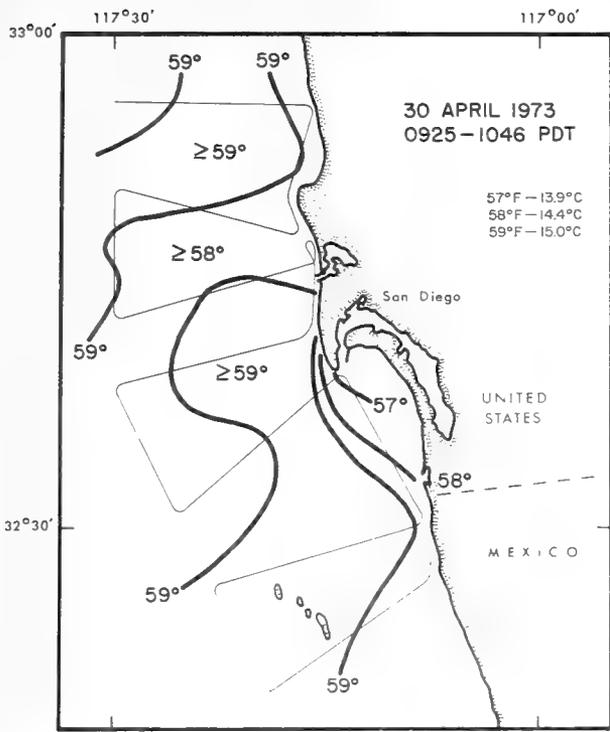


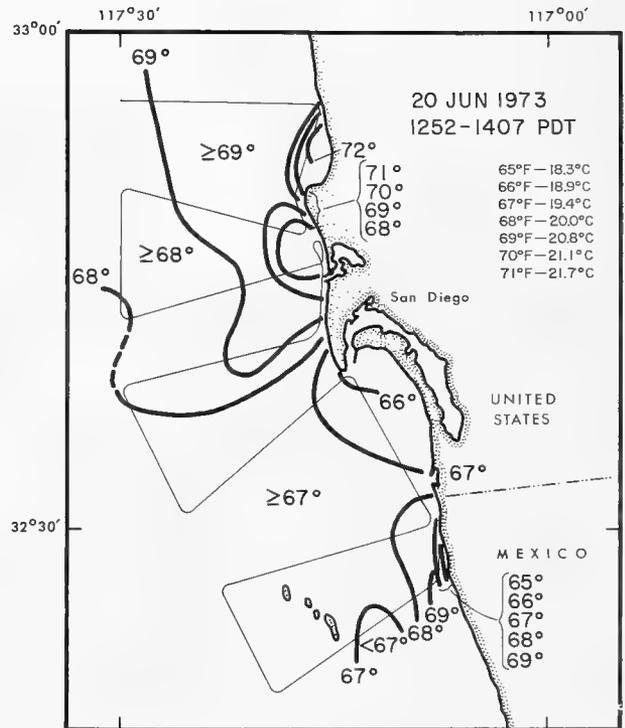
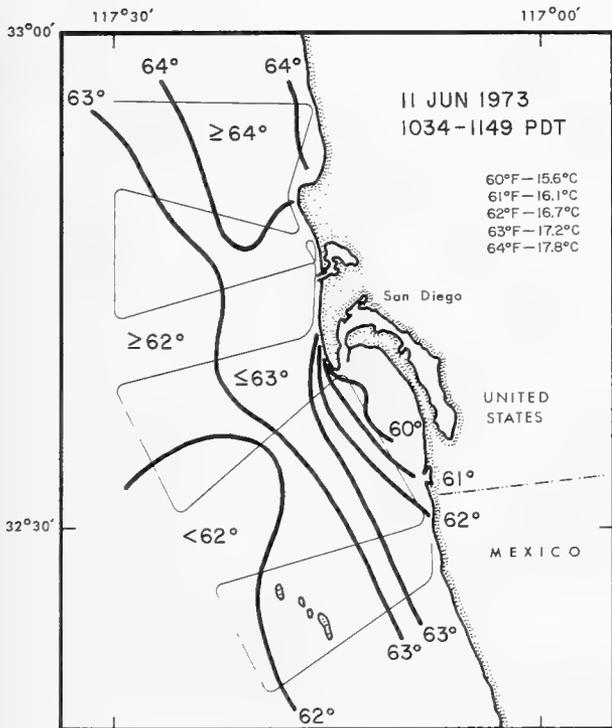
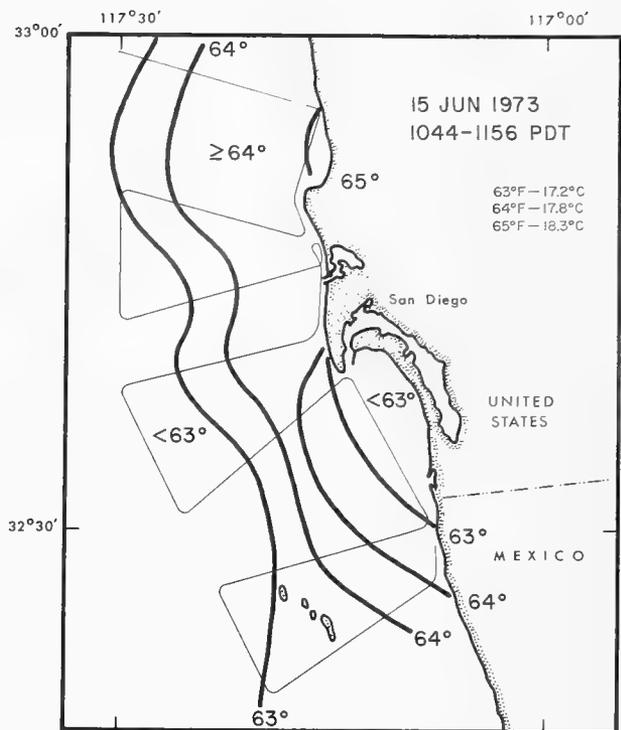
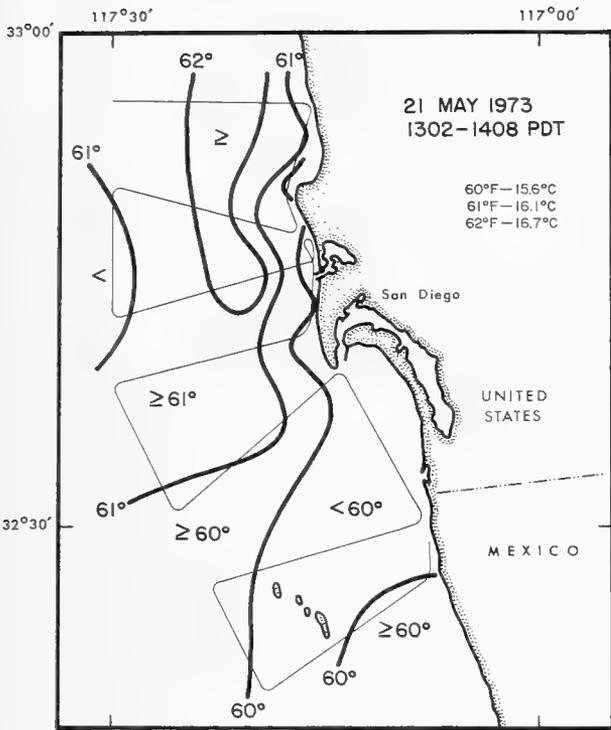


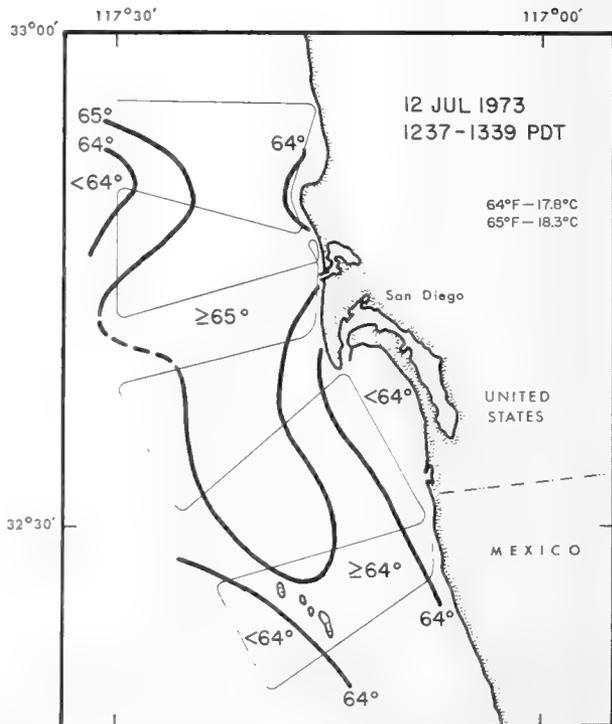
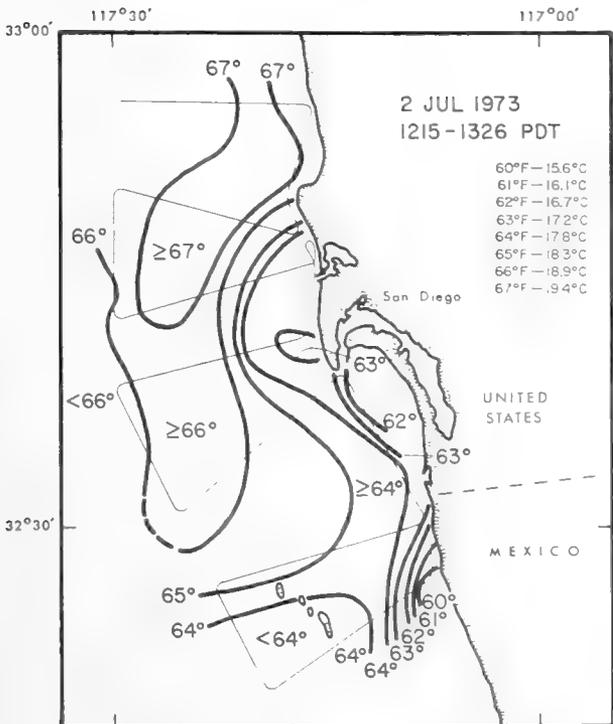
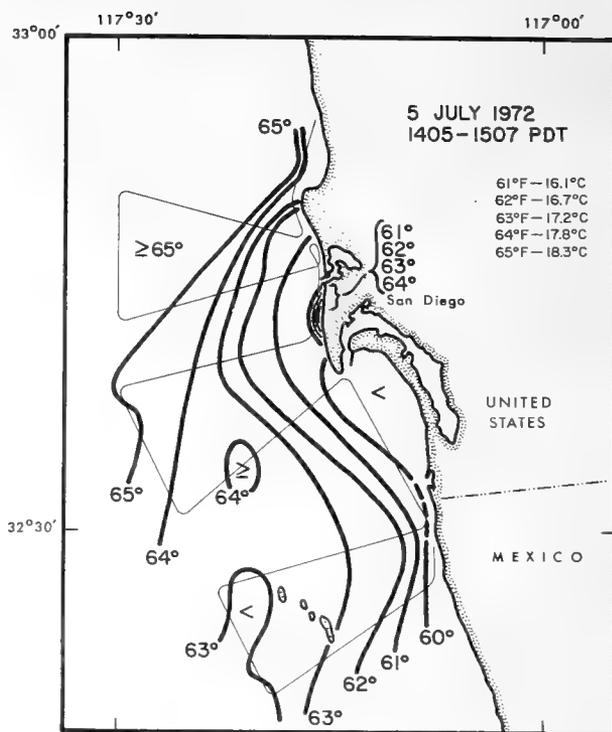
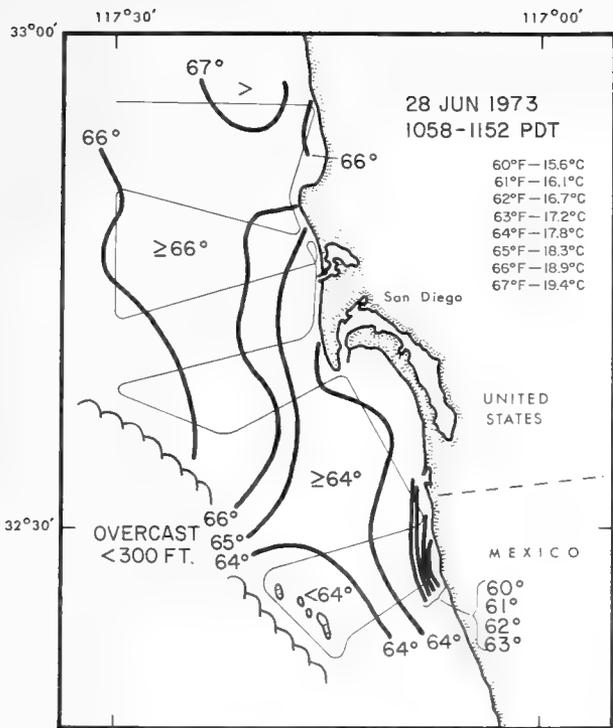


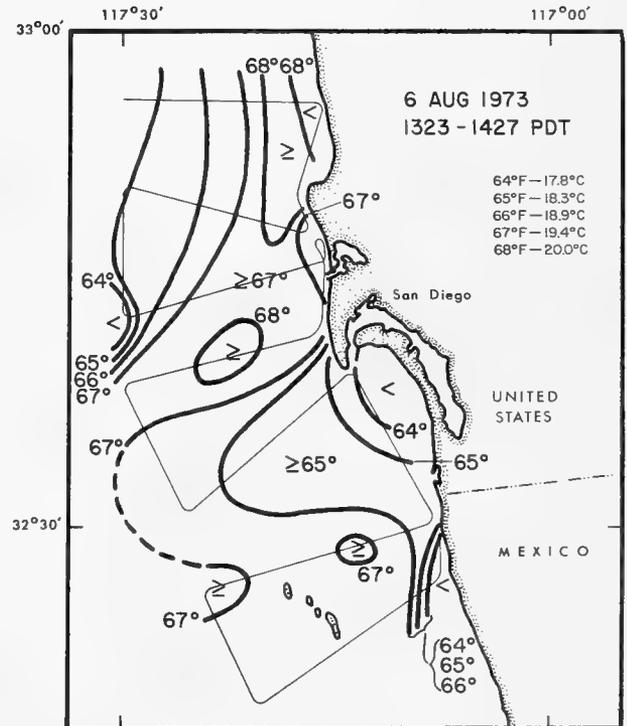
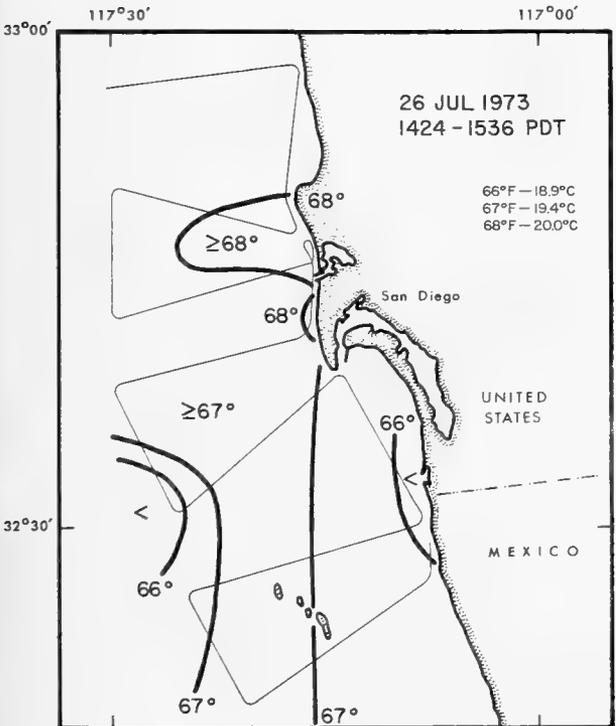
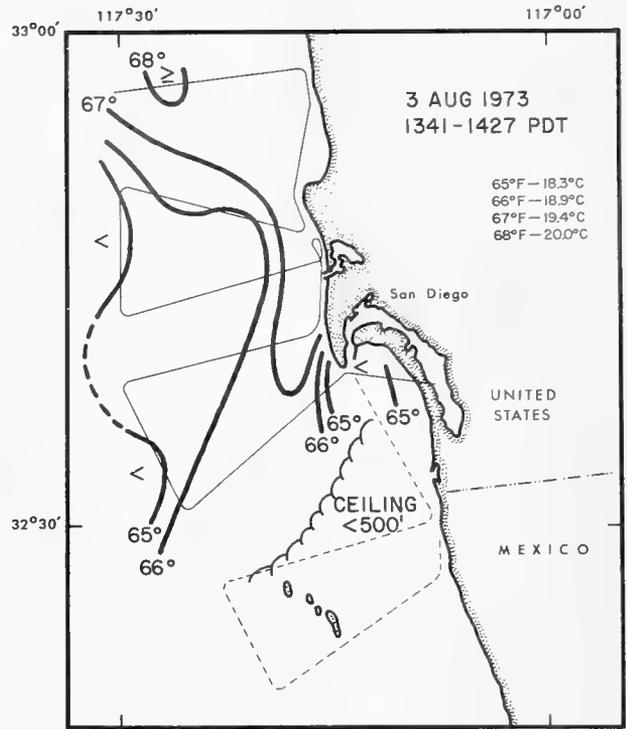
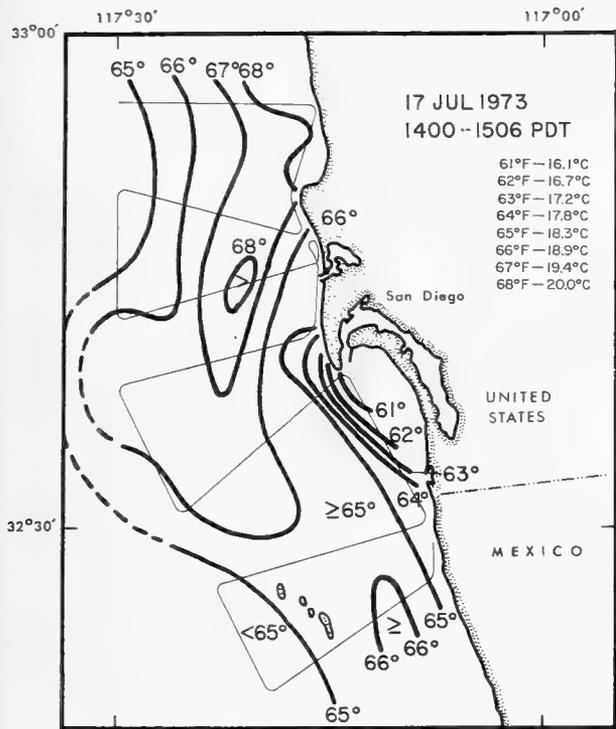


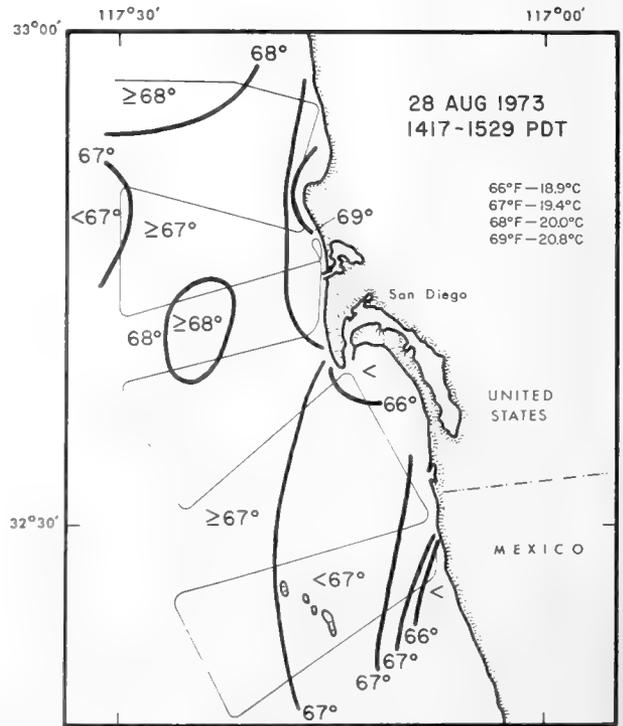
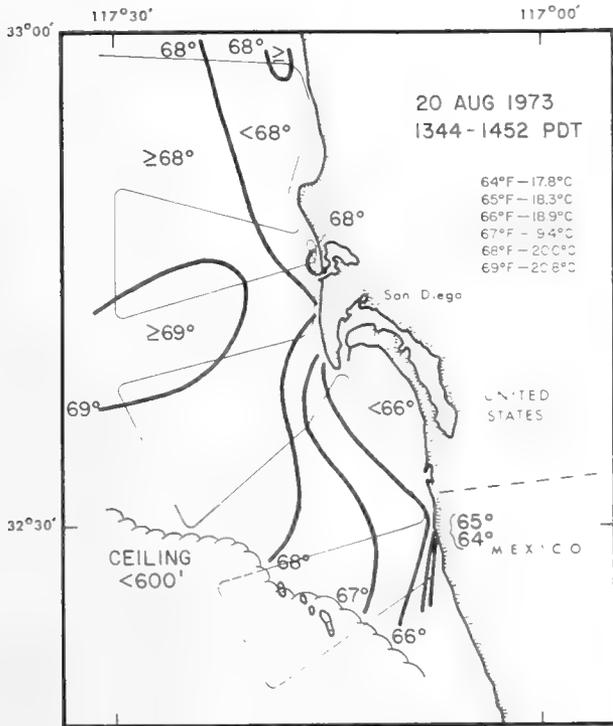
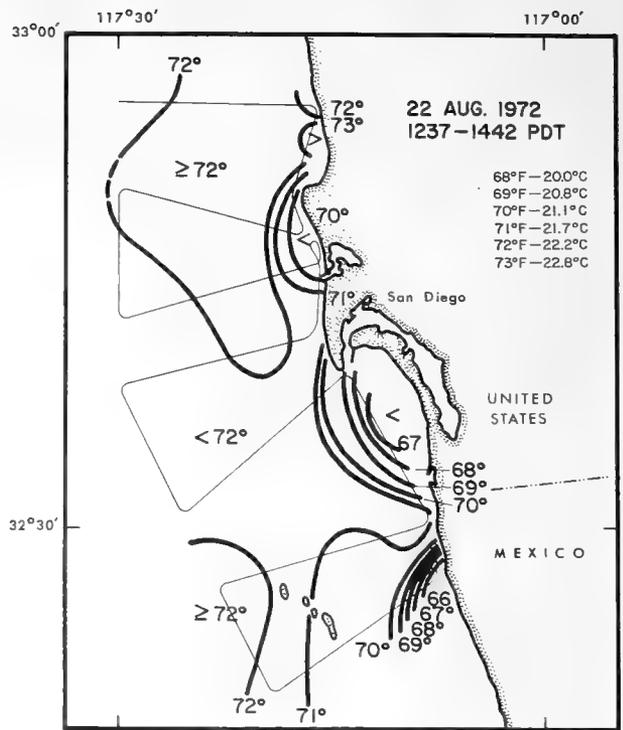
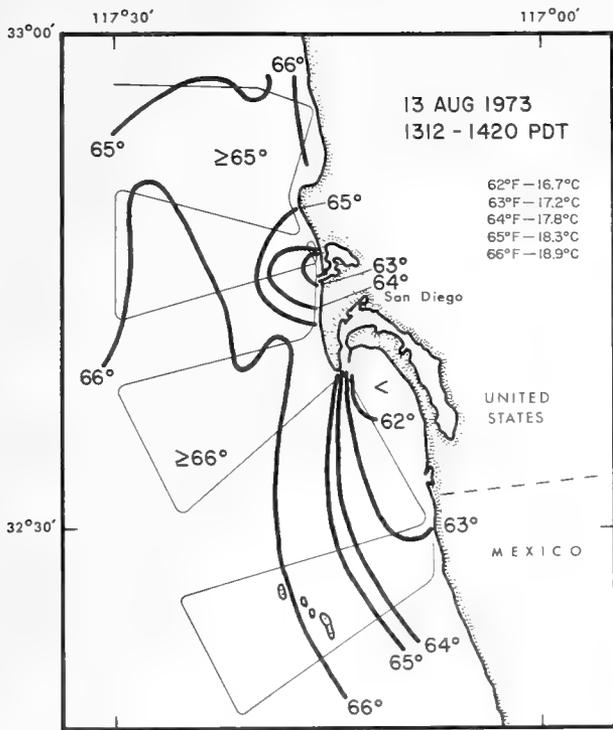


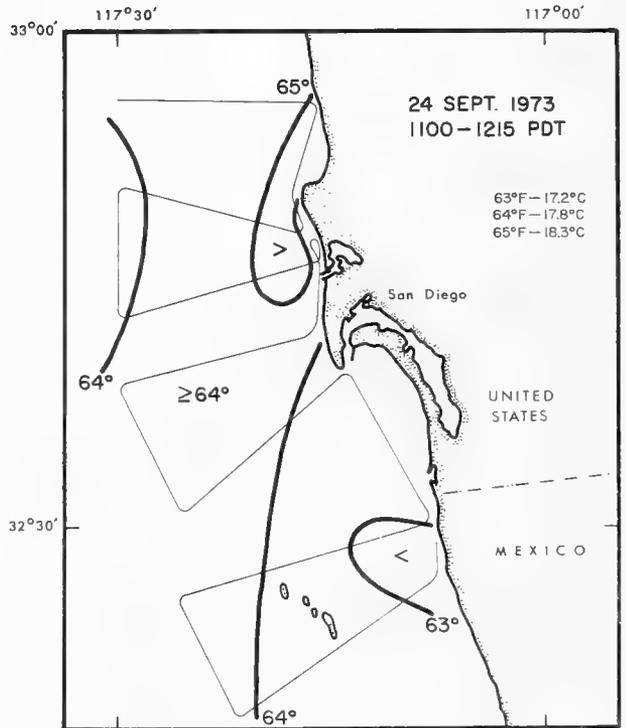
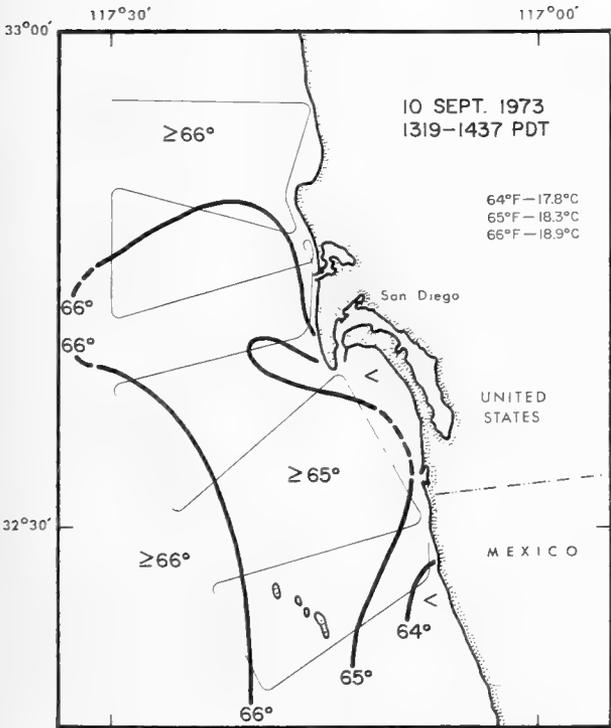
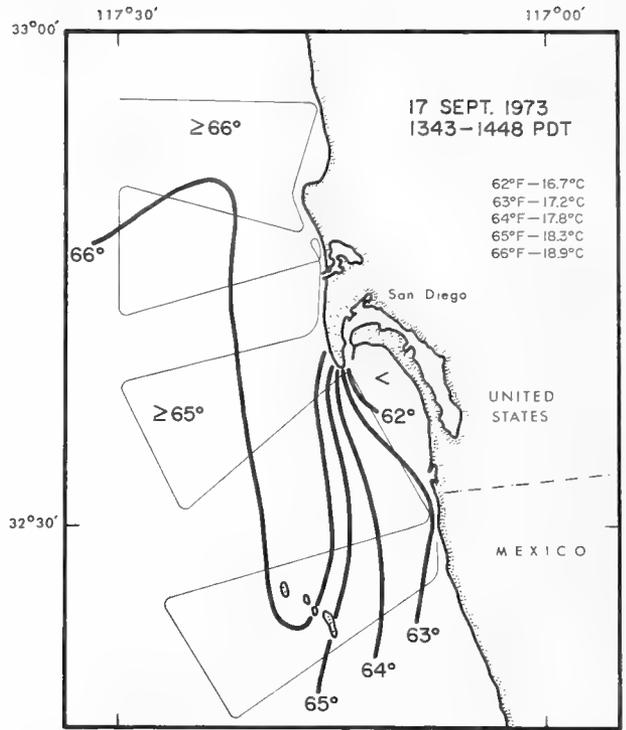
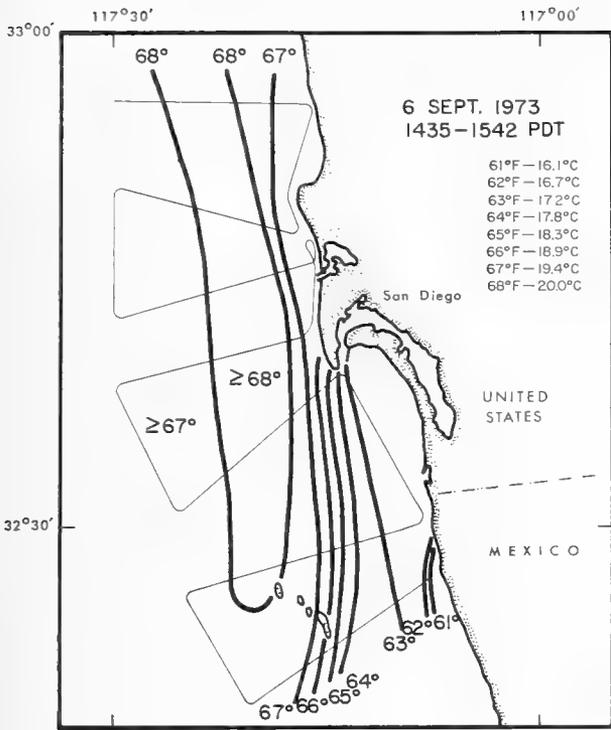


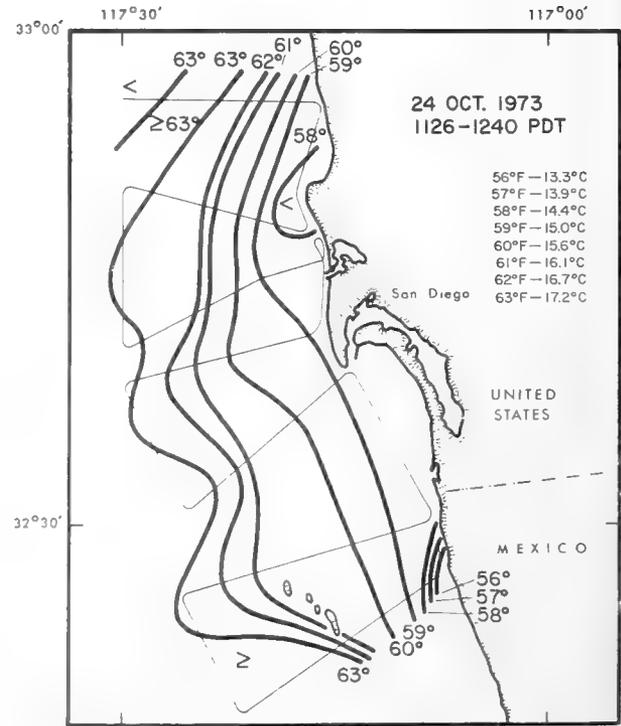
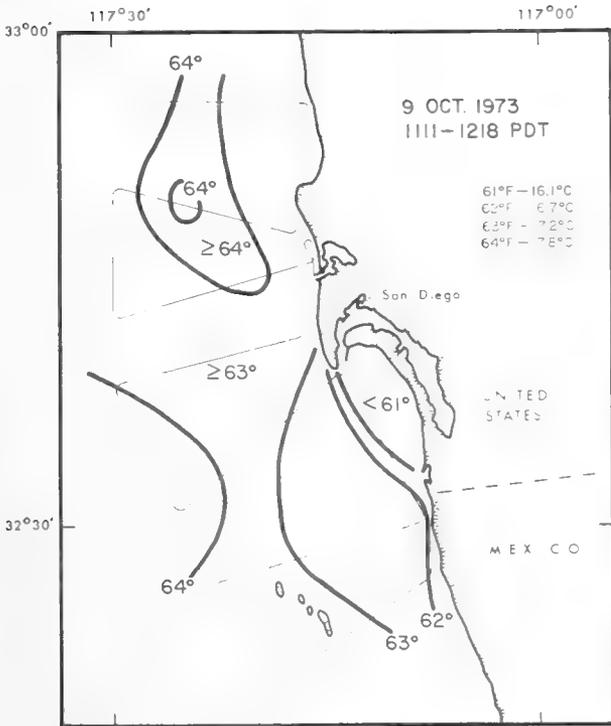
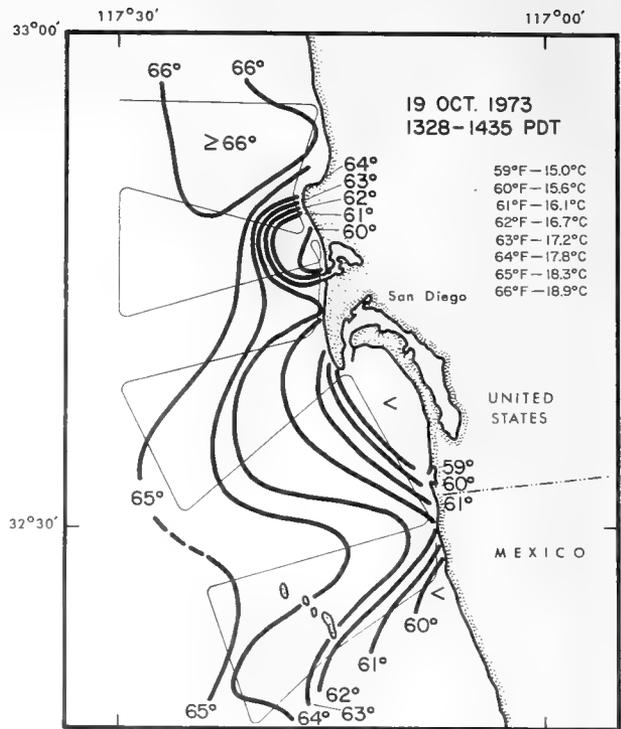
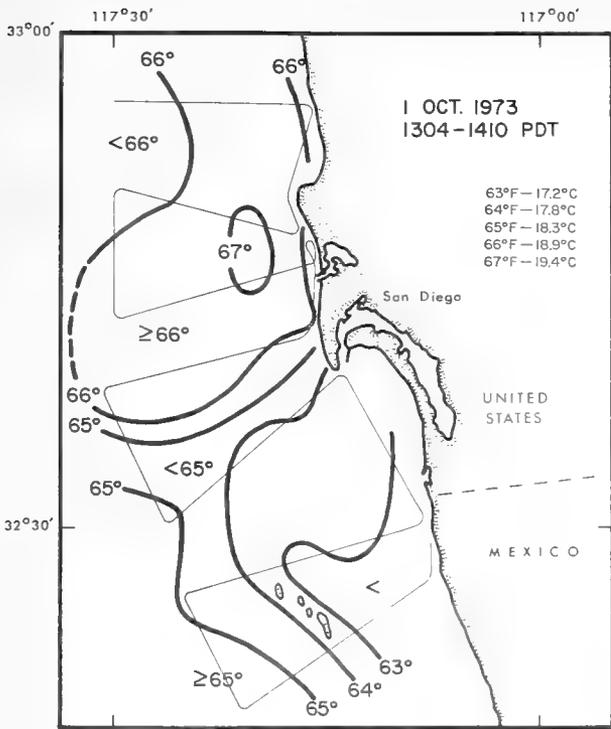


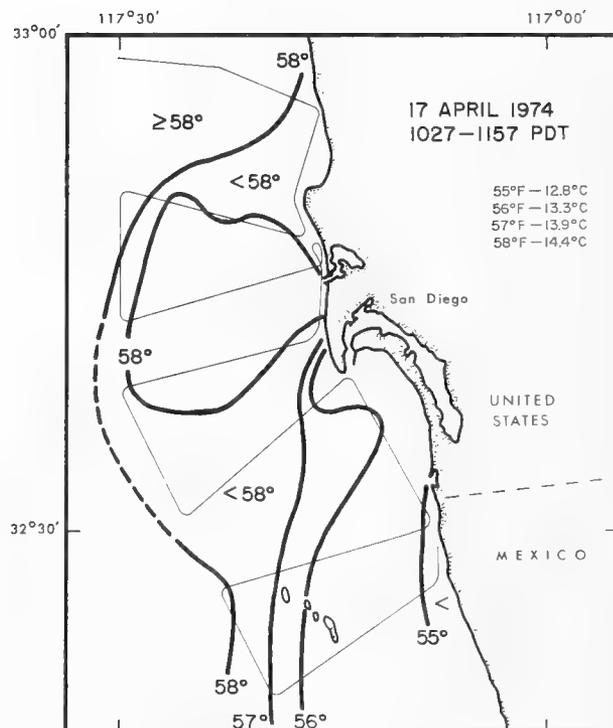
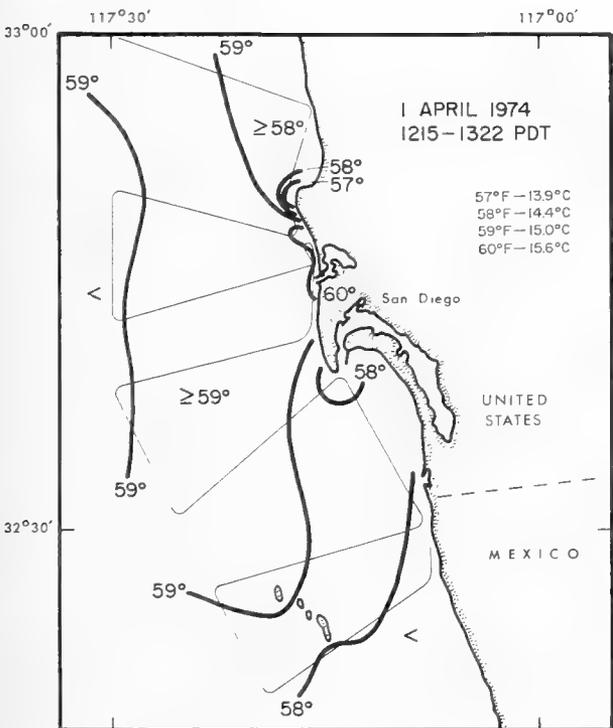
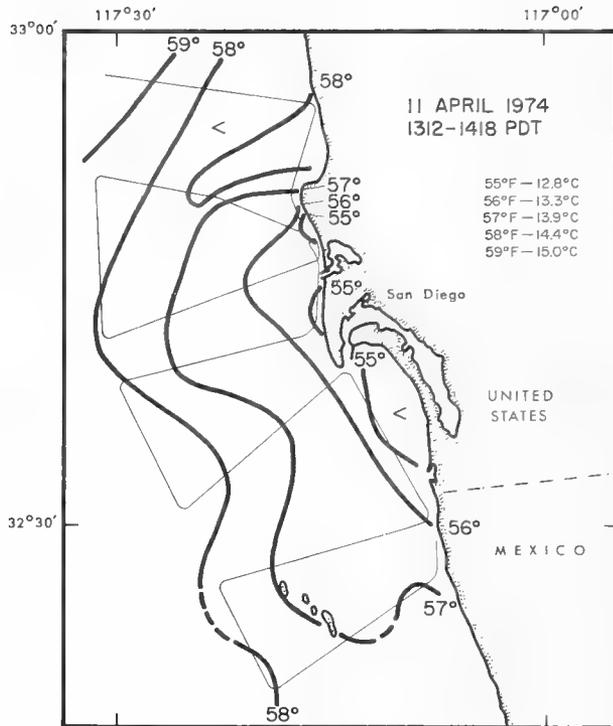
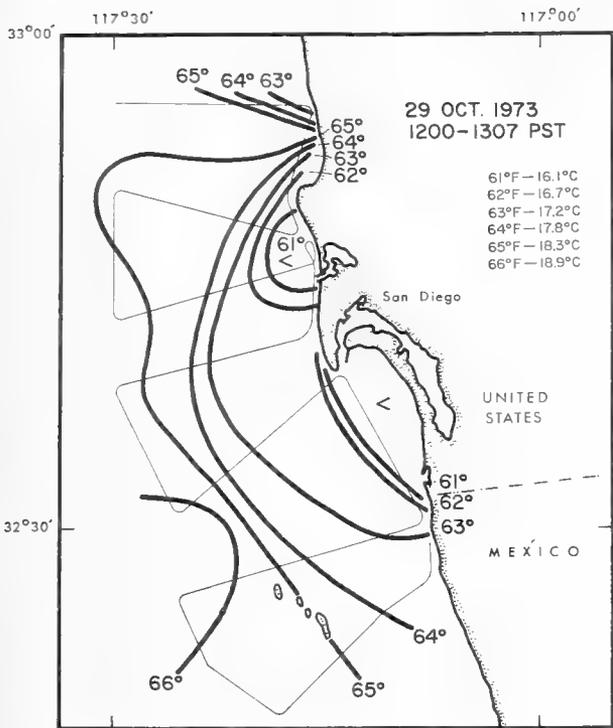


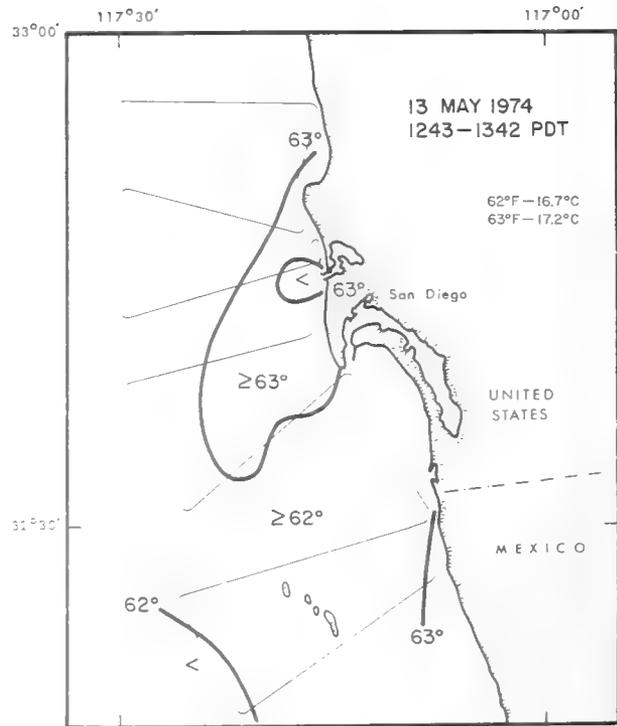
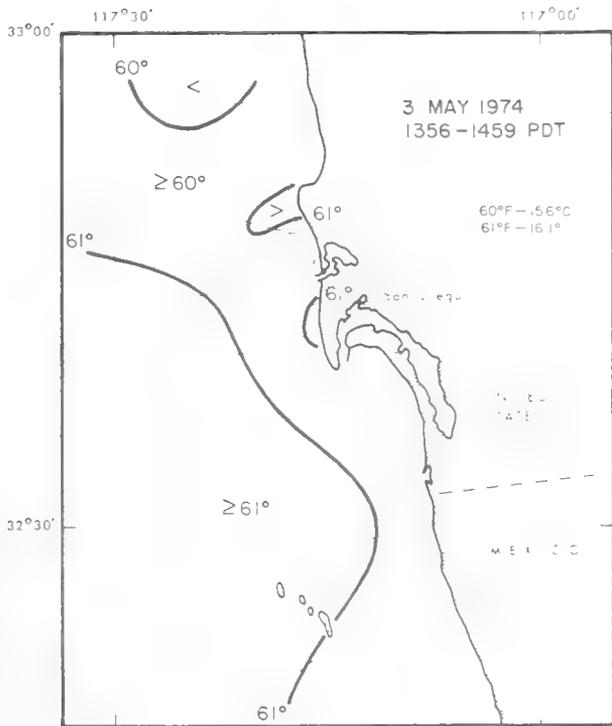
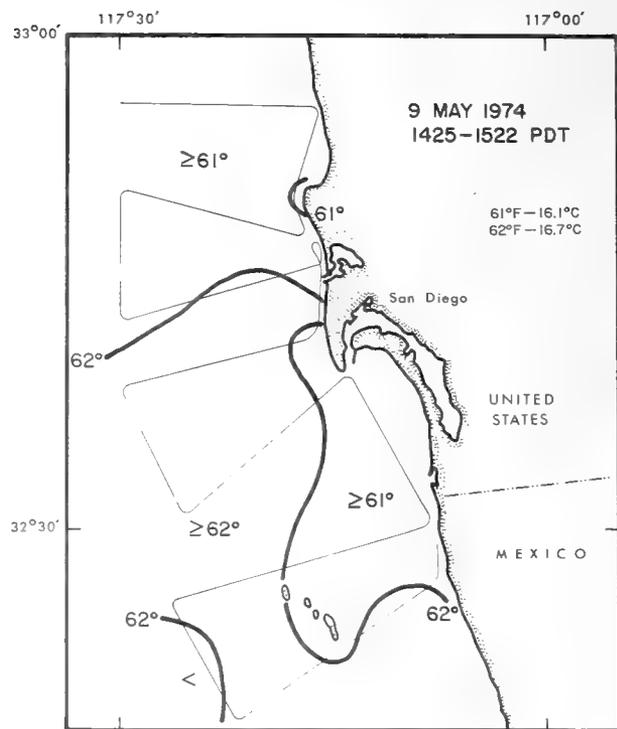
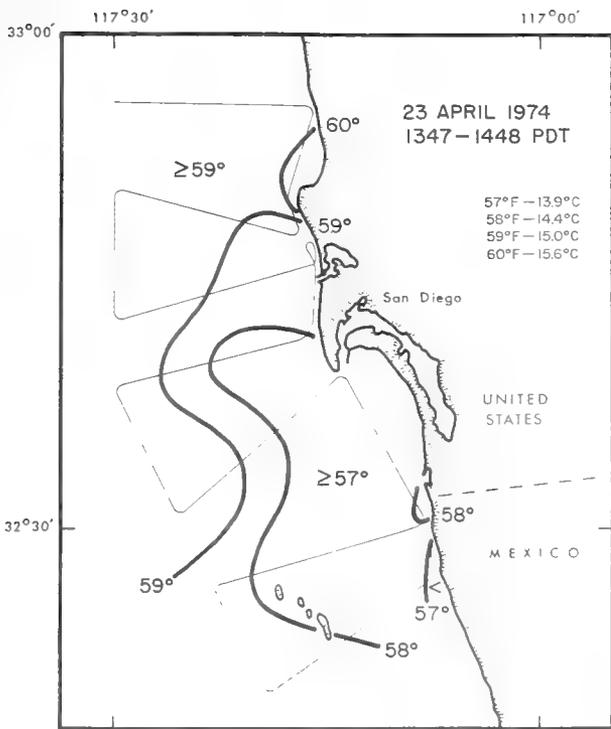


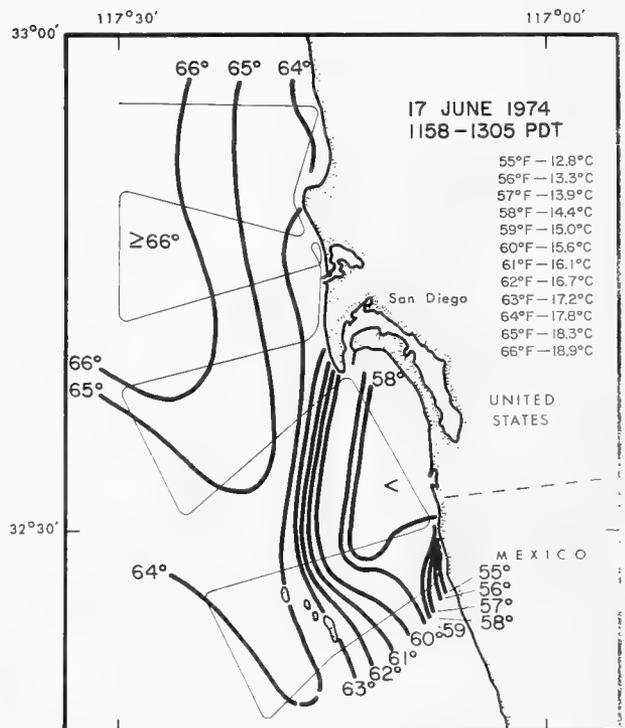
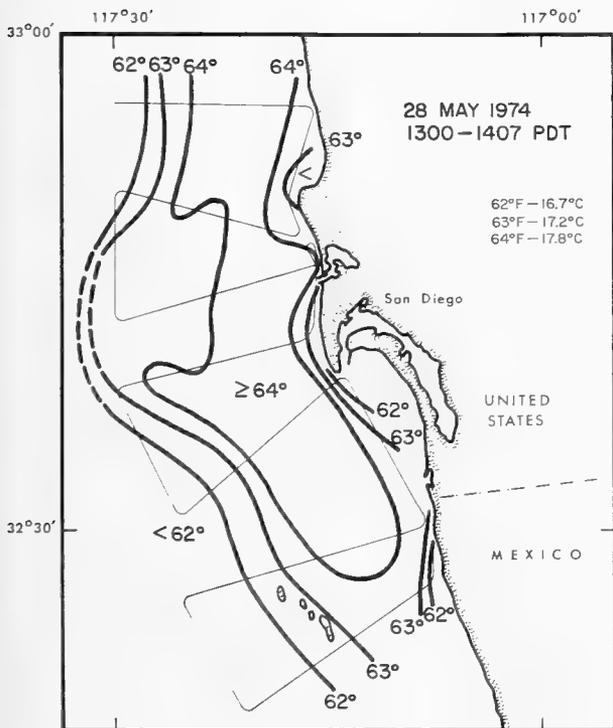
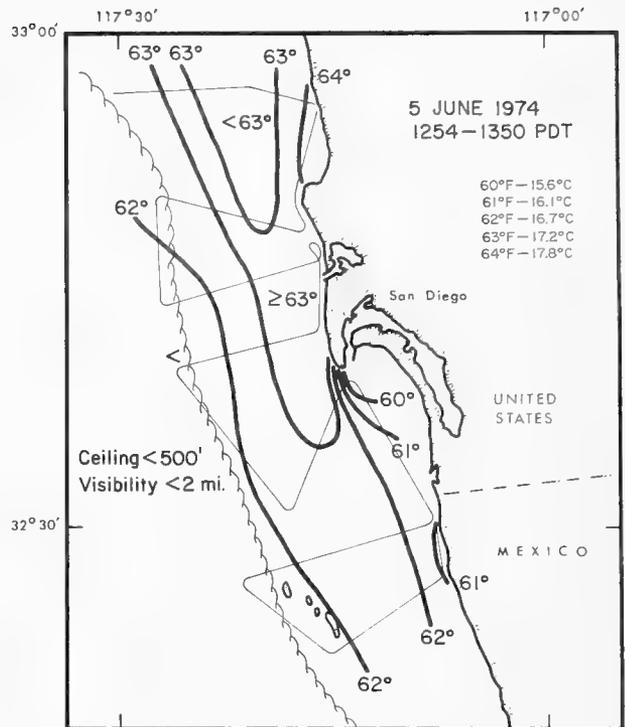
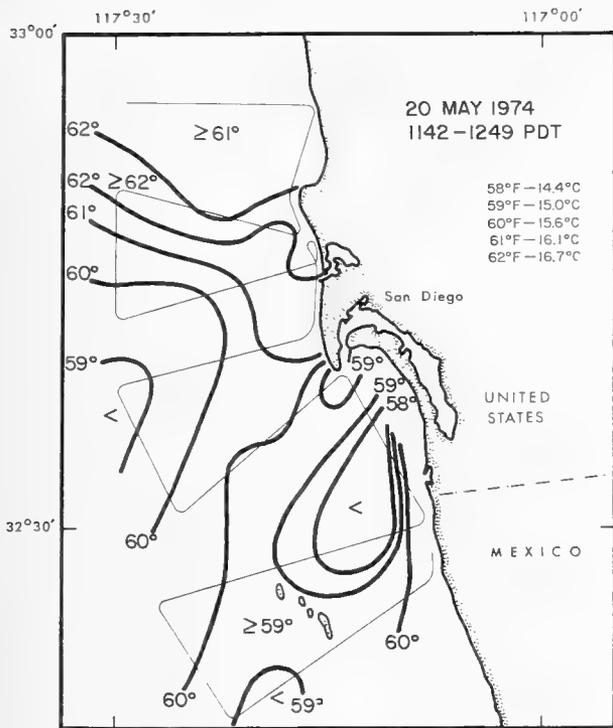


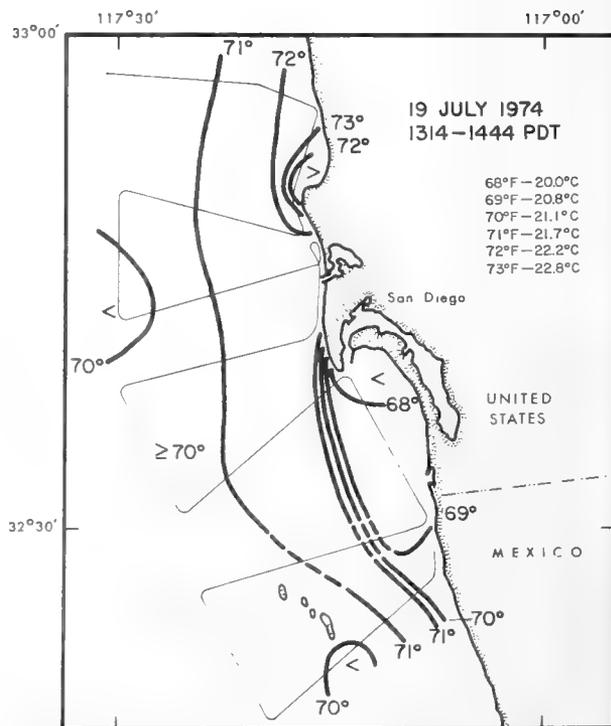
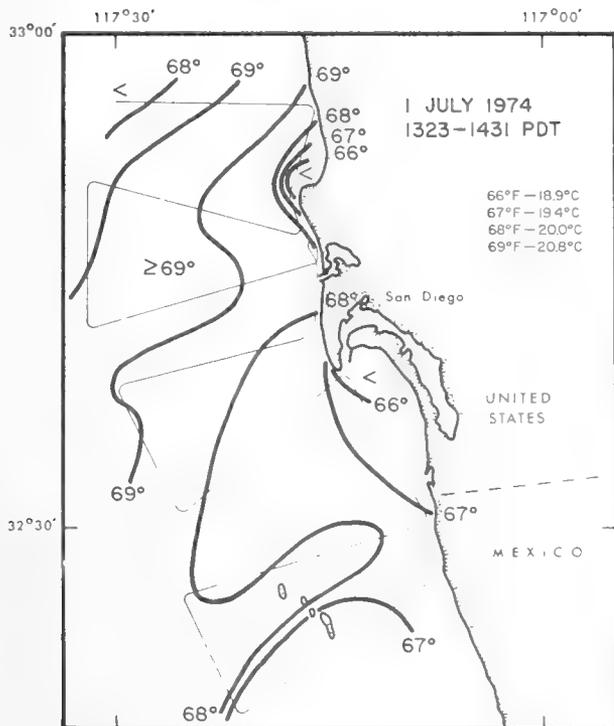
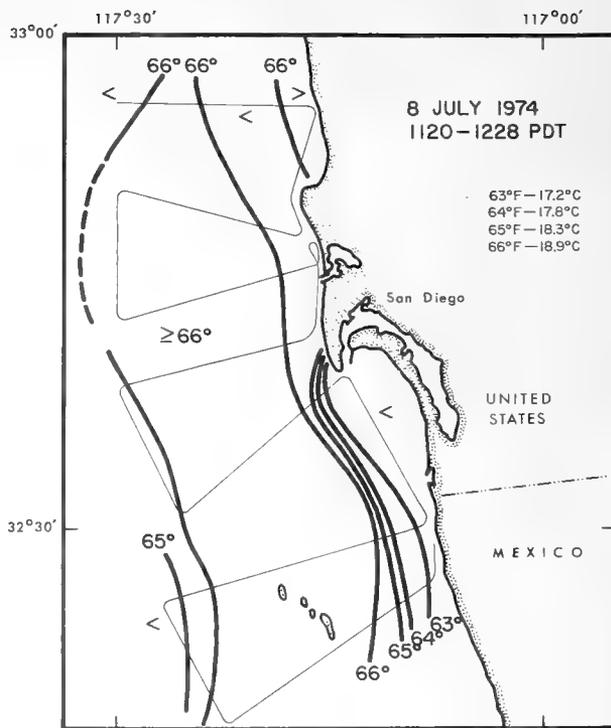
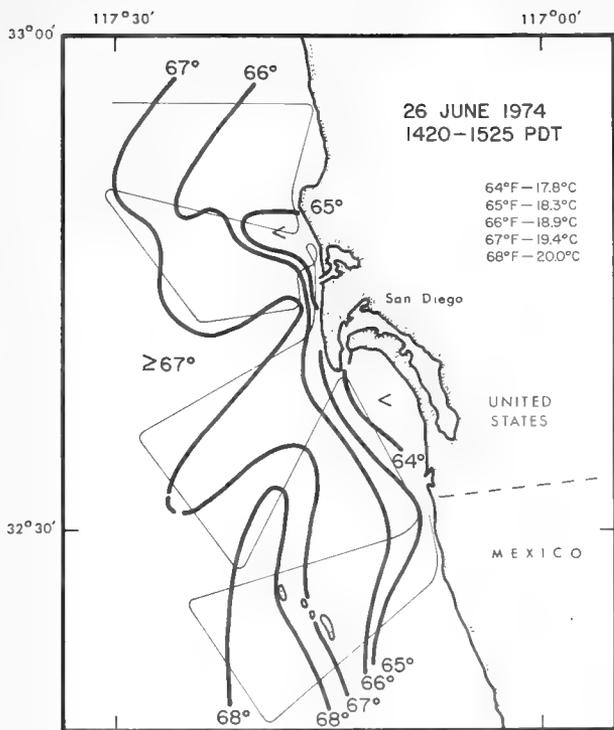


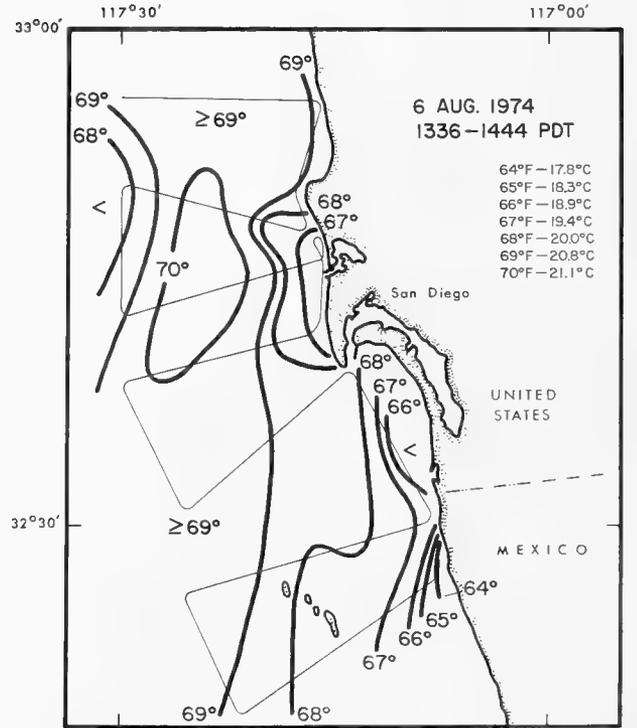
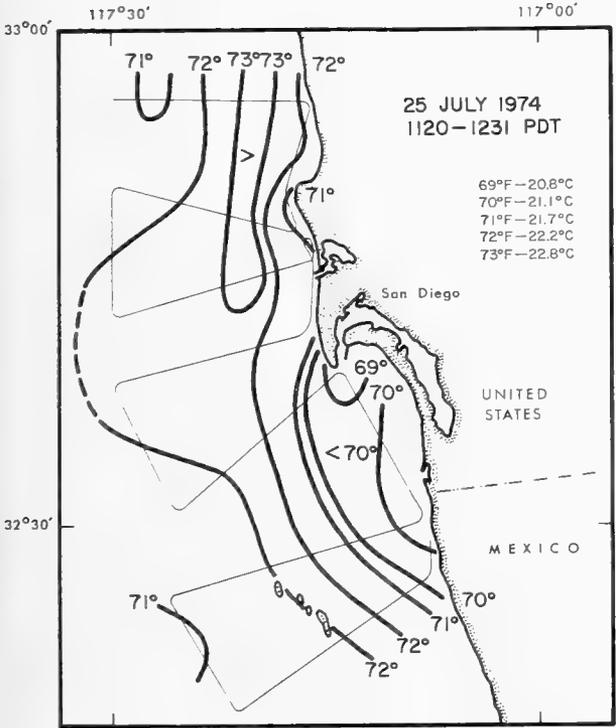
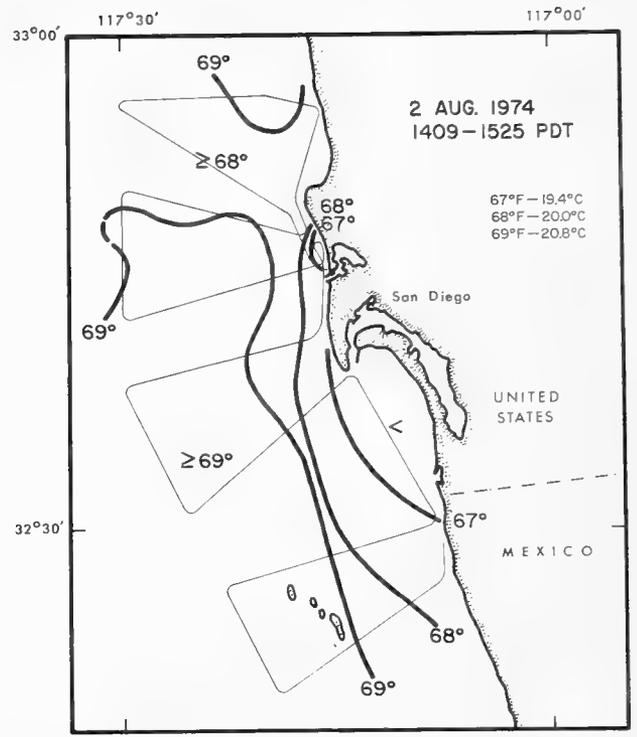
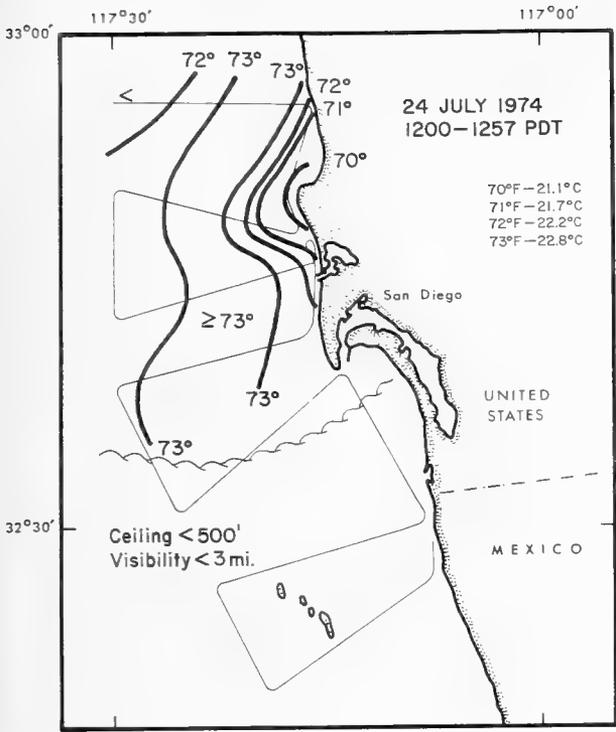


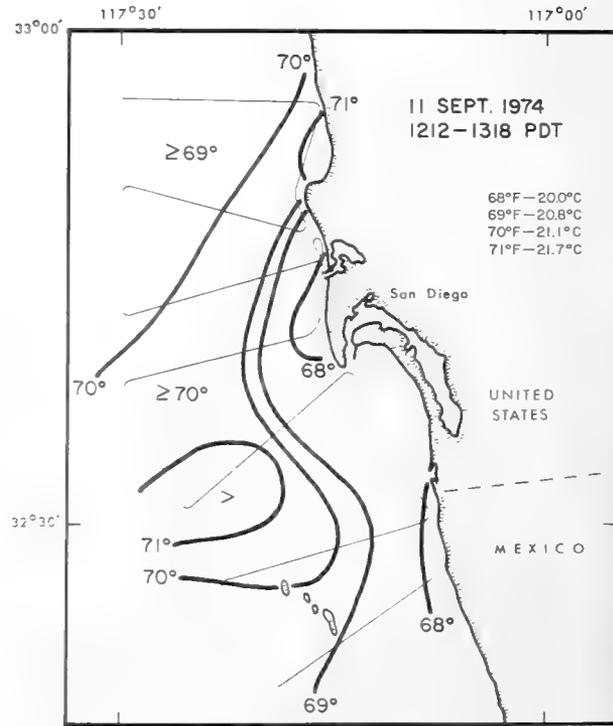
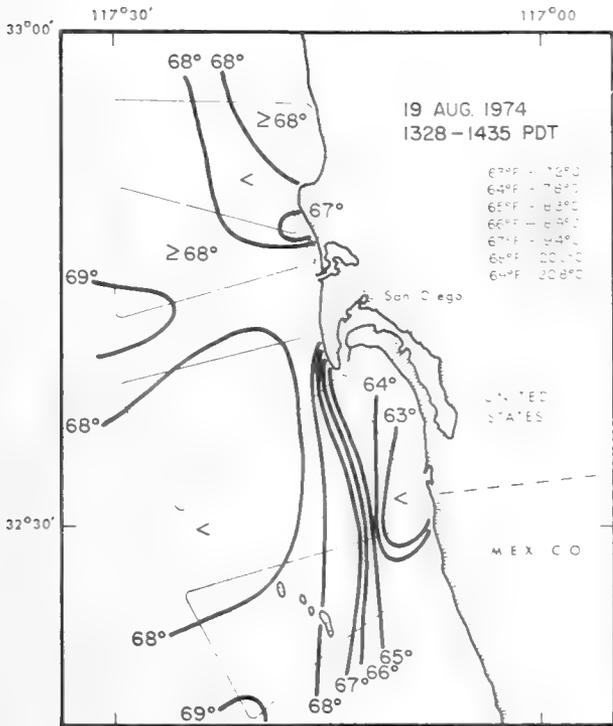
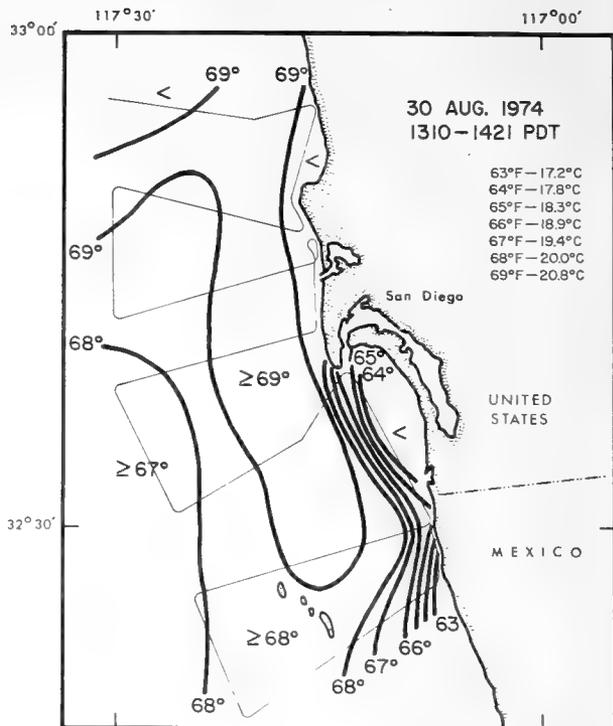
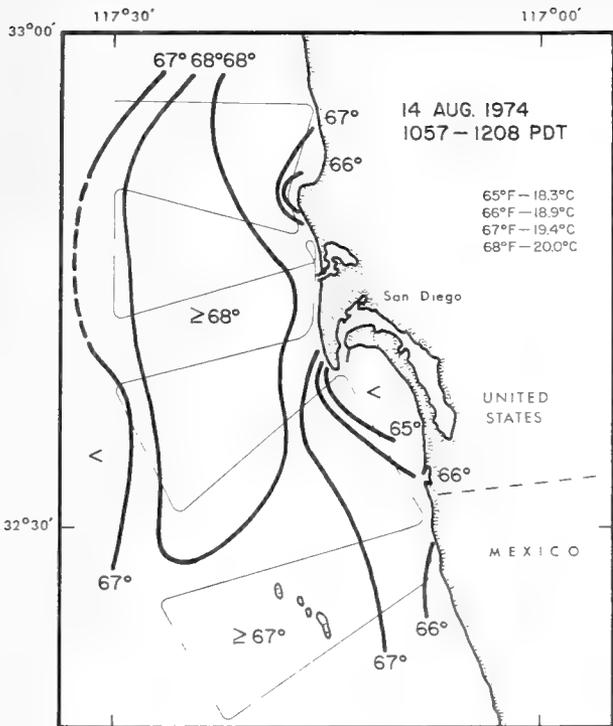


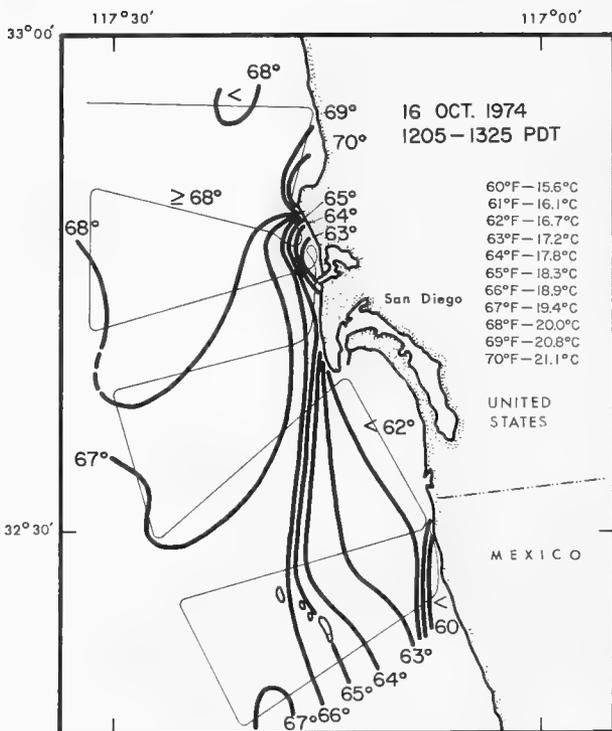
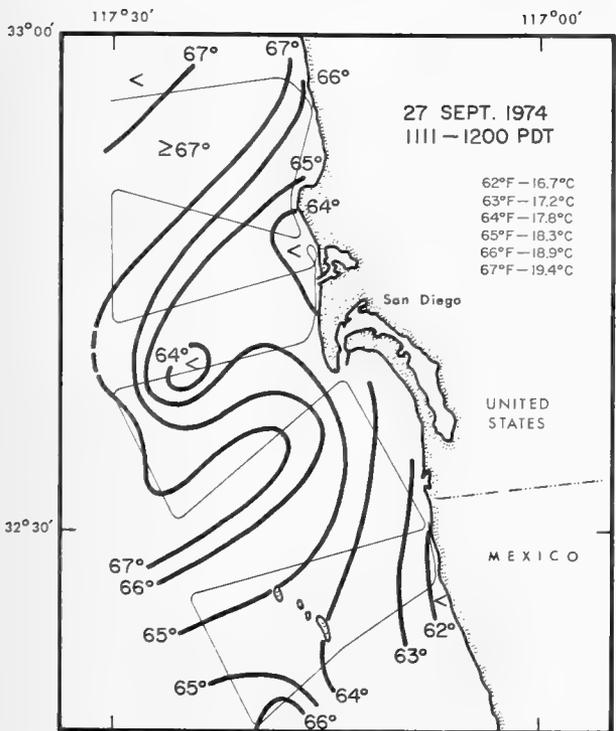
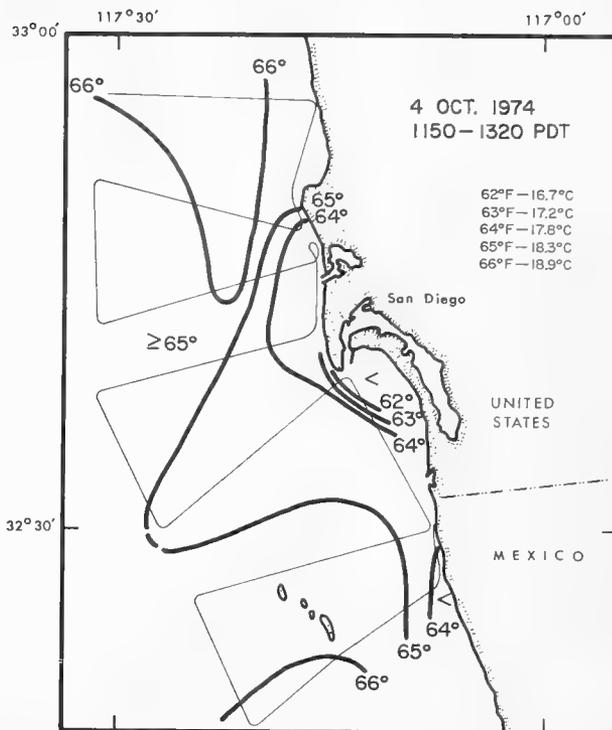
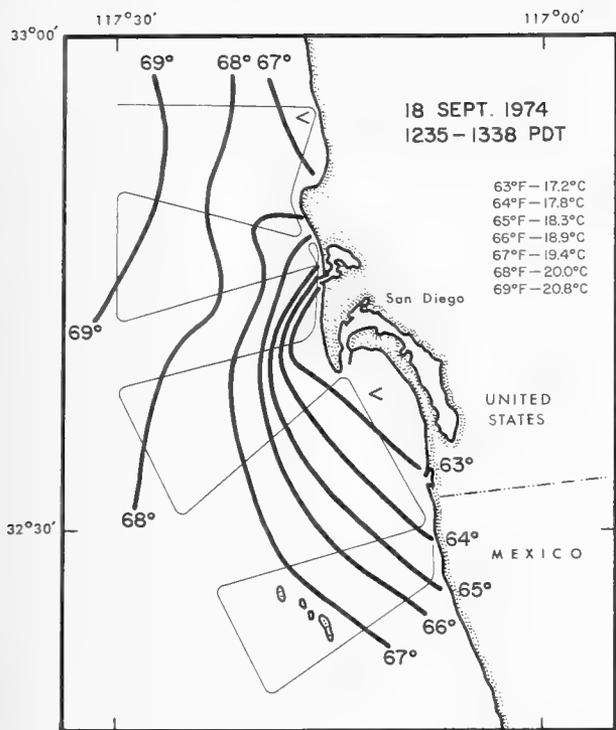


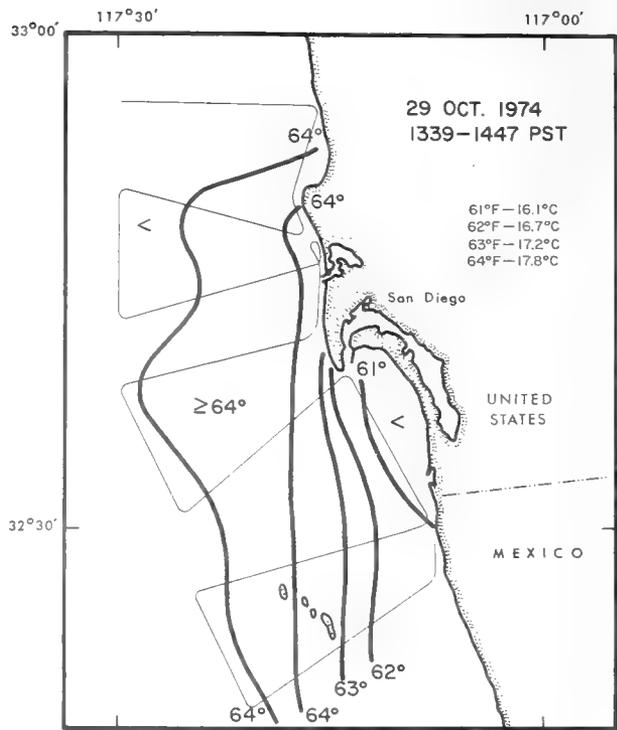
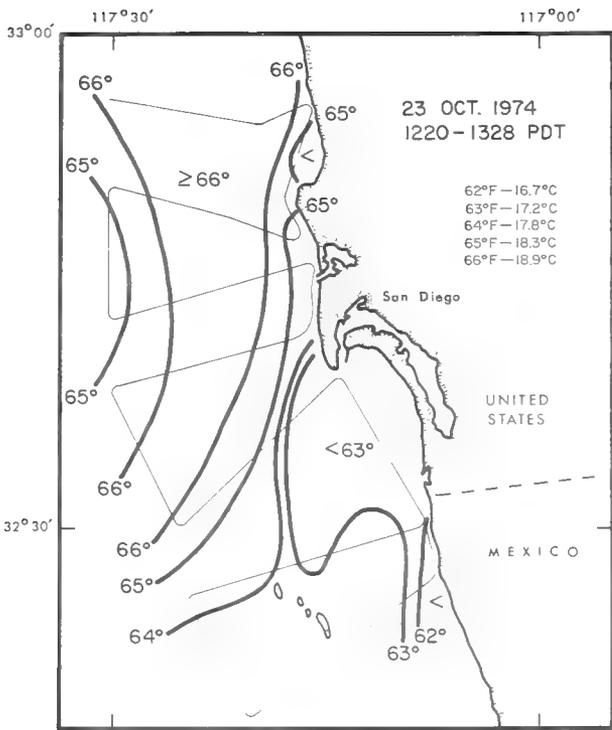












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NOAA Technical Report NMFS SSRF-721

National Marine Fisheries Service Survey of Trace Elements in the Fishery Resource

R. A. Hall, E. G. Zook, and
G. M. Meaburn

March 1978



U.S. DEPARTMENT OF COMMERCE
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The Special Scientific Report—Fisheries series was established in 1949. The series carries reports on scientific investigations that document long-term continuing programs of NMFS, or intensive scientific reports on studies of restricted scope. The reports may deal with applied fishery problems. The series is also used as a medium for the publication of bibliographies of a specialized scientific nature.

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NOAA Technical Report NMFS SSRF-721

**National Marine Fisheries
Service Survey of
Trace Elements in
the Fishery Resource**

R. A. Hall, E. G. Zook, and
G. M. Meaburn

March 1978

U.S. DEPARTMENT OF COMMERCE

Juanita M. Kreps, Secretary

National Oceanic and Atmospheric Administration

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National Marine Fisheries Service

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National Marine Fisheries Service Survey of Trace Elements in the Fishery Resource

R. A. HALL, E. G. ZOOK, and G. M. MEABURN¹

ABSTRACT

Trace element levels have been determined in tissues of 204 species of finfish, Mollusca, and Crustacea taken from 198 sites around the coastal United States, including Alaska and Hawaii. The survey was undertaken as part of the Microconstituents Program of the National Marine Fisheries Service, and covers the occurrence of 15 elements: antimony, arsenic, cadmium, chromium, copper, lead, manganese, mercury, molybdenum, nickel, selenium, silver, tin, vanadium, and zinc. Total concentrations of each element were determined without regard to chemical form. The species analyzed represent approximately 93% of the volume of the U.S. commercial and sportfish catch. The analytical data are summarized in several ways in order to emphasize different aspects of the trace element distributions. Mean levels of each element are presented in relation to the number of species examined, the U.S. (commercial and sportfish) catch, and the U.S. catch intended for consumption. More detailed analytical data on all 15 elements are given for individual species with reference to tissue analyzed, length and weight of fish, and location of catch. For the most part, experimental results are presented without interpretive comment. Mean levels of mercury, the only element for which a regulatory action level is in force, were found to exceed 0.5 ppm Hg in species representing less than 2% of the U.S. catch intended for consumption.

INTRODUCTION

A primary goal of the National Marine Fisheries Service (NMFS) is to promote the economic utilization of the Nation's fishery resource, in full recognition of the necessity to safeguard the health of the consumer. The NMFS Microconstituents Program was established with the purpose, among others, of developing information on the occurrence of trace elements in fishes and fishery products intended for human consumption. Over the past decade there has been a growing concern that certain chemical elements and their compounds entering the marine environment, chiefly as a result of industrial and urban pollution, may be accumulating in fishes at levels constituting a public health hazard. It was apparent in 1970, when the U.S. Food and Drug Administration (FDA) established a temporary action level for a permissible mercury content of fish, that there was a lack of information on trace element levels in fishes. Further, it was evident that a thorough assessment of any adverse effects of these microconstituents on the future utilization of the resource would require the availability of a broad data base to which newly acquired measurements of contaminants could be referred. To meet these needs and with the added incentive of reassuring a concerned fishing industry, NMFS undertook a series of surveys to determine, through chemical analysis of fish tissues, trace element levels throughout the U.S. fish supply.

A preliminary survey on the occurrence of five

elements (arsenic, cadmium, chromium, lead, and mercury) was completed in 1974. At least 10 samples each of 29 commonly consumed, domestic and imported, fishes and shellfishes were analyzed in the study. With the exception of Pacific halibut, *Hippoglossus stenolepis*; Pacific rockfish (mixed species); and red snapper, *Lutjanus campechanus*, none of the samples contained mercury above the FDA action level of 0.5 ppm Hg. Details of this study have been published (Zook et al. 1976).

A comprehensive trace element survey, referred to here as the Resource Survey, was initiated in 1971 to cover the occurrence of 15 elements—antimony (Sb), arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), manganese (Mn), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), silver (Ag), tin (Sn), vanadium (V), and zinc (Zn)—in 204 species representing at least 93% of the volume of the U.S. commercial catch (Wheeland 1973) and 93% of the volume of the U.S. sportfish catch (Deuel 1973). The elemental analyses provide baseline data to help identify where there may be a potential problem involving species, elements, or locations. This report presents the experimental data obtained during the course of the Resource Survey.

MATERIALS AND METHODS

Fish Collection

For purposes of fish collection and data assembly, U.S. coastal waters were divided into seven areas along natural and traditional boundaries. Each area was then divided into three degree lettered squares, except in Alaska, and subdivided into one degree sites as shown in

¹Southeast Fisheries Center, National Marine Fisheries Service, NOAA, Regent Drive, University of Maryland Campus, College Park, MD 20740.

Appendix Figure 1; Alaskan sites measure one by two degrees. Individuals from NMFS laboratories and affiliated agencies involved in fish collection (Appendix Table 1) in each of these areas, were asked to collect designated species of fish and shellfish. Most of the 167 requested species, genera, or families were collected. The original list was augmented by additional species to give a final tally of 204 species. Collectors were provided a protocol for labeling, preparing, storing, and shipping fishes, as well as a supply of Fish Data Labels (Appendix Figure 2).

Collectors were requested to supply enough fish of each assigned species to yield 10 2-lb samples of edible muscle (hereafter referred to as a group) from each of four sites within their area (40 samples per species per area). Fishes were frozen as soon as possible after capture and shipped under dry ice via air freight to the Utilization Research Division, Northwest and Alaska Fisheries Center,² Seattle, Wash., from Pacific locations, or to the College Park Laboratory, Southeast Fisheries Center,³ College Park, Md., from Atlantic and Gulf of Mexico locations. Each fish was stored, as received, at -25°C until samples were prepared from them.

Wherever possible, collectors were asked to provide the common and scientific names, sex, length, weight, age, and tissue or cut of the fish; the date, depth, and location (latitude and longitude and/or local name) of capture; the number of individual fish; and the name of the boat and captain or market, as appropriate, on the Fish Data Label. If not performed by the collector, individual fish were counted, weighed, and measured at College Park and Seattle; fish were also sexed at Seattle.

Finfishes were received for sample preparation in various forms; whole, headed and gutted, headed only, gutted only, skinless fillets and chunks, with and without skin. Livers were included with about one-fourth of the finfishes. Some milt and roe were also received. Shellfishes were received both whole and prepared; shrimps were whole or headed; lobsters and crabs were in the shell; oysters and abalone were shucked; clams were in the shell or shucked; squid and octopi were whole; most scallops were received as abductor muscle only.

Sample Preparation

Fish were thawed immediately prior to sample preparation and processed as rapidly as possible to minimize any possible moisture loss, decomposition, or contamination from the laboratory environment. Skinless fillets or their closest equivalent were prepared from most finfishes. Some small species and juveniles of other species were ground whole or as otherwise received. Shrimps were headed, peeled, and, unless too small, deveined. Lobsters were prepared as body, claw, tail, leg, or a combination of claw and tail. Crabs were prepared as body, claw, or as a combination of the two parts. Clams

and oysters were shucked. Except in one case, abductor muscles of scallops were prepared. Squid and octopi were prepared whole or as mantle only. Most samples consisted of raw tissue, although lobsters and some crabs from the Pacific coast were cooked. Each sample was assigned a laboratory reference number and thoroughly ground to provide a homogeneous mixture for analysis. From 1 to 10 subsamples of each sample were packed in polyethylene cups and stored at or below -25°C .

Analytical Procedures

All chemical analyses were performed under contract⁴ by Omni Research, Inc., San German, Puerto Rico. The concentration levels of 15 elements were determined in each of approximately 15,000 sample cups, including controls and duplicates, by atomic absorption spectrophotometry (AAS). Mercury was analyzed by a flameless (cold vapor) method based on that described by Hatch and Ott (1968) and later applied to analysis of fish tissues (Uthe et al. 1970). Arsenic and selenium were analyzed as their hydrides following procedures based on the arsine generation method of Dalton and Malanoski (1971) and further adapted from a development of this method for analysis of As and Se in fish tissues (Southeast Utilization Research Center 1975⁵). The samples were at first digested for As analysis by dry ashing methods (about 40% of the samples). For the remainder of the As and all of the Se analyses, samples were wet ashed. The remaining elements (Sb, Cd, Cr, Cu, Pb, Mn, Mo, Ni, Ag, Sn, V, and Zn) were analyzed by conventional flame AAS, with direct aspiration of a digested sample after appropriate dilution. For Sb, Mo, Sn, and V analyses, samples were dry ashed only. For the other eight elements, approximately the first third of the 15,000 sample cups were analyzed following wet ashing with a $\text{HNO}_3\text{-HClO}_4$ mixture; these were reanalyzed along with the remaining samples when the contractor changed to a dry ashing procedure.

Numbered cups of all samples, including randomly interspersed control and replicate samples, were shipped in the frozen state by the College Park Laboratory to Omni at regular intervals. Omni was not aware of the contents of any cup.

Control samples were prepared from the raw muscle of Pacific halibut by grinding and thoroughly mixing the tissue from several large fish. They were packaged identically to the other samples. A minimum of 10 controls was included in each shipment of 300 sample cups. In all, approximately 600 controls were sent to the contractor. Four different control samples were used during consecutive periods of the contract. They were also used at the College Park Laboratory as control samples for in-house analytical experiments and other contractual work. Analytical results for controls were the first items checked

⁴Department of Commerce contract No. 2-35403, June 28, 1972.

⁵Southeast Utilization Research Center, NMFS. 1975. Arsenic and selenium in North American lobster (*Homarus americanus*) including relation to previously determined mercury content. NMFS in-house report, 71 p.

²Formerly known as the Pacific Utilization Research Center.
³Formerly known as the Southeast Utilization Research Center.

upon receipt of data from Omni. The values reported for each element were followed from shipment to shipment to detect any abnormal trends. Three consecutive high or low values were taken to indicate the existence of an analytical problem. To avoid having all samples in a group analyzed during a period of abnormally high or low values, whenever possible no more than two samples from the same group were sent in the same shipment. Bar graphs of control sample analytical values were constructed to assist in the evaluation and were sent periodically to Omni.

As a method of checking analytical reproducibility over time, in addition to using controls, a minimum of 20% of the samples from each group was to be duplicated in later shipments; overall duplication was about 50%. Single analyses were run on the remainder. Duplication was also used to confirm or reject suspect data.

Frequent contacts were made with Omni to review the status of contract work, including methods of analysis, variations in analytical values, their possible causes, and recommendations for correction.

Data Management

Collection and physical composition data were assembled from information furnished on the Fish Data Label (Appendix Figure 2) returned by collectors with each fish. Information that the collector failed to provide was added at College Park (e.g., length and weight of a whole fish), or gathered from a phone call or letter, when possible. Not all the information requested was available for all fishes. Depth of catch and age were seldom available; sex was sometimes available; latitude and longitude of catch were available for approximately half the fishes; date of catch, fish length and weight, and the number of fish were usually available; and some description of the catch location was almost always available. When only the weight of a headed, gutted, or headed and gutted fish was provided, that weight was converted to an estimated round weight.

The collection and physical composition data for each group of samples were then entered on a "history" sheet. If the collector did not send enough fish for 10 samples, as requested, samples composed of fish from similar dates of catch, location, and/or size were grouped together on one "history" sheet. These groups represent pages in the "history" sheet files and were a necessary means of checking the computer tapes.

When the analytical data were received from the contractor, they were entered on a coding form (Appendix Figure 3) with the data from the "history" sheet and were keypunched and entered into the computer. For the latter half of the samples, the contractor entered the analytical data directly on the coding forms.

To check that the data were entered correctly, a cycle of: 1) generate computer printout, 2) check printout for accuracy, 3) correct errors and add new data was repeated several times. Once all the data were in the computer, each group was reviewed using Grubbs' outlier test (paragraph 4.1 of Grubbs 1969) to determine if

any values deviated from the group mean more than could be anticipated with normal statistical theory to remove grossly unreasonable lone values as well as to identify periods when values were repeatedly unreasonable. Using this approach, about 1% of the analytical values was determined to be too questionable for use in this report.

The Microconstituent Data Bank, in which the Resource Survey data are stored, is a card-to-tape system with a format similar to the coding form (Appendix Figure 3). It was established in 1973 for the purpose of storage, retrieval, and tabulation of data generated by the Resource Survey and similar studies. Twelve program runs, most with several choices of data breakdown, can be generated with programs presently in the system; Table 5, page 119, is an example of one of these, the MF17 program run. Other programs list species, broken down according to location, and provide a varying depth of detail from 1 to 15 elements. They also provide differing aggregates of history information.

RESULTS

Overview

The Resource Survey provides information on the occurrence of 15 elements in the fishery resource. It covers 204 species taken from 198 sites in 7 areas of U.S. coastal waters. Excluding controls, a total of 9,347 unique samples of 13 different tissues or product forms were analyzed.

The contractor returned approximately 220,000 analytical values of element levels, including replicates but excluding controls. Of these, about 2,900 values were rejected according to the criteria established for data checking. Approximately 37,500 analyses were reported by the contractor as "not detected" or "zero" without reference to detection limits and consequently were not used to determine mean trace element levels.

In a project of this magnitude, invariably some information is lost and a degree of uncertainty introduced into the data as a result of logistical and analytical difficulties encountered during various phases of the work. There were periods during this survey when analytical results reported by the contractor reflected problems of this kind. At times, imprecision in the data could be associated with changes in methodology and analytical procedures. During some periods, many of the samples appeared to have been contaminated with one or more elements. At other times, only occasional unreasonably high values were reported.

When checking data, it is relatively simple to find a single deviant value among the results of many analyses on the same sample or even the same species, i.e., when comparing similar fish. It is generally impossible to distinguish between deviant and acceptable values, however, when few analyses are available. Therefore, there is a much higher chance of reporting an inaccurate value of the mean element content of a species

represented by very few samples. Furthermore, if two samples of the same species are analyzed during a period of deviant values, their reported element contents tend to lend credence to each other and, therefore, cannot easily be removed from the data collection, although it is recognized that their inclusion leads to less accurate mean values. Attempts were made, through data checking, to remove all such deviant values.

After reviewing the values received for the control samples as well as the results of the outlier tests, generalizations can be made on the precision of the data. Analytical results on controls for Ag and Mn were very consistent and very few of the values had to be rejected. Controls for Cd were at first reported as zero, but shortly after the contractor changed to a dry ash methodology for this element, the analytical values for controls became very consistent. Very few Cd values were eliminated. Likewise, there were few Hg values discarded; however, there was slightly more variation among the control values for Hg. Zinc showed fairly consistent controls but had occasional abnormally high values overall, with about 1% being rejected, while Ni, Cu, and Se showed more variation in the controls than did Zn but had fewer abnormal values overall. During one short period, Ni and Zn both had a series of abnormal values. Lead and chromium both showed an abundance of zero control values for samples analyzed following wet digestion and erratic standard values for samples that had been dry ashed. There were several periods when almost all of the values for both elements were too high to be included in the mean, based on the outlier test. Approximately 2% of the Pb values and 3% of the Cr values were discarded. The Sn controls showed variability similar to Pb and Cr but with even more periods of high values. About 4% of the Sn values were not used, including almost all of one series of 150 samples. Although only about 1% of the reported As values was discarded, As showed more variation than any other element, with standard deviations approaching the mean value itself. Moreover, As control values became higher shortly after a change from dry ash to wet ash methodology. Results received for Mo, V, and Sb differed greatly within themselves over time. Each had periods when almost all results were reported as zero. When not zero, Sb results showed some degree of reproducibility while Mo and V values were more erratic.

Explanation of Tables

A list of all species analyzed in the Resource Survey is presented in alphabetical order, by common name, in Table 1. The species numbers are those assigned by the College Park Laboratory for use in the Microconstituent Data Bank and are the same as those used in Tables 2, 4, and 5. The first three digits refer to a fish family; the last three digits refer to a species within that family. The scientific name for each species is also given.

Areas in which the fish were caught, types of tissue analyzed, and the total number of samples of each species in the survey are presented in species number

order in Table 2. Some species were captured in more than one area and more than one tissue was sometimes analyzed for one species. Specific tissues taken from a single species were not necessarily analyzed for fish from all listed areas, e.g., black sea bass livers were analyzed only for fish collected from the South Atlantic, although muscle was analyzed for both North and South Atlantic fish.

Table 3 is in 15 parts. Each part presents a summarized view of the levels of one of the elements measured in the Resource Survey, e.g., the distribution of mean mercury level is shown in Table 3.8. The ranges of mean analytical values are broken out separately for each tissue examined. The number of species, the percent of the U.S. commercial and sportfish catch intended for human consumption represented by those species, based on 1970 figures (Deuel 1973; Wheeland 1973), are listed next to the corresponding range. Because Table 3 does not identify species, data on one tissue may not be compared with data on other tissues; Table 4 should be consulted to determine which species fall in a particular range and how many samples of those species were analyzed.

The 15 parts of Table 4 are alphabetical lists of Resource Survey species, showing the distribution of mean elemental levels in the tissues analyzed for each species. The columns on the right correspond to the ranges of mean analytical values listed in Table 3; the range delineating the mean analytical value for a particular tissue of each species is marked accordingly. The two columns of numbers give the total number of samples analyzed and the number of sample values used in calculating the mean; "not detected" or "zero" values were not used in calculating the mean.

Table 5 is an MF17 computer printout for the entire Resource Survey from the Microconstituent Data Bank. Each species is listed separately in species number order. The species numbers are the same as those listed in Table 1 and are found to the right of the scientific name. Within each species, each tissue is listed separately. Sites are one degree squares from a specific area (one by two in Alaska) designating the location of catch according to the map shown in Appendix Figure 1. The mean analytical value is calculated for each unique species-tissue-site combination. If known, length and weight data are tabulated along with the number of samples for which the fish were measured. The mean, standard deviation and range of these lengths and weights are given in meters and kilograms, respectively. This information is followed by the analytical data for each element. Included are the total number of samples from the site, the number of samples in which none of the element was detected ("N Det."), together with the mean, standard deviation and range of all detected analytical values.

It should be noted that some of the species are represented by very few samples and their mean elemental values may not be as reliable as those found for species more extensively sampled. Where there is a high proportion of "not detected" or "zero" values, their ex-

clusion can also give rise to less reliable data by overestimating mean values.

Element Levels

The distribution of mean element levels in Resource Survey species is summarized in Table 3 for the 159 species of finfishes whose muscle was analyzed, 82 species whose liver was analyzed, 17 species of whole finfish, 18 species of Mollusca, and 16 species of Crustacea. The main features of the results are outlined below for each of the elements analyzed.

Antimony (Sb): The mean Sb levels in most finfish muscles and livers fell in the range 0.5-0.9 ppm. Most species of whole finfishes contained Sb levels between 1.0 and 3.0 ppm. Most shellfish species displayed mean Sb levels between 0.8 and 1.0 ppm.

Arsenic (As): The mean As levels showed a wide range of values for finfish muscles and livers, whole finfishes, and Mollusca, with most species falling between 2.0 and 5.0 ppm in each category. Crustacea showed somewhat higher levels, with the largest number of species falling between 4.0 and 5.0 ppm.

Cadmium (Cd): Finfish muscles usually contained less than 0.1 ppm Cd, whereas finfish livers ranged in Cd content up to 30.0 ppm with no apparent mode. The whole finfishes examined generally fell in the range 0.1-0.3 ppm Cd as did Mollusca and Crustacea, with Mollusca showing more variation than the other two.

Chromium (Cr): Except for whole finfishes, the mean Cr levels for most species fell within the range 0.1-0.4 ppm. A range of 0.2-0.6 ppm Cr was found for the majority of the whole finfishes analyzed.

Copper (Cu): There is a significant difference in mean Cu levels between finfish muscles and livers. The muscles ranged from 0.1 to 2.0 ppm Cu, with most species falling between 0.2 and 0.5 ppm. On the other hand, livers ranged from 1.0-110.0 ppm, with no apparent mode. Although no pattern could be discerned for whole finfishes and shellfishes, much higher Cu levels were found in the shellfishes.

Lead (Pb): The mean Pb levels in the majority of species were found to fall in the following ranges: finfish muscles, 0.3-0.7 ppm; finfish livers, 0.2-0.6 ppm; Mollusca and Crustacea, 0.5-0.8 ppm. No pattern was observed for mean Pb levels in whole finfishes.

Manganese (Mn): Mean Mn levels in finfish muscles and livers ranged up to 2.0 ppm, with muscles usually below 0.3 ppm and livers usually above 0.6 ppm. Whole finfishes exhibited a mode in the range 1.0-2.0 ppm Mn.

Mercury (Hg): Most finfish muscles had mean Hg levels below 0.3 ppm and only 31 species were found to contain mean Hg levels above the FDA action level of 0.5 ppm. However, these 31 species represent only one percentage point of the 63.9% of the catch intended for consumption represented by the 159 species analyzed. Extrapolation of these results indicates that, in fact, less than 2% of the U.S. catch intended for consumption may be in excess of the action level. Of the 31 species above 0.5 ppm Hg, 10 are sharks and 4 are billfishes. Livers

generally showed slightly higher Hg levels than muscle samples. All species of whole finfishes had mean Hg levels below 0.3 ppm. Likewise, Crustacea had mean levels less than 0.3 ppm Hg and Mollusca were all below 0.1 ppm.

Molybdenum (Mo): The mean Mo levels for the majority of finfish muscles and livers, whole finfishes and Mollusca, and all the Crustacea ranged from < 0.1 to 0.4 ppm Mo.

Nickel (Ni): The distributions for Ni are similar to those found for Cr. The mean Ni levels in finfish muscles and livers ranged from 0.1 to 0.3 ppm for most species. The majority of the whole finfishes were between 0.3 and 0.5 ppm Ni. For most of the Crustacea the range of mean Ni levels was 0.2-0.4 ppm.

Selenium (Se): With the exception of finfish livers, no mean Se values were greater than 2.0 ppm. For finfish muscles, the mean level in the majority of species ranged from 0.4 to 0.9 ppm Se. Finfish livers showed a greatly extended range of 0.6-30.0 ppm, with the majority between 1.0 and 3.0 ppm.

Silver (Ag): Finfish muscles contained mean levels less than 0.1 ppm Ag for all but one specimen examined. The majority of the species in the other categories were likewise below 0.1 ppm Ag, although livers ranged up to 0.6 ppm, whole finfishes to 0.2 ppm, Mollusca to 0.7 ppm, and Crustacea up to 0.5 ppm.

Tin (Sn): The ranges of mean Sn levels for most species were 0.4-0.8 ppm for muscles and 0.3-0.7 ppm for livers. Most of the whole finfishes contained 1.0-2.0 ppm Sn.

Vanadium (V): The mean V levels of finfish muscles and livers were below 0.5 ppm for most species, although livers tended to be higher than muscles. Most whole finfishes had mean values of V less than 0.8 ppm. Vanadium levels in most shellfishes fell between 0.2 and 0.5 ppm.

Zinc (Zn): The distributions for Zn are similar to those found for Cu, although the values are higher. Muscles ranged from 2.0 to 20.0 ppm, with the majority of species falling in the range 3.0-6.0 ppm, whereas livers ranged from 4.0 to 700.0 ppm, with the majority of species in the range 10.0-40.0 ppm Zn.

CONCLUDING REMARKS

The completion of this data report does not bring the Resource Survey to an end. No attempt has been made here, for example, to compare element levels in a particular species or to investigate possible relationships between element levels and fish location, size, or sex. The analytical values have been summarized by site only for each species and tissue, and very little of the history of the fish has been presented. Many of the data not made available here will be presented in the form of detailed data reports. Two such reports currently in preparation present trace element levels in fishes and shellfishes taken from the New York Bight and adjacent waters, and in sharks caught in U.S. waters. The com-

plete collection of data is available for use in interpretive studies. It is also anticipated that the data will be made available to the public, in the future, through the National Oceanographic Data Center, Environmental Data Service, National Oceanic and Atmospheric Administration, Rockville, Md.

This work represents an essential first step towards a better understanding of possible constraints that may be placed upon the safe and economic utilization of the Nation's fishery resource due to contamination by trace elements. It provides a broad view of the occurrence of 15 elements and contains baseline information that should be of assistance in planning future, more detailed investigations of trace element levels in selected species of fishes and shellfishes. Several such in-depth studies are currently underway on species revealed to be relatively high in one or more elements. Some underutilized species are also being studied in depth because of their potential commercial value, not necessarily because they are known to be high in any element. Other surveys of this kind are being undertaken in locations believed to be polluted. Elements selected for detailed investigations include those found in toxic form and those believed to offset the toxic effects of others through chemical or biochemical interactions. In the long term, the ability to distinguish between toxic and relatively harmless contaminants would be extremely valuable from a public health standpoint and in assisting efficient management of the fishery resource.

ACKNOWLEDGMENTS

This has been a cooperative project involving sample collection by NMFS's many field laboratories and statistical agents; sample preparation by the College Park and Seattle NMFS laboratories; chemical analysis by a contractor in Puerto Rico; and sample packaging and shipping, review of the raw experimental data, data manage-

ment, and preliminary and final data report preparation by the College Park Laboratory. Thanks are due to all NMFS personnel who assisted with fish collection; E. Gauglitz and other members of the Seattle staff who participated in sample preparation; College Park personnel involved in sample preparation and data handling, especially J. Powell for supervising the collection of fish and preparation of samples, and T. Chambers and S. Nealis for their part in checking data and assembling tables; G. Moyer of NOAA/OMCS for his contribution in creating and maintaining the Microconstituents Data Bank; and G. Knobl and H. Seagran, past and present Directors of the College Park Laboratory, for their valuable comments and suggestions throughout the course of this work.

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Table 1.—Alphabetical list of species analyzed in the Resource Survey.

Common name	Species number	Scientific name
Abalone, green	187-005	<i>Haliotis fulgens</i>
Abalone, red	187-008	<i>Haliotis rufescens</i>
Alewife	078-005	<i>Alosa pseudoharengus</i>
Anchovy, northern	001-016	<i>Engraulis mordax</i>
Anchovy, striped	001-006	<i>Anchoa hepsetus</i>
Argentine, Atlantic	002-002	<i>Argentina silus</i>
Ballyhoo	062-014	<i>Hemiramphus brasiliensis</i>
Barracuda, Atlantic	005-002	<i>Sphyræna barracuda</i>
Barracuda, Pacific	005-001	<i>Sphyræna argentea</i>
Bass, black sea	006-006	<i>Centropristis striata</i>
Bass, striped	007-004	<i>Morone saxatilis</i>
Bluefish	012-001	<i>Pomatomus saltatrix</i>
Bonito, Atlantic	091-011	<i>Sarda sarda</i>
Bonito, Pacific	091-009	<i>Sarda chiliensis</i>
Bullhead, brown	021-007	<i>Ictalurus nebulosus</i>
Butterfish	018-014	<i>Peprilus triacanthus</i>
Catfish, channel	021-010	<i>Ictalurus punctatus</i>
Catfish, gafftopsail	023-002	<i>Bagre marinus</i>
Catfish, sea	023-001	<i>Arius felis</i>
Catfish, white	021-002	<i>Ictalurus catus</i>
Clam, butter	191-003	<i>Saxidomus gigantea</i>
Clam, hard (quahog)	191-001	<i>Mercenaria mercenaria</i>
Clam, Pacific littleneck	191-008	<i>Protothaca staminea</i>
Clam, razor	243-002	<i>Siliqua patula</i>
Clam, soft	242-001	<i>Mya arenaria</i>
Clam, surf	244-005	<i>Spisula solidissima</i>
Cod, Atlantic	033-008	<i>Gadus morhua</i>
Cod, Pacific (gray)	033-007	<i>Gadus macrocephalus</i>
Crab, blue	196-001	<i>Callinectes sapidus</i>
Crab, Dungeness	196-011	<i>Cancer magister</i>
Crab, king	196-012	<i>Paralithodes camschatica</i>
Crab, red, deep sea	196-006	<i>Geryon quinquedens</i>
Crab, rock	196-003	<i>Cancer erroratus</i>
Crab, tanner (bairdi)	196-035	<i>Chionoecetes bairdi</i>
Croaker, Atlantic	045-026	<i>Micropogon undulatus</i>
Cusk	033-004	<i>Brosme brosme</i>
Cusk-eel, fawn	037-004	<i>Lepophidium cervinum</i>
Dogfish, smooth	145-018	<i>Mustelus canis</i>
Dogfish, spiny	141-007	<i>Squalus acanthias</i>
Dolphin	040-002	<i>Coryphaena hippurus</i>
Drum, banded	045-019	<i>Larimus fasciatus</i>
Drum, black	045-028	<i>Pogonias cromis</i>
Drum, red	045-030	<i>Sciaenops ocellata</i>
Eel, American	051-001	<i>Anguilla rostrata</i>
Eel, conger	047-002	<i>Conger oceanicus</i>
Eulachon	153-009	<i>Thaleichthys pacificus</i>
Flounder, fourspot	058-028	<i>Paralichthys oblongus</i>
Flounder, Gulf	058-024	<i>Paralichthys albigutta</i>
Flounder, southern	058-027	<i>Paralichthys lethostigma</i>
Flounder, summer (fluke)	058-026	<i>Paralichthys dentatus</i>
Flounder, windowpane (s. dab)	058-030	<i>Scophthalmus aquosus</i>
Flounder, winter	059-030	<i>Pseudopleuronectes americanus</i>
Flounder, witch	059-005	<i>Glyptocephalus cynoglossus</i>
Flounder, yellowtail	059-016	<i>Limanda ferruginea</i>
Gag	006-040	<i>Mycteroperca microlepis</i>
Goatfish	066-009	<i>Mulloidichthys samoensis</i>
Goosefish	068-001	<i>Lophius americanus</i>
Grouper, black	006-037	<i>Mycteroperca bonaci</i>
Grouper, red	006-017	<i>Epinephelus morio</i>
Grouper, yellowmouth	006-038	<i>Mycteroperca interstitialis</i>
Grunt, bluestriped (yellow)	073-015	<i>Haemulon sciurus</i>
Grunt, white	073-014	<i>Haemulon plumieri</i>
Haddock	033-011	<i>Melanogrammus aeglefinus</i>
Hake, Pacific	033-013	<i>Merluccius productus</i>
Hake, red	033-020	<i>Urophycis chuss</i>
Hake, silver (whiting)	033-012	<i>Merluccius bilinearis</i>
Hake, spotted	033-024	<i>Urophycis regius</i>
Hake, white	033-025	<i>Urophycis tenuis</i>
Halibut, Pacific	059-011	<i>Hippoglossus stenolepis</i>
Hammerhead, scalloped	143-001	<i>Sphyrna lewini</i>

Table 1.—Alphabetical list of species analyzed in the Resource Survey.—Continued.

Common name	Species number	Scientific name
Hammerhead, smooth	143-005	<i>Sphyrna zygaena</i>
Harvestfish	018-011	<i>Peprilus alepidotus</i>
Herring, Atlantic	078-011	<i>Clupea harengus harengus</i>
Herring, blueback	078-001	<i>Alosa aestivalis</i>
Herring, Pacific	078-012	<i>Clupea harengus pallasii</i>
Herring, round	078-015	<i>Etrumeus teres</i>
Hind, speckled	006-013	<i>Epinephelus drummondhayi</i>
Jack (mackerel scad)	079-068	<i>Decapterus pinnulatus</i>
Jack, akule	079-053	<i>Trachurops crumenophthalmus</i>
Jack, crevalle	079-005	<i>Caranx hippos</i>
Jack, crevalle (Hawaii)	079-069	<i>Caranx melampygus</i>
Jacks melt	149-004	<i>Atherinopsis californiensis</i>
Jewfish	006-016	<i>Epinephelus itajara</i>
Kingfish, northern	045-024	<i>Menticirrhus saxatilis</i>
Kingfish, southern	045-021	<i>Menticirrhus americanus</i>
Ladyfish	200-002	<i>Elops saurus</i>
Lingcod	071-005	<i>Ophiodon elongatus</i>
Lobster, northern (American)	194-012	<i>Homarus americanus</i>
Lobster, spiny (Atlantic)	194-002	<i>Panulirus argus</i>
Lobster, spiny (Pacific)	194-003	<i>Panulirus interruptus</i>
Mackerel, Atlantic	091-013	<i>Scomber scombrus</i>
Mackerel, chub	091-012	<i>Scomber japonicus</i>
Mackerel, jack	079-034	<i>Trachurus symmetricus</i>
Mackerel, king	091-014	<i>Scomberomorus cavalla</i>
Mackerel, Spanish	091-016	<i>Scomberomorus maculatus</i>
Mako, shortfin	144-003	<i>Isurus oxyrinchus</i>
Marlin, blue	011-002	<i>Makaira nigricans</i>
Marlin, striped	011-005	<i>Tetrapturus audax</i>
Marlin, white	011-003	<i>Tetrapturus albidus</i>
Mempachi	162-012	<i>Myripristis argyromus</i>
Menhaden, Atlantic	078-010	<i>Brevoortia tyrannus</i>
Menhaden, Gulf	078-008	<i>Brevoortia patronus</i>
Menhaden, yellowfin	078-009	<i>Brevoortia smithi</i>
Milkfish	206-001	<i>Chanos chanos</i>
Mojarra, yellowfin	094-010	<i>Gerres cinereus</i>
Mullet, silver (white)	098-003	<i>Mugil curema</i>
Mullet, striped	098-002	<i>Mugil cephalus</i>
Octopus (marmoratus)	205-001	<i>Polypus marmoratus</i>
Oyster, eastern	189-001	<i>Crassostrea virginica</i>
Oyster, Pacific (giant)	189-002	<i>Crassostrea gigas</i>
Palomet	079-030	<i>Trachinotus goodei</i>
Perch, ocean (Pacific)	131-023	<i>Sebastes alutus</i>
Perch, ocean (redfish)	131-052	<i>Sebastes marinus</i>
Perch, sand	006-010	<i>Diplectrum formosum</i>
Perch, shiner	168-005	<i>Cymatogaster aggregata</i>
Perch, silver	045-003	<i>Bairdiella chrysura</i>
Perch, white	007-001	<i>Morone americana</i>
Permit	079-029	<i>Trachinotus falcatus</i>
Pigfish	073-017	<i>Orthopristis chrysoptera</i>
Pinfish, spottail	114-013	<i>Diplodus holbrooki</i>
Plaice, American (dab)	059-008	<i>Hippoglossoides platessoides</i>
Pollock	033-017	<i>Pollachius virens</i>
Pollock, walleye (Alaska)	033-019	<i>Theragra chalcogramma</i>
Pompano, Florida	079-028	<i>Trachinotus carolinus</i>
Porgy, red	114-014	<i>Pagrus sedecim</i>
Pout, ocean	056-018	<i>Macrozoarces americanus</i>
Rockfish, bocaccio	131-061	<i>Sebastes paucispinis</i>
Rockfish, canary	131-063	<i>Sebastes pinniger</i>
Rockfish, copper	131-031	<i>Sebastes caurinus</i>
Rockfish, yellowtail	131-043	<i>Sebastes flavidus</i>
Runner, blue	079-004	<i>Caranx crysos</i>
Sablefish	126-001	<i>Anoplopoma fimbria</i>
Sailfish	011-001	<i>Istiophorus platypterus</i>
Salmon, chinook (king)	179-020	<i>Oncorhynchus tshawytscha</i>
Salmon, chum (keta)	179-017	<i>Oncorhynchus keta</i>
Salmon, coho (silver)	179-018	<i>Oncorhynchus kisutch</i>
Salmon, pink	179-016	<i>Oncorhynchus gorbuscha</i>
Salmon, sockeye (red)	179-019	<i>Oncorhynchus nerka</i>
Scad, round	079-013	<i>Decapterus punctatus</i>
Scallop, Atlantic bay	190-014	<i>Aequipecten irradians</i>

Table 1.—Alphabetical list of species analyzed in the Resource Survey.—Continued.

Common name	Species number	Scientific name
Scallop, calico	190-016	<i>Aequipecten gibbus</i>
Scallop, pink	190-028	<i>Chlamys hericius</i>
Scallop, sea (smooth)	190-013	<i>Placopecten magellanicus</i>
Scamp	006-041	<i>Mycteroperca phenax</i>
Sculpin, longhorn	132-031	<i>Myoxocephalus octodecemspinosus</i>
Scup	114-016	<i>Stenotomus chrysops</i>
Searobin, northern	135-010	<i>Prionotus carolinus</i>
Searobin, striped	135-011	<i>Prionotus evolans</i>
Seatrout, gray (weakfish)	045-012	<i>Cynoscion regalis</i>
Seatrout, sand	045-007	<i>Cynoscion arenarius</i>
Seatrout, silver (white)	045-010	<i>Cynoscion nothus</i>
Seatrout, spotted (speckled)	045-008	<i>Cynoscion nebulosus</i>
Shad, American	078-006	<i>Alosa sapidissima</i>
Shark, Atlantic sharpnose	145-025	<i>Rhizoprionodon terraenovae</i>
Shark, blacktip	145-006	<i>Carcharhinus limbatus</i>
Shark, blue	145-023	<i>Prionace glauca</i>
Shark, dusky	145-010	<i>Carcharhinus obscurus</i>
Shark, sandbar	145-009	<i>Carcharhinus milberti</i>
Shark, white	144-001	<i>Carcharodon carcharias</i>
Sheepshead	114-001	<i>Archosargus probatocephalus</i>
Shrimp, Alaska (sidestripe)	192-012	<i>Pandalopsis dispar</i>
Shrimp, brown	192-005	<i>Penaeus aztecus</i>
Shrimp, ocean	192-007	<i>Pandalus jordani</i>
Shrimp, pink	192-010	<i>Penaeus duorarum</i>
Shrimp, pink (northern)	192-011	<i>Pandalus borealis</i>
Shrimp, royal red	192-003	<i>Hymenopenaeus robustus</i>
Shrimp, white	192-004	<i>Penaeus setiferus</i>
Skate, little	150-005	<i>Raja erinacea</i>
Skate, winter	150-012	<i>Raja ocellata</i>
Snapper, blackfin	155-005	<i>Lutjanus buccanella</i>
Snapper, gray	155-025	<i>Aprion virescens</i>
Snapper, gray (mangrove)	155-008	<i>Lutjanus griseus</i>
Snapper, red	155-006	<i>Lutjanus campechanus</i>
Snapper, red (ehu)	155-024	<i>Etelis marchi</i>
Snapper, vermilion	155-015	<i>Rhomboplites aurorubens</i>
Snapper, yellowtail	155-013	<i>Ocyurus chrysurus</i>
Snook	157-004	<i>Centropomus undecimalis</i>
Sole, Dover	059-021	<i>Microstomus pacificus</i>
Sole, English	059-022	<i>Parophrys vetulus</i>
Sole, petrale	059-004	<i>Eopsetta jordani</i>
Sole, rex	059-006	<i>Glyptocephalus zachirus</i>
Sole, rock	059-014	<i>Lepidopsetta bilineata</i>
Spearfish, shortbill	011-004	<i>Tetrapturus angustirostris</i>
Spot	045-020	<i>Leiostomus xanthurus</i>
Squid, Atlantic longfinned	188-003	<i>Loligo pealii</i>
Squid, Pacific	188-006	<i>Loligo opalescens</i>
Squid, shortfinned	188-014	<i>Illex illecebrosus</i>
Sturgeon, green	166-003	<i>Acipenser medirostris</i>
Surfperch, barred	168-001	<i>Amphistichus argenteus</i>
Tarpon	200-003	<i>Megalops atlantica</i>
Tautog	185-022	<i>Tautoga onitis</i>
Tilefish	174-003	<i>Lopholatilus chamaeleonticeps</i>
Trout, cutthroat	179-028	<i>Salmo clarki</i>
Trout, rainbow (steelhead)	179-029	<i>Salmo gairdneri</i>
Tuna, albacore	091-019	<i>Thunnus alalunga</i>
Tuna, bigeye	091-022	<i>Thunnus obesus</i>
Tuna, blackfin	091-021	<i>Thunnus atlanticus</i>
Tuna, bluefin	091-023	<i>Thunnus thynnus</i>
Tuna, skipjack	091-008	<i>Katsuwonus pelamis</i>
Tuna, yellowfin	091-020	<i>Thunnus albacares</i>
Tunny, little	091-006	<i>Euthynnus alletteratus</i>
Wahoo	091-001	<i>Acanthocybium solanderi</i>
Wolffish, Atlantic	183-002	<i>Anarhichas lupus</i>
Yellowtail	079-023	<i>Seriola dorsalis</i>

Table 2. Resource Survey: Areas of Catch, Tissues Analyzed, and Number of Samples Analyzed; by Species

Species Number	Species Name	Areas of Catch	Tissues Analyzed	No. of Samples
001-006	Anchovy, striped	Gulf of Mexico	headed & gutted	40
001-016	Anchovy, northern	California	whole	40
002-002	Argentine, Atlantic	N. Atlantic	headed & gutted	7
005-001	Barracuda, Pacific	California	muscle	20
005-002	Barracuda, Atlantic	Gulf of Mexico	muscle	7
006-006	Bass, black sea	N. & S. Atlantic	muscle, liver	57
006-010	Perch, sand	S. Atlantic	muscle	1
006-013	Hind, speckled	S. Atlantic	muscle, liver	27
006-016	Jewfish	Gulf of Mexico	muscle	8
006-017	Grouper, red	Gulf of Mexico	muscle	41
006-037	Grouper, black	Gulf of Mexico	muscle	34
006-038	Grouper, yellowmouth	S. Atlantic	muscle, liver	11
006-040	Gag	Gulf of Mexico	muscle	30
006-041	Scamp	S. Atlantic	muscle, liver	11
007-001	Perch, white	N. Atlantic	muscle, headed & gutted	46
007-004	Bass, striped	N. Atlantic, California, Northwest	muscle, liver	120
011-001	Sailfish	N. & S. Atlantic, Gulf of Mexico	muscle, liver	46
011-002	Marlin, blue	N. & S. Atlantic, Hawaii	muscle, liver	44
011-003	Marlin, white	N. & S. Atlantic, Gulf of Mexico	muscle, liver	65
011-004	Spearfish, shortbill	Hawaii	muscle, liver	19
011-005	Marlin, striped	Hawaii	muscle, liver	49
012-001	Bluefish	N. & S. Atlantic, Gulf of Mexico	muscle, liver	77
018-011	Harvestfish	N. & S. Atlantic	muscle, whole	19
018-014	Butterfish	N. Atlantic	muscle, whole, headed & gutted	90
021-002	Catfish, white	N. Atlantic	muscle	1
021-007	Bullhead, brown	N. Atlantic	muscle	4
021-010	Catfish, channel	N. Atlantic	muscle	20
023-001	Catfish, sea	Gulf of Mexico	muscle, liver	53
023-002	Catfish, gafftopsail	Gulf of Mexico	muscle, liver	37
033-004	Cusk	N. Atlantic	muscle, liver	94
033-007	Cod, Pacific (gray)	Northwest, Alaska	muscle, liver	75
033-008	Cod, Atlantic	N. Atlantic	muscle, liver	150
033-011	Haddock	N. Atlantic	muscle, liver, whole	96
033-012	Hake, silver (whiting)	N. Atlantic	muscle, liver	86
033-013	Hake, Pacific	California, Northwest	muscle, liver	50
033-017	Pollock	N. Atlantic	muscle, liver	106
033-019	Pollock, walleye (Alaska)	Northwest, Alaska	muscle, liver	51
033-024	Hake, red	N. Atlantic	muscle	65
033-024	Hake, spotted	N. Atlantic	muscle	65
033-025	Hake, white	N. Atlantic	muscle, liver	101
037-004	Cusk-eel, fawn	N. Atlantic	muscle	2
041-002	Dolphin	S. Atlantic, Gulf of Mexico, Hawaii	muscle, liver	91
045-003	Perch, silver	S. Atlantic	muscle	20
045-007	Seatrout, sand	Gulf of Mexico	muscle	18
045-008	Seatrout, spotted (speckled)	N. & S. Atlantic, Gulf of Mexico	muscle, liver	92
045-010	Seatrout, silver (white)	Gulf of Mexico	muscle, liver	45
045-012	Seatrout, gray (weakfish)	N. & S. Atlantic	muscle, liver, whole	85
045-019	Drum, banded	N. & S. Atlantic	muscle	5
045-020	Spot	N. & S. Atlantic	muscle	54
045-021	Kingfish, southern	Gulf of Mexico	muscle, liver	15
045-024	Kingfish, northern	N. Atlantic	muscle	6
045-026	Croaker, Atlantic	N. & S. Atlantic, Gulf of Mexico	muscle	92
045-028	Drum, black	Gulf of Mexico	muscle, liver	63
045-030	Drum, red	N. & S. Atlantic, Gulf of Mexico	muscle, liver	76
047-002	Eel, conger	N. Atlantic	muscle	1
051-001	Eel, American	N. Atlantic	muscle	30
056-018	Pout, ocean	N. Atlantic	muscle, liver	37
058-024	Flounder, Gulf	Gulf of Mexico	muscle, liver	42
058-026	Flounder, summer (fluke)	S. Atlantic	muscle, liver	44
058-027	Flounder, southern	S. Atlantic, Gulf of Mexico	muscle, liver	44
058-028	Flounder, fourspot	N. Atlantic	muscle	71
058-030	Flounder, windowpane (s. dab)	N. Atlantic	muscle	18
059-004	Sole, petrale	California, Northwest	muscle, liver	64
059-005	Flounder, witch	N. Atlantic	muscle	71
059-006	Sole, rex	California, Northwest	muscle	61
059-008	Plaice, American (dab)	N. Atlantic	muscle	69
059-011	Halibut, Pacific	Northwest, Alaska	muscle, liver	53
059-014	Sole, rock	Northwest	muscle	10
059-016	Flounder, yellowtail	N. Atlantic	muscle, liver	91
059-021	Sole, Dover	California, Northwest	muscle, liver	74
059-022	Sole, English	California, Northwest	muscle, liver	78
059-030	Flounder, winter	N. Atlantic	muscle, liver	125
062-014	Ballyhoo	S. Atlantic	whole	58
066-009	Goatfish	Hawaii	muscle	40
068-001	Goosefish	N. Atlantic	muscle, liver, headed & gutted	92

Table 2. Resource Survey: Areas of Catch, Tissues Analyzed, and Number of Samples Analyzed; by Species (cont'd)

Species Number	Species Name	Areas of Catch	Tissues Analyzed	No. of Samples
071-005	Lingcod	California, Northwest	muscle, liver	91
073-014	Grunt, white	S. Atlantic, Gulf of Mexico	muscle	17
073-015	Grunt, bluestriped (yellow)	S. Atlantic, Gulf of Mexico	muscle	16
073-017	Pigfish	N. & S. Atlantic	muscle	34
078-001	Herring, blueback	N. Atlantic	whole	1
078-005	Alewife	N. Atlantic	muscle, whole	47
078-006	Shad, American	N. Atlantic, Northwest	muscle	60
078-008	Menhaden, Gulf	Gulf of Mexico	muscle, whole, gutted	87
078-009	Menhaden, yellowfin	Gulf of Mexico	whole	13
078-010	Menhaden, Atlantic	N. & S. Atlantic	muscle, whole	111
078-011	Herring, Atlantic	N. Atlantic	muscle, whole, headed, headed & gutted	95
078-012	Herring, Pacific	Northwest, Alaska	muscle, whole	44
078-015	Herring, round	N. Atlantic	headed & gutted	50
079-004	Runner, blue	Gulf of Mexico	muscle, liver	60
079-005	Jack, crevalle	Gulf of Mexico	muscle, liver	53
079-013	Scad, round	S. Atlantic	headed & gutted	3
079-023	Yellowtail	California	muscle	24
079-028	Pompano, Florida	S. Atlantic, Gulf of Mexico	muscle, liver	65
079-029	Permit	S. Atlantic	muscle	9
079-030	Palometa	S. Atlantic	muscle	2
079-034	Mackerel, jack	California	muscle, liver, headed	15
079-053	Jack, akule	Hawaii	muscle	39
079-068	Jack, (mackerel scad)	Hawaii	muscle	40
079-069	Jack, crevalle (Hawaii)	Hawaii	muscle	40
091-001	Wahoo	Gulf of Mexico, Hawaii	muscle, liver	21
091-006	Tunny, little	Gulf of Mexico	muscle, liver	52
091-008	Tuna, skipjack	California, Hawaii, Pacific	muscle, liver	78
091-009	Bonito, Pacific	California	muscle, liver	41
091-011	Bonito, Atlantic	Gulf of Mexico	muscle	15
091-012	Mackerel, chub	California	muscle	30
091-013	Mackerel, Atlantic	N. Atlantic	muscle	80
091-014	Mackerel, king	S. Atlantic, Gulf of Mexico	muscle, liver, milt, roe	129
091-016	Mackerel, Spanish	S. Atlantic, Gulf of Mexico	muscle, liver	113
091-019	Tuna, albacore	California, Northwest	muscle, liver	45
091-020	Tuna, yellowfin	California, Hawaii	muscle, liver	106
091-021	Tuna, blackfin	Gulf of Mexico	muscle	1
091-022	Tuna, bigeye	Hawaii	muscle, liver	61
091-023	Tuna, bluefin	N. Atlantic, California	muscle, liver	12
094-010	Mojarra, yellowfin	S. Atlantic	muscle	10
098-002	Mullet, striped	S. Atlantic, Gulf of Mexico, Hawaii	muscle, liver	163
098-003	Mullet, silver (white)	S. Atlantic, Gulf of Mexico	muscle	36
114-001	Sheepshead	Gulf of Mexico	muscle, liver	62
114-013	Pinfish, spottail	S. Atlantic	muscle, liver	11
114-014	Porgy, red	S. Atlantic	muscle, liver	23
114-016	Scup	N. & S. Atlantic	muscle	72
126-001	Sablefish	California, Northwest, Alaska	muscle, liver	118
131-023	Perch, ocean (Pacific)	Northwest	muscle, liver	48
131-031	Rockfish, copper	Northwest	muscle	10
131-043	Rockfish, yellowtail	Northwest	muscle	20
131-052	Perch, ocean (redfish)	N. Atlantic	muscle, liver	82
131-061	Rockfish, bocaccio	California, Northwest	muscle, liver	52
131-063	Rockfish, canary	California, Northwest	muscle, liver	46
132-031	Sculpin, longhorn	N. Atlantic	muscle	1
135-010	Searobin, northern	N. & S. Atlantic	muscle	78
135-011	Searobin, striped	N. Atlantic	muscle	10
141-007	Dogfish, spiny	N. & S. Atlantic, Northwest	muscle, liver	144
143-001	Hammerhead, scalloped	N. & S. Atlantic	muscle	12
143-005	Hammerhead, smooth	S. Atlantic	muscle, liver	17
144-001	Shark, white	N. Atlantic	muscle	2
144-003	Mako, shortfin	N. Atlantic	muscle, liver	5
145-006	Shark, blacktip	S. Atlantic, Gulf of Mexico	muscle, liver	20
145-009	Shark, sandbar	N. Atlantic, Gulf of Mexico	muscle, liver	20
145-010	Shark, dusky	N. & S. Atlantic, Gulf of Mexico	muscle	4
145-018	Dogfish, smooth	N. Atlantic	muscle	95
145-023	Shark, blue	N. Atlantic	muscle, liver	23
145-025	Shark, Atlantic sharpnose	S. Atlantic	muscle	1
149-004	Jacksnelt	California	whole	20
150-005	Skate, little	N. Atlantic	muscle, liver	56
150-012	Skate, winter	N. Atlantic	muscle, liver	3
153-009	Eulachon	Northwest	whole	33
155-005	Snapper, blackfin	Gulf of Mexico	muscle	13
155-006	Snapper, red	S. Atlantic, Gulf of Mexico	muscle	38
155-008	Snapper, gray (mangrove)	S. Atlantic, Gulf of Mexico	muscle	28
155-013	Snapper, yellowtail	S. Atlantic, Gulf of Mexico	muscle	43
155-015	Snapper, vermilion	S. Atlantic	muscle, liver	38
155-024	Snapper, red (ehu)	Hawaii	muscle	40
155-025	Snapper, gray	Hawaii	muscle	40

Table 2. Resource Survey: Areas of Catch, Tissues Analyzed, and Number of Samples Analyzed; by Species (cont'd)

Species Number	Species Name	Areas of Catch	Tissues Analyzed	No. of Samples
157-004	Snook	Gulf of Mexico	muscle	12
162-012	Mempachi	Hawaii	muscle, liver	21
166-003	Sturgeon, green	Northwest	muscle	10
168-001	Surfperch, barred	California	muscle	20
168-005	Perch, shiner	California	whole	2
174-003	Tilefish	Gulf of Mexico	muscle	60
179-016	Salmon, pink	Alaska	muscle, liver	32
179-017	Salmon, chum (keta)	Northwest, Alaska	muscle, liver	62
179-018	Salmon, coho (silver)	Northwest, Alaska	muscle, liver	76
179-019	Salmon, sockeye (red)	Northwest, Alaska	muscle, liver	66
179-020	Salmon, chinook (king)	California, Northwest, Alaska	muscle, liver	132
179-028	Trout, cutthroat	Northwest	muscle	3
179-029	Trout, rainbow (steelhead)	Northwest	muscle, liver	10
183-002	Wolfish, Atlantic	N. Atlantic	muscle, liver	75
185-022	Tautog	N. Atlantic	muscle	14
187-005	Abalone, green	California	shucked	10
187-008	Abalone, red	California	shucked	10
188-003	Squid, Atlantic longfinned	N. Atlantic	whole, mantle	133
188-006	Squid, Pacific	California	whole	50
188-014	Squid, Atlantic shortfinned	N. Atlantic	mantle	92
189-001	Oyster, eastern	N. & S. Atlantic, Gulf of Mexico	shucked	153
189-002	Oyster, Pacific (giant)	California, Northwest	shucked	70
190-013	Scallop, sea (smooth)	N. Atlantic	adductor muscle	11
190-014	Scallop, Atlantic bay	S. Atlantic	adductor muscle	20
190-016	Scallop, calico	S. Atlantic	shucked, adductor muscle	30
190-028	Scallop, pink	Alaska	adductor muscle	5
191-001	Clam, hard (quahog)	N. & S. Atlantic	shucked	141
191-003	Clam, butter	Northwest	shucked	29
191-008	Clam, Pacific littleneck	Alaska	shucked	1
192-003	Shrimp, royal red	S. Atlantic	peeled tail	12
192-004	Shrimp, white	S. Atlantic, Gulf of Mexico	peeled tail	77
192-005	Shrimp, brown	Gulf of Mexico	peeled tail	53
192-007	Shrimp, ocean	Northwest	peeled tail	10
192-010	Shrimp, pink	Gulf of Mexico	peeled tail	50
192-011	Shrimp, pink (northern)	N. Atlantic, Alaska	peeled tail	64
192-012	Shrimp, Alaska (sidestripe)	Alaska	peeled tail	17
194-002	Lobster, spiny (Atlantic)	S. Atlantic, Gulf of Mexico	tailmeat	40
194-003	Lobster, spiny (Pacific)	California	tailmeat	5
194-012	Lobster, northern (American)	N. Atlantic	body, claw, tail, leg meat	88
196-001	Crab, blue	N. & S. Atlantic, Gulf of Mexico	body meat, claw meat	94
196-003	Crab, rock	N. Atlantic	meat	15
196-006	Crab, red, deep sea	N. Atlantic	meat	25
196-011	Crab, dungeness	California, Northwest, Alaska	meat, claw & body meat	50
196-012	Crab, king	Alaska	meat, claw & body meat	29
196-035	Crab, tanner (bairdi)	Alaska	meat	50
200-002	Ladyfish	Gulf of Mexico	muscle	2
200-003	Tarpon	Gulf of Mexico	muscle, liver	14
205-001	Octopus (marmuratus)	Hawaii	whole, mantle	40
206-001	Milkfish	Hawaii	muscle	40
242-001	Clam, soft	N. Atlantic	shucked	19
243-002	Clam, razor	Northwest, Alaska	shucked	39
244-005	Clam, surf	N. Atlantic	shucked	23

Table 3.1. Summarized Distribution of Mean Antimony Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
< 0.1	5	* ^{3/}	*
0.1 to 0.2	1	12.5	*
0.3 to 0.4	2	*	*
0.4 to 0.5	2	*	*
0.5 to 0.6	18	2.4	3.6
0.6 to 0.7	51	8.8	17.3
0.7 to 0.8	33	8.7	14.9
0.8 to 0.9	28	36.6	26.0
0.9 to 1.0	9	0.8	1.7
1.0 to 2.0	10	0.7	10.5
TOTAL:	159	70.5	63.9
Finfish, liver			
< 0.1	3	0.4	0.7
0.1 to 0.2	2	0.2	*
0.2 to 0.3	1	0.1	0.2
0.3 to 0.4	5	0.3	0.6
0.4 to 0.5	8	3.3	6.6
0.5 to 0.6	20	8.8	18.2
0.6 to 0.7	9	2.4	4.9
0.7 to 0.8	11	8.7	16.7
0.8 to 0.9	6	1.7	3.6
0.9 to 1.0	6	0.3	0.7
1.0 to 2.0	11	2.0	4.1
TOTAL:	82	28.3	56.3
Finfish, whole			
< 0.1	1	0.5	1.1
0.1 to 0.2	1	*	*
0.3 to 0.4	1	0.1	0.1
1.0 to 2.0	9	3.5	3.0
2.0 to 3.0	5	41.3	*
TOTAL:	17	45.4	4.3

Table 3.1. Summarized Distribution of Mean Antimony Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Mollusca, edible tissues			
< 0.1	3	1.6	3.4
0.5 to 0.6	2	0.2	0.4
0.6 to 0.7	1	0.5	0.6
0.7 to 0.8	2	0.1	0.1
0.8 to 0.9	2	0.9	1.9
0.9 to 1.0	5	0.5	1.1
1.0 to 2.0	3	* ^{3/}	*
TOTAL:	18	3.8	7.5
Crustacea, edible tissues			
0.2 to 0.3	2	*	0.1
0.7 to 0.8	1	*	*
0.8 to 0.9	3	4.2	8.7
0.9 to 1.0	7	5.7	11.7
1.0 to 2.0	3	3.8	7.8
TOTAL:	16	13.7	28.4

^{1/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

^{2/} See page 12 for an explanation of these columns.

^{3/} * denotes less than .05%.

Table 3.2. Summarized Distribution of Mean Arsenic Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
0.6 to 0.7	1	0.1	0.2
1.0 to 2.0	8	1.8	2.6
2.0 to 3.0	47	30.3	35.0
3.0 to 4.0	35	31.4	13.8
4.0 to 5.0	18	2.1	3.0
5.0 to 6.0	7	1.5	2.8
6.0 to 7.0	7	0.2	0.3
7.0 to 8.0	9	2.5	5.0
8.0 to 9.0	7	0.1	0.1
9.0 to 10.0	6	0.1	0.2
10.0 to 20.0	12	0.4	0.7
20.0 to 30.0	2	0.1	0.2
TOTAL:	159	70.5	63.9
Finfish, liver			
0.7 to 0.8	1	* ^{3/}	*
1.0 to 2.0	9	7.3	15.0
2.0 to 3.0	12	5.4	9.7
3.0 to 4.0	13	0.7	1.0
4.0 to 5.0	14	7.4	15.3
5.0 to 6.0	9	5.4	10.8
6.0 to 7.0	2	*	*
7.0 to 8.0	4	0.3	0.6
8.0 to 9.0	3	0.3	0.6
9.0 to 10.0	4	0.7	1.5
10.0 to 20.0	4	0.2	0.3
20.0 to 30.0	4	0.5	1.1
30.0 to 40.0	1	*	*
40.0 to 50.0	1	*	*
TOTAL:	81	28.1	55.9
Finfish, whole			
1.0 to 2.0	2	0.1	0.2
2.0 to 3.0	6	2.2	2.2
3.0 to 4.0	4	5.1	0.6
4.0 to 5.0	2	36.4	*
5.0 to 6.0	1	0.1	0.2
7.0 to 8.0	1	1.0	*
20.0 to 30.0	1	0.5	1.1
TOTALS:	17	45.4	4.3

Table 3.2. Summarized Distribution of Mean Arsenic Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Mollusca, edible tissues			
2.0 to 3.0	6	2.2	4.0
3.0 to 4.0	5	1.6	3.2
4.0 to 5.0	3	* ^{3/}	0.1
7.0 to 8.0	1	*	*
10.0 to 20.0	3	*	0.1
TOTAL:	18	3.8	7.5
Crustacea, edible tissues			
3.0 to 4.0	1	0.9	1.8
4.0 to 5.0	5	6.8	14.2
5.0 to 6.0	1	1.2	2.5
6.0 to 7.0	1	2.8	5.8
9.0 to 10.0	1	1.0	2.0
10.0 to 20.0	4	0.2	0.5
20.0 to 30.0	2	0.7	1.5
40.0 to 50.0	1	*	*
TOTAL:	16	13.7	28.4

^{1/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

^{2/} See page 12 for an explanation of these columns.

^{3/} * denotes less than .05%.

Table 3.3. Summarized Distribution of Mean Cadmium Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
< 0.1	149	70.4	63.8
0.1 to 0.2	10	0.1	0.1
TOTAL:	159	70.5	63.9
Finfish, liver			
< 0.1	1	0.1	0.2
0.1 to 0.2	5	1.3	2.4
0.2 to 0.3	9	4.3	5.8
0.3 to 0.4	9	2.0	7.1
0.4 to 0.5	8	3.3	6.7
0.5 to 0.6	2	0.9	1.9
0.6 to 0.7	6	3.6	7.0
0.7 to 0.8	2	0.1	0.1
0.8 to 0.9	3	1.3	2.7
0.9 to 1.0	2	0.1	0.3
1.0 to 2.0	13	1.9	3.8
2.0 to 3.0	8	0.6	1.2
3.0 to 4.0	1	* ^{3/}	*
4.0 to 5.0	4	1.2	2.4
6.0 to 7.0	1	1.7	3.5
7.0 to 8.0	2	0.1	0.2
8.0 to 9.0	3	4.9	10.2
10.0 to 20.0	2	1.0	0.8
20.0 to 30.0	1	*	*
TOTAL:	82	28.3	56.3
Finfish, whole			
< 0.1	2	.8	1.3
0.1 to 0.2	13	28.2	2.9
0.2 to 0.3	1	12.5	*
0.3 to 0.4	1	4.0	*
TOTAL:	17	45.4	4.3

Table 3.3. Summarized Distribution of Mean Cadmium Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Mollusca, edible tissues			
< 0.1	1	* ^{3/}	*
0.1 to 0.2	7	1.5	3.0
0.2 to 0.3	3	0.6	1.2
0.3 to 0.4	1	*	*
0.7 to 0.8	1	0.5	0.6
0.9 to 1.0	1	0.9	2.0
1.0 to 2.0	2	0.3	0.6
2.0 to 3.0	2	0.1	0.1
TOTAL:	18	3.8	7.5
Crustacea, edible tissues			
< 0.1	3	4.7	9.8
0.1 to 0.2	9	8.2	17.0
0.2 to 0.3	3	0.7	1.5
0.3 to 0.4	1	*	0.1
TOTAL:	16	13.7	28.4

^{1/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

^{2/} See page 12 for an explanation of these columns.

^{3/} * denotes less than .05%.

Table 3.4. Summarized Distribution of Mean Chromium Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
<0.1	4	0.1	0.3
0.1 to 0.2	90	27.1	51.0
0.2 to 0.3	56	43.3	12.5
0.3 to 0.4	7	* ^{3/}	*
0.4 to 0.5	2	*	*
TOTAL:	159	70.6	63.9
Finfish, liver			
<0.1	7	1.7	2.9
0.1 to 0.2	44	13.4	26.4
0.2 to 0.3	16	12.1	25.0
0.3 to 0.4	11	0.9	1.9
0.4 to 0.5	3	0.1	0.1
1.0 to 2.0	1	0.1	0.1
TOTAL:	82	28.3	56.3
Finfish, whole			
<0.1	2	0.8	1.3
0.2 to 0.3	3	1.2	0.7
0.3 to 0.4	6	6.0	2.1
0.4 to 0.5	3	1.0	*
0.5 to 0.6	1	0.1	0.2
0.6 to 0.7	1	12.5	*
0.7 to 0.8	1	23.8	*
TOTAL:	17	45.4	4.3

Table 3.4. Summarized Distribution of Mean Chromium Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Mollusca, edible tissues			
0.1 to 0.2	3	0.5	0.6
0.2 to 0.3	5	0.4	0.7
0.3 to 0.4	8	3.0	6.1
0.4 to 0.5	1	* ^{3/}	*
0.5 to 0.6	1	*	*
TOTAL:	18	3.8	7.5
Crustacea, edible tissues			
0.1 to 0.2	7	2.6	5.4
0.2 to 0.3	9	11.1	22.9
TOTAL:	16	13.6	28.3

^{1/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

^{2/} See page 12 for an explanation of these columns.

^{3/} * denotes less than .05%.

Table 3.5. Summarized Distribution of Mean Copper Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
0.1 to 0.2	13	0.8	1.5
0.2 to 0.3	54	6.8	13.5
0.3 to 0.4	35	5.0	9.8
0.4 to 0.5	22	3.1	4.7
0.5 to 0.6	9	5.5	11.5
0.6 to 0.7	5	5.2	10.8
0.7 to 0.8	7	4.2	5.8
0.8 to 0.9	7	27.1	5.6
0.9 to 1.0	1	0.3	0.5
1.0 to 2.0	6	12.6	0.1
TOTAL:	159	70.5	63.9
Finfish, liver			
1.0 to 2.0	7	0.2	0.4
2.0 to 3.0	10	3.3	5.3
3.0 to 4.0	7	2.3	4.6
4.0 to 5.0	11	3.4	6.8
5.0 to 6.0	5	0.2	0.5
6.0 to 7.0	7	3.2	6.6
7.0 to 8.0	4	0.7	1.1
8.0 to 9.0	5	0.4	0.8
9.0 to 10.0	2	0.1	0.2
10.0 to 20.0	14	6.8	14.1
20.0 to 30.0	4	2.4	5.1
30.0 to 40.0	1	0.2	0.3
40.0 to 50.0	2	1.2	2.4
50.0 to 110.0	3	3.9	8.0
TOTAL:	82	28.3	56.3
Finfish, whole			
0.4 to 0.5	4	0.4	0.7
0.5 to 0.6	1	* ^{3/}	*
0.6 to 0.7	2	0.6	1.1
0.7 to 0.8	3	24.8	*
0.8 to 0.9	2	1.4	0.8
0.9 to 1.0	1	*	0.1
1.0 to 2.0	4	18.3	1.7
TOTAL:	17	45.4	4.3

Table 3.5. Summarized Distribution of Mean Copper Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Mollusca, edible tissues			
0.1 to 0.2	2	0.1	0.3
0.3 to 0.4	1	* <u>3/</u>	0.1
0.6 to 0.7	3	1.4	2.9
0.7 to 0.8	2	*	*
1.0 to 2.0	1	*	*
2.0 to 3.0	2	0.3	0.7
3.0 to 4.0	1	*	*
4.0 to 5.0	1	0.3	0.5
5.0 to 6.0	1	*	*
8.0 to 9.0	1	*	*
10.0 to 20.0	1	0.2	0.3
20.0 to 30.0	1	0.5	0.6
30.0 to 40.0	1	0.9	1.9
TOTAL:	18	3.8	7.5
Crustacea, edible tissues			
1.0 to 2.0	1	0.9	1.8
2.0 to 3.0	3	3.3	6.7
3.0 to 4.0	3	3.0	6.3
4.0 to 5.0	1	*	*
5.0 to 6.0	1	0.5	1.1
6.0 to 7.0	3	4.2	8.7
7.0 to 8.0	1	*	0.1
9.0 to 10.0	2	1.1	2.2
10.0 to 20.0	1	0.7	1.4
TOTAL:	16	13.7	28.4

1/ Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

2/ See page 12 for an explanation of these columns.

3/ * denotes less than .05%.

Table 3.6. Summarized Distribution of Mean Lead Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
0.1 to 0.2	1	* ^{3/}	*
0.2 to 0.3	4	*	*
0.3 to 0.4	33	4.9	9.9
0.4 to 0.5	59	17.7	33.8
0.5 to 0.6	35	19.0	9.4
0.6 to 0.7	16	28.9	10.7
0.7 to 0.8	5	*	*
0.9 to 1.0	2	*	*
1.0 to 2.0	3	*	*
2.0 to 3.0	1	*	*
TOTAL:	159	70.5	63.9
Finfish, liver			
< 0.1	2	0.3	0.6
0.1 to 0.2	3	3.3	6.9
0.2 to 0.3	10	4.0	8.4
0.3 to 0.4	10	0.9	1.8
0.4 to 0.5	17	4.7	9.5
0.5 to 0.6	16	9.2	17.6
0.6 to 0.7	10	2.1	4.4
0.7 to 0.8	3	*	*
0.8 to 0.9	1	1.6	0.1
0.9 to 1.0	5	1.7	6.4
1.0 to 2.0	4	0.2	0.3
2.0 to 3.0	1	0.1	0.2
TOTAL:	82	28.3	56.3
Finfish, whole			
0.1 to 0.2	1	0.1	0.2
0.3 to 0.4	1	0.5	1.1
0.5 to 0.6	1	0.2	0.2
0.7 to 0.8	2	0.1	0.2
0.8 to 0.9	1	*	*
0.9 to 1.0	1	1.2	0.6
1.0 to 2.0	9	19.5	2.0
2.0 to 3.0	1	23.8	*
TOTAL:	17	45.4	4.3

Table 3.6. Summarized Distribution of Mean Lead Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Mollusca, edible tissues			
0.2 to 0.3	2	* ^{3/}	*
0.4 to 0.5	2	0.2	0.4
0.5 to 0.6	5	1.7	3.4
0.6 to 0.7	7	1.7	3.0
0.7 to 0.8	1	0.3	0.7
0.8 to 0.9	1	0.1	0.1
TOTAL:	18	3.8	7.5
Crustacea, edible tissues			
0.4 to 0.5	1	*	*
0.5 to 0.6	4	1.7	3.5
0.6 to 0.7	9	8.9	18.5
0.7 to 0.8	1	3.0	6.2
0.8 to 0.9	1	*	0.1
TOTAL:	16	13.7	28.4

^{1/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

^{2/} See page 12 for an explanation of these columns.

^{3/} * denotes less than .05%.

Table 3.7. Summarized Distribution of Mean Manganese Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
<0.1	17	0.4	0.9
0.1 to 0.2	102	28.0	55.9
0.2 to 0.3	24	2.0	3.7
0.3 to 0.4	7	3.1	3.0
0.4 to 0.5	2	0.5	0.1
0.5 to 0.6	2	0.1	0.3
0.6 to 0.7	1	23.8	* ^{3/}
0.7 to 0.8	2	12.6	*
1.0 to 2.0	2	*	*
TOTAL:	159	70.5	63.9
Finfish, liver			
0.2 to 0.3	1	*	*
0.3 to 0.4	2	*	*
0.4 to 0.5	1	*	*
0.5 to 0.6	6	4.0	8.2
0.6 to 0.7	15	6.4	13.2
0.7 to 0.8	13	3.9	8.1
0.8 to 0.9	11	3.1	6.3
0.9 to 1.0	6	0.5	1.0
1.0 to 2.0	27	10.3	19.5
TOTAL:	82	28.3	56.3
Finfish, whole			
0.2 to 0.3	1	0.1	0.2
0.4 to 0.5	1	0.5	1.1
0.5 to 0.6	2	0.2	0.2
0.6 to 0.7	1	*	*
0.7 to 0.8	1	*	*
1.0 to 2.0	8	4.2	2.7
2.0 to 3.0	1	3.9	*
5.0 to 6.0	1	12.6	*
9.0 to 10.0	1	23.8	*
TOTAL:	17	45.4	4.3

Table 3.7. Summarized Distribution of Mean Manganese Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Mollusca, edible tissues			
0.1 to 0.2	1	* ^{3/}	*
0.2 to 0.3	4	0.2	0.4
0.3 to 0.4	1	*	0.1
0.4 to 0.5	1	0.5	0.6
0.5 to 0.6	1	*	*
0.6 to 0.7	1	*	0.1
0.8 to 0.9	1	*	*
1.0 to 2.0	2	1.4	2.8
2.0 to 3.0	2	0.1	0.1
4.0 to 5.0	1	0.9	1.9
6.0 to 7.0	2	0.6	1.2
7.0 to 8.0	1	0.1	0.3
TOTAL:	18	3.8	7.5
Crustacea, edible tissues			
0.1 to 0.2	1	0.2	0.4
0.2 to 0.3	2	0.9	1.8
0.3 to 0.4	6	3.1	6.5
0.4 to 0.5	1	*	*
0.5 to 0.6	1	0.7	1.5
0.6 to 0.7	2	4.5	9.4
0.7 to 0.8	1	1.2	2.5
1.0 to 2.0	2	3.1	6.3
TOTAL:	16	13.7	28.4

^{1/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

^{2/} See page 12 for an explanation of these columns.

^{3/} * denotes less than .05%.

Table 3.8. Summarized Distribution of Mean Mercury Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
< 0.1	45	53.6	30.7
0.1 to 0.2	49	12.8	26.1
0.2 to 0.3	18	1.9	3.9
0.3 to 0.4	15	1.7	2.2
0.4 to 0.5	1	* ^{3/}	*
0.5 to 0.6	8	0.4	0.7
0.6 to 0.7	3	*	*
0.7 to 0.8	4	0.1	0.1
0.8 to 0.9	3	*	*
1.0 to 2.0	8	*	*
2.0 to 3.0	4	*	*
4.0 to 5.0	1	*	*
TOTAL:	159	70.5	63.9
Finfish, liver			
< 0.1	31	13.5	27.1
0.1 to 0.2	17	4.7	9.8
0.2 to 0.3	6	7.0	14.4
0.3 to 0.4	5	1.0	2.1
0.4 to 0.5	1	0.1	0.2
0.5 to 0.6	2	0.3	0.5
0.6 to 0.7	1	0.1	0.3
0.7 to 0.8	2	*	*
0.8 to 0.9	2	1.0	0.8
0.9 to 1.0	4	0.2	0.5
1.0 to 2.0	4	*	*
2.0 to 3.0	3	0.2	0.4
3.0 to 4.0	1	*	*
5.0 to 6.0	1	*	*
7.0 to 8.0	1	*	*
10.0 to 20.0	1	*	*
TOTAL:	82	28.3	56.3
Finfish, whole			
< 0.1	13	31.2	3.7
0.1 to 0.2	3	13.8	0.6
0.2 to 0.3	1	0.4	*
TOTAL:	17	45.4	4.3

Table 3.8. Summarized Distribution of Mean Mercury Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Mollusca, edible tissues			
< 0.1	18	3.8	7.5
Crustacea, edible tissues			
< 0.1	6	6.6	13.7
0.1 to 0.2	9	6.4	13.2
0.2 to 0.3	1	0.7	1.4
	TOTAL: 16	13.7	28.4

^{1/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

^{2/} See page 12 for an explanation of these columns.

^{3/} * denotes less than .05%.

Table 3.9. Summarized Distribution of Mean Molybdenum Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
< 0.1	21	0.4	0.8
0.1 to 0.2	48	5.9	9.6
0.2 to 0.3	61	57.2	40.9
0.3 to 0.4	18	5.6	10.7
0.4 to 0.5	7	0.3	0.7
0.5 to 0.6	4	0.5	1.0
TOTAL:	159	70.5	63.8
Finfish, liver			
< 0.1	4	0.3	0.7
0.1 to 0.2	12	1.1	2.2
0.2 to 0.3	27	9.0	18.0
0.3 to 0.4	16	8.3	15.6
0.4 to 0.5	14	8.6	17.8
0.5 to 0.6	6	0.1	0.3
0.6 to 0.7	1	0.2	0.3
0.9 to 1.0	1	0.1	0.1
1.0 to 2.0	1	0.6	1.3
TOTAL:	82	28.3	56.3
Finfish, whole			
< 0.1	2	0.8	1.3
0.1 to 0.2	2	* <u>3/</u>	*
0.2 to 0.3	5	2.1	2.2
0.3 to 0.4	6	14.9	0.8
0.4 to 0.5	1	23.8	*
0.5 to 0.6	1	3.9	*
TOTAL:	17	45.4	4.3

Table 3.9. Summarized Distribution of Mean Molybdenum Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Mollusca, edible tissues			
< 0.1	1	* ^{3/}	*
0.1 to 0.2	2	*	*
0.2 to 0.3	7	1.0	1.6
0.3 to 0.4	2	1.6	3.5
0.4 to 0.5	2	0.9	1.9
0.5 to 0.6	1	*	*
0.7 to 0.8	2	0.1	0.1
3.0 to 4.0	1	0.1	0.3
TOTAL:	18	3.8	7.5
Crustacea, edible tissues			
0.1 to 0.2	11	4.7	9.8
0.2 to 0.3	3	8.7	18.1
0.3 to 0.4	2	0.2	0.4
TOTAL:	16	13.7	28.4

^{1/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

^{2/} See page 12 for an explanation of these columns.

^{3/} * denotes less than .05%.

Table 3.10. Summarized Distribution of Mean Nickel Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
< 0.1	2	* ^{3/}	*
0.1 to 0.2	36	4.5	7.8
0.2 to 0.3	111	53.1	55.4
0.3 to 0.4	5	12.9	0.7
0.4 to 0.5	1	*	*
0.6 to 0.7	1	*	*
0.7 to 0.8	1	*	*
0.9 to 1.0	1	*	*
2.0 to 3.0	1	*	*
TOTAL:	159	70.5	63.9
Finfish, liver			
0.1 to 0.2	22	11.7	22.4
0.2 to 0.3	32	9.3	24.7
0.3 to 0.4	9	0.3	0.7
0.4 to 0.5	5	0.7	1.5
0.5 to 0.6	8	6.1	6.5
0.6 to 0.7	1	*	0.5
0.8 to 0.9	2	*	*
1.0 to 2.0	1	*	*
2.0 to 3.0	2	*	*
TOTAL:	82	28.3	56.3
Finfish, whole			
0.2 to 0.3	2	0.8	1.1
0.3 to 0.4	6	3.2	2.9
0.4 to 0.5	2	0.1	0.1
0.5 to 0.6	3	1.0	0.2
0.6 to 0.7	1	*	*
0.7 to 0.8	1	3.9	*
0.8 to 0.9	1	12.6	*
0.9 to 1.0	1	23.8	*
TOTAL:	17	45.4	4.3

Table 3.10. Summarized Distribution of Mean Nickel Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Mollusca, edible tissues			
0.2 to 0.3	5	0.7	1.0
0.3 to 0.4	3	0.2	0.4
0.4 to 0.5	1	* ^{3/}	*
0.5 to 0.6	4	2.6	5.4
0.7 to 0.8	2	*	*
1.0 to 2.0	2	0.3	0.7
2.0 to 3.0	1	*	*
TOTAL:	18	3.8	7.5
Crustacea, edible tissues			
0.2 to 0.3	4	3.1	6.4
0.3 to 0.4	8	6.3	13.1
0.4 to 0.5	1	3.0	6.2
0.5 to 0.6	2	1.2	2.5
0.8 to 0.9	1	*	0.1
TOTAL:	16	13.7	28.4

^{1/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

^{2/} See page 12 for an explanation of these columns.

^{3/} * denotes less than .05%.

Table 3.11. Summarized Distribution of Mean Selenium Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
0.1 to 0.2	2	0.2	0.5
0.2 to 0.3	2	* ^{3/}	*
0.3 to 0.4	8	1.1	2.3
0.4 to 0.5	23	11.2	21.2
0.5 to 0.6	29	5.4	8.3
0.6 to 0.7	27	26.4	4.9
0.7 to 0.8	19	13.6	2.1
0.8 to 0.9	17	3.3	5.4
0.9 to 1.0	10	0.7	1.5
1.0 to 2.0	22	8.5	17.7
TOTAL:	159	70.5	63.9
Finfish, liver			
0.6 to 0.7	2	0.1	0.1
0.7 to 0.8	1	0.1	0.2
0.8 to 0.9	3	1.2	2.4
0.9 to 1.0	3	2.1	4.2
1.0 to 2.0	32	7.3	14.7
2.0 to 3.0	17	4.3	7.7
3.0 to 4.0	7	1.2	2.5
4.0 to 5.0	1	*	*
5.0 to 6.0	2	0.1	0.3
6.0 to 7.0	1	3.2	6.7
7.0 to 8.0	1	*	*
8.0 to 9.0	2	1.0	0.8
9.0 to 10.0	2	1.7	3.6
10.0 to 20.0	4	6.0	12.4
20.0 to 30.0	1	0.1	0.2
TOTAL:	79	28.1	55.9
Finfish, whole			
0.3 to 0.4	1	0.1	0.2
0.4 to 0.5	1	*	0.1
0.5 to 0.6	3	3.9	0.1
0.6 to 0.7	1	0.2	0.2
0.7 to 0.8	3	1.4	0.9
0.8 to 0.9	4	25.7	1.8
1.0 to 2.0	4	14.1	1.1
TOTAL:	17		4.3

Table 3.11. Summarized Distribution of Mean Selenium Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Mollusca, edible tissues			
0.1 to 0.2	1	* ^{3/}	*
0.2 to 0.3	1	*	*
0.3 to 0.4	4	1.6	3.2
0.4 to 0.5	5	0.4	0.8
0.5 to 0.6	4	0.5	0.7
0.7 to 0.8	2	1.1	2.3
0.8 to 0.9	1	0.3	0.5
TOTAL:	18	3.8	7.5
Crustacea, edible tissues			
0.2 to 0.3	1	0.2	0.4
0.3 to 0.4	4	2.5	5.1
0.4 to 0.5	1	1.0	2.1
0.5 to 0.6	1	0.5	1.1
0.6 to 0.7	4	5.7	11.9
0.7 to 0.8	2	3.0	6.2
0.8 to 0.9	1	0.7	1.4
1.0 to 2.0	2	*	0.1
TOTAL:	16	13.7	28.4

^{1/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

^{2/} See page 12 for an explanation of these columns.

^{3/} * denotes less than .05%.

Table 3.12. Summarized Distribution of Mean Silver Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
0.1	158	70.5	63.9
0.1 to 0.2	1	* <u>3/</u>	*
TOTAL:	159	70.5	63.9
Finfish, liver			
0.1	66	20.5	40.1
0.1 to 0.2	9	1.3	2.9
0.2 to 0.3	3	4.6	9.5
0.3 to 0.4	3	1.2	2.4
0.5 to 0.6	1	0.6	1.3
TOTAL:	82	28.3	56.3
Finfish, whole			
0.1	10	4.0	4.0
0.1 to 0.2	7	41.4	0.4
TOTAL:	17	45.4	4.3
Mollusca, edible tissues			
0.1	10	2.4	4.5
0.1 to 0.2	3	*	*
0.2 to 0.3	2	0.7	1.0
0.3 to 0.4	2	0.9	1.9
0.6 to 0.7	1	*	*
TOTAL:	18	3.8	7.5

Table 3.12. Summarized Distribution of Mean Silver Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Crustacea, edible tissues			
< 0.1	8	6.9	14.2
0.1 to 0.2	5	3.1	6.3
0.3 to 0.4	2	3.0	6.3
0.4 to 0.5	1	0.7	1.4
TOTAL:	16	13.7	28.2

1/ Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

2/ See page 12 for an explanation of these columns.

3/ * denotes less than .05%.

Table 3.13. Summarized Distribution of Mean Tin Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
0.2 to 0.3	2	0.1	0.2
0.3 to 0.4	6	0.3	0.6
0.4 to 0.5	35	4.5	8.0
0.5 to 0.6	75	25.3	24.9
0.6 to 0.7	23	12.0	21.7
0.7 to 0.8	11	28.2	8.2
0.8 to 0.9	4	* ^{3/}	*
1.0 to 2.0	3	0.1	0.3
TOTAL:	159	70.5	63.9
Finfish, liver			
< 0.1	1	*	*
0.2 to 0.3	8	1.8	2.4
0.3 to 0.4	18	3.5	6.6
0.4 to 0.5	11	5.1	10.3
0.5 to 0.6	14	7.8	16.0
0.6 to 0.7	12	5.3	10.8
0.7 to 0.8	8	3.7	7.6
0.8 to 0.9	3	0.6	1.3
0.9 to 1.0	4	0.2	0.4
1.0 to 2.0	3	0.3	0.7
TOTAL:	82	28.3	56.3
Finfish, whole			
0.3 to 0.4	1	0.5	1.1
0.5 to 0.6	1	0.2	0.2
0.8 to 0.9	1	0.1	0.1
1.0 to 2.0	11	44.1	2.9
2.0 to 3.0	1	0.4	*
4.0 to 5.0	1	*	*
8.0 to 9.0	1	*	*
TOTAL:	17	45.4	4.3

Table 3.13. Summarized Distribution of Mean Tin Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Mollusca, edible tissues			
0.3 to 0.4	1	* ^{3/}	*
0.4 to 0.5	2	1.5	3.1
0.5 to 0.6	3	1.2	2.5
0.6 to 0.7	4	0.9	1.4
0.7 to 0.8	2	0.2	0.4
0.8 to 0.9	2	*	*
0.9 to 1.0	1	*	*
1.0 to 2.0	3	*	*
TOTAL:	18	3.8	7.5
Crustacea, edible tissues			
0.6 to 0.7	5	5.4	11.3
0.7 to 0.8	4	1.5	3.0
0.8 to 0.9	4	4.2	10.8
0.9 to 1.0	2	2.6	3.3
1.0 to 2.0	1	*	*
TOTAL:	16	13.7	28.4

^{1/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

^{2/} See page 12 for an explanation of these columns.

^{3/} * denotes less than .05%.

Table 3.14. Summarized Distribution of Mean Vanadium Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
< 0.1	17	0.6	0.3
0.1 to 0.2	12	0.2	0.3
0.2 to 0.3	56	25.4	22.5
0.3 to 0.4	44	16.2	32.2
0.4 to 0.5	20	27.3	6.8
0.5 to 0.6	4	0.8	1.5
0.6 to 0.7	3	* _{3/}	*
0.7 to 0.8	1	0.1	0.3
0.8 to 0.9	1	*	*
1.0 to 2.0	1	*	*
TOTAL:	159	70.5	63.9
Finfish, liver			
< 0.1	18	2.0	3.5
0.1 to 0.2	4	2.8	5.8
0.2 to 0.3	18	6.2	12.5
0.3 to 0.4	8	6.9	14.4
0.4 to 0.5	8	5.2	10.8
0.5 to 0.6	1	0.1	0.3
0.6 to 0.7	4	0.1	0.2
0.7 to 0.8	3	0.7	1.4
0.8 to 0.9	3	1.3	2.7
0.9 to 1.0	2	0.1	0.3
1.0 to 2.0	10	1.7	3.3
2.0 to 3.0	1	*	*
3.0 to 4.0	1	1.0	0.7
5.0 to 6.0	1	0.1	0.2
TOTAL:	82	28.3	56.3

Table 3.14. Summarized Distribution of Mean Vanadium Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, whole			
< 0.1	1	0.5	1.1
0.1 to 0.2	1	0.2	0.2
0.2 to 0.3	1	* ^{3/}	*
0.3 to 0.4	1	*	0.1
0.4 to 0.5	5	3.2	2.6
0.6 to 0.7	2	0.1	0.1
0.7 to 0.8	3	4.1	0.3
1.0 to 2.0	2	13.6	*
2.0 to 3.0	1	23.8	*
TOTAL:	17	45.4	4.3
Mollusca, edible tissues			
< 0.1	1	*	*
0.1 to 0.2	1	*	*
0.2 to 0.3	5	0.6	0.8
0.3 to 0.4	1	0.2	0.3
0.4 to 0.5	5	2.0	4.0
0.5 to 0.6	2	*	0.1
0.6 to 0.7	1	*	*
0.7 to 0.8	1	0.9	1.9
1.0 to 2.0	1	0.2	0.3
TOTAL:	18	3.8	7.5
Crustacea, edible tissues			
0.1 to 0.2	1	0.9	1.8
0.2 to 0.3	2	*	*
0.3 to 0.4	5	3.5	7.4
0.4 to 0.5	8	9.2	19.2
TOTAL:	16	13.7	28.3

^{1/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

^{2/} See page 12 for an explanation of these columns.

^{3/} * denotes less than .05%.

Table 3.15. Summarized Distribution of Mean Zinc Levels
in Resource Survey Species

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, muscle			
2.0 to 3.0	7	0.3	0.7
3.0 to 4.0	34	6.3	12.4
4.0 to 5.0	48	7.8	14.8
5.0 to 6.0	29	14.2	27.9
6.0 to 7.0	19	38.3	2.0
7.0 to 8.0	8	1.7	2.4
8.0 to 9.0	6	1.7	3.6
9.0 to 10.0	2	* ^{3/}	*
10.0 to 20.0	6	0.1	0.1
TOTAL:	159	70.5	63.9
Finfish, liver			
4.0 to 5.0	1	*	*
5.0 to 6.0	1	*	*
8.0 to 9.0	1	*	*
9.0 to 10.0	1	*	*
10.0 to 20.0	16	2.4	5.0
20.0 to 30.0	19	8.2	16.5
30.0 to 40.0	14	8.6	16.3
40.0 to 50.0	7	1.9	4.0
50.0 to 60.0	6	0.9	1.7
60.0 to 70.0	3	1.1	1.9
70.0 to 80.0	2	4.9	10.1
80.0 to 90.0	1	*	*
90.0 to 100.0	2	0.1	0.2
100.0 to 200.0	3	*	*
200.0 to 300.0	3	0.2	0.3
300.0 to 400.0	1	*	*
600.0 to 700.0	1	*	*
TOTAL:	82	28.3	56.3

Table 3.15. Summarized Distribution of Mean Zinc Levels
in Resource Survey Species (continued)

Range, ppm ^{1/}	No. of Species	Percent of ^{2/} U. S. Catch	Percent of U. S. Catch ^{2/} Intended for Human Consumption
Finfish, whole			
2.0 to 3.0	1	0.5	1.1
6.0 to 7.0	1	0.2	0.2
10.0 to 20.0	10	16.9	3.0
20.0 to 30.0	5	27.8	0.1
TOTAL:	17	45.4	4.3
Mollusca, edible tissues			
5.0 to 6.0	1	* ^{3/}	*
7.0 to 8.0	1	*	*
8.0 to 9.0	1	*	*
10.0 to 20.0	13	2.7	5.2
100.0 to 200.0	1	0.2	0.3
300.0 to 400.0	1	0.9	1.9
TOTAL:	18	3.8	7.5
Crustacea, edible tissues			
10.0 to 20.0	8	7.5	15.5
20.0 to 30.0	3	0.9	1.9
30.0 to 40.0	2	3.0	6.2
40.0 to 50.0	2	1.2	2.5
50.0 to 60.0	1	1.1	2.2
TOTAL:	16	13.7	28.4

^{1/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g. 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

^{2/} See page 12 for an explanation of these columns.

^{3/} * denotes less than .05%.

Table 4.1. Distribution of Mean Antimony Levels in the Resource Survey, by Species

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Antimony Content, ppm ^{2/}																							
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0
078-005	Alewife	muscle	43	40							M																	
		whole	4	4											W													
001-016	Anchovy, northern	whole	40	37											W													
001-006	Anchovy, striped	h & g	40	18										H	W													
002-002	Argentine, Atlantic	h & g	7	4										H														
062-014	Ballyhoo	whole	57	43											W													
005-002	Barracuda, Atlantic	muscle	7	1	M																							
005-001	Barracuda, Pacific	muscle	20	18									M															
006-006	Bass, black sea	muscle	55	39							M																	
		liver	2	2										L														
007-004	Bass, striped	muscle	117	92					M																			
		liver	3	2										L														
012-001	Bluefish	muscle	73	54						M																		
		liver	4	4									L															
091-011	Bonito, Atlantic	muscle	15	1					M																			
091-009	Bonito, Pacific	muscle	40	35									M															
		liver	1	1										L														
021-007	Bullhead, brown	muscle	4	4						M																		
018-014	Butterfish	muscle	72	61							M																	
		whole	17	1						W																		
		h & g	1	1										H														
021-010	Catfish, channel	muscle	20	10					M																			
023-002	Catfish, gafftopsail	muscle	34	30											M													
		liver	3	3									L															
023-001	Catfish, sea	muscle	47	34								M																
		liver	6	5									L															
021-002	Catfish, white	muscle	1	1						M																		
033-008	Cod, Atlantic	muscle	114	39								M																
		liver	35	8						L																		
033-007	Cod, Pacific (gray)	muscle	59	49									M															
		liver	15	11						L																		
045-026	Croaker, Atlantic	muscle	91	64										M														
033-004	Cusk	muscle	76	58										M														
		liver	18	10						L																		
037-004	Cusk-eel, fawn	muscle	2	2											M													
145-018	Dogfish, smooth	muscle	95	62											M													
141-007	Dogfish, spiny	muscle	115	99											M													
		liver	29	22									L															
041-002	Dolphin	muscle	63	33										M														
		liver	28	29										L														
045-019	Drum, banded	muscle	5	2											M													
045-028	Drum, black	muscle	61	51																								
		liver	2	2											L													
045-030	Drum, red	muscle	73	57											M													
		liver	3	3											L													
051-001	Eel, American	muscle	30	22											M													
047-002	Eel, conger	muscle	1	0																								
153-009	Eulachon	whole	33	26											M													
058-028	Flounder, fourspot	muscle	71	47																								
058-024	Flounder, Gulf	muscle	41	38										M														
		liver	1	1																								
058-027	Flounder, southern	muscle	42	25																								
		liver	2	2																								
058-026	Flounder, summer (fluke)	muscle	42	29																								
		liver	2	2																								
058-030	Flounder, windowpane (s.dab)	muscle	18	15											M													
059-030	Flounder, winter	muscle	123	104											M													
		liver	2	2																								
059-005	Flounder, witch	muscle	71	69																								
059-016	Flounder, yellowtail	muscle	89	85																								
		liver	2	2																								
006-040	Gag	muscle	30	27																								
066-009	Goatfish	muscle	40	31											M													
068-001	Goosefish	muscle	80	66											M													
		liver	10	9																								
		h & g	1	0																								
006-037	Grouper, black	muscle	34	31																								
006-017	Grouper, red	muscle	41	36																								
006-038	Grouper, yellowmouth	muscle	10	8																								
		liver	1	1																								
073-015	Grunt, bluestriped (yellow)	muscle	16	6																								

Table 4.1. Distribution of Mean Antimony Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Antimony Content, ppm ^{2/}																							
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0
Finfish																												
073-014	Grunt, white	muscle	17	12												M												
033-011	Haddock	muscle	77	74						M																		
		liver	18	14					L																			
		whole	1	0	W																							
033-013	Hake, Pacific	muscle	49	36						M																		
		liver	1	1	L																							
033-020	Hake, red	muscle	65	64						M																		
033-012	Hake, silver (whiting)	muscle	83	81						M																		
		liver	3	3					L																			
033-024	Hake, spotted	muscle	65	22						M																		
033-025	Hake, white	muscle	70	70						M																		
		liver	31	25					L																			
059-011	Halibut, Pacific	muscle	37	32												M												
		liver	16	15						L																		
143-001	Hammerhead, scalloped	muscle	12	12												M												
143-005	Hammerhead, smooth	muscle	10	8												M												
		liver	7	5												L												
018-011	Harvestfish	muscle	3	2												M												
		whole	16	2					W																			
078-011	Herring, Atlantic	muscle	24	10												M												
		whole	63	63																				W				
		headed	6	6																			E					
		h & g	2	2																			H					
078-001	Herring, blueback	whole	1	1																			W					
078-012	Herring, Pacific	muscle	14	12																			M					
		whole	30	30																			W					
078-015	Herring, round	h & g	50	17																			H					
006-013	Hind, speckled	muscle	20	20																								
		liver	7	7																								
079-068	Jack, (mackerel scad)	muscle	40	30												L												
079-053	Jack, akule	muscle	39	34												M												
079-005	Jack, crevalle	muscle	49	43																								
		liver	4	3																								
079-069	Jack, crevalle (Hawaii)	muscle	39	31																								
149-004	Jacksmelt	whole	20	20																			W					
006-016	Jewfish	muscle	8	6																			M					
045-024	Kingfish, northern	muscle	6	6																								
045-021	Kingfish, southern	muscle	14	14																								
		liver	1	1																			L					
200-002	Ladyfish	muscle	2	2																								
071-005	Lingcod	muscle	78	60																			M					
		liver	13	13																								
091-013	Mackerel, Atlantic	muscle	80	52																								
091-012	Mackerel, chub	muscle	30	29																								
079-034	Mackerel, jack	muscle	10	10																								
		liver	1	1																								
		headed	4	4																								
091-014	Mackerel, king	muscle	107	94																								
		liver	10	9																								
		milt	1	0																								
		roe	11	1																								
091-016	Mackerel, Spanish	muscle	109	91																								
		liver	4	4																								
144-003	Mako, shortfin	muscle	3	3																								
		liver	2	2																								
011-002	Marlin, blue	muscle	33	28																								
		liver	11	7																								
011-005	Marlin, striped	muscle	40	35																								
		liver	9	6																								
011-003	Marlin, white	muscle	54	48																								
		liver	10	8																								
162-012	Mempachi	muscle	20	12																								
		liver	1	0																								
078-010	Menhaden, Atlantic	muscle	10	1	L																							
		whole	101	92																								
078-008	Menhaden, Gulf	muscle	50	44																								
		whole	28	25																								
		guttled	9	7																								
078-009	Menhaden, yellowfin	whole	13	12																								
206-001	Milkfish	muscle	39	35																								

Table 4.1. Distribution of Mean Antimony Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	Ranges of Mean Antimony Content, ppm ^{2/}																										
				# samples in mean	< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0		
Finfish																														
094-010	Mojarra, yellowfin	muscle	10	9																										
098-003	Mullet, silver (white)	muscle	36	36																										
098-002	Mullet, striped	muscle	156	129																										
		liver	5	4																										
079-030	Palometa	muscle	2	0	M																									
131-023	Perch, ocean (Pacific)	muscle	30	22																										
		liver	18	14																										
131-052	Perch, ocean (redfish)	muscle	80	70																										
		liver	2	2																										
006-010	Perch, sand	muscle	1	1																										
168-005	Perch, shiner	whole	2	2		M																								
045-003	Perch, silver	muscle	20	17																										
007-001	Perch, white	muscle	27	26																										
		h & g	19	19																										
079-029	Permit	muscle	9	7																										
073-017	Pigfish	muscle	34	26																										
114-013	Pinfish, spottail	muscle	10	7																										
		liver	1	1																										
059-008	Plaice, American (dab)	muscle	68	66																										
		whole	1	1																										
033-017	Pollock	muscle	73	67																										
		liver	33	23																										
033-019	Pollock, walleye (Alaska)	muscle	48	46																										
		liver	3	3																										
079-028	Pompano, Florida	muscle	60	56																										
		liver	4	3																										
114-014	Porgy, red	muscle	22	21																										
		liver	1	0																										
056-018	Pout, ocean	muscle	34	24																										
		liver	3	2																										
131-061	Rockfish, bocaccio	muscle	48	25																										
		liver	4	4																										
131-063	Rockfish, canary	muscle	44	23																										
		liver	1	1																										
131-031	Rockfish, copper	muscle	10	10																										
131-043	Rockfish, yellowtail	muscle	20	15																										
079-004	Runner, blue	muscle	56	52																										
		liver	4	3																										
126-001	Sablefish	muscle	103	87																										
		liver	14	10																										
011-001	Sailfish	muscle	42	37																										
		liver	3	3																										
179-020	Salmon, chinook, (King)	muscle	109	47																										
		liver	22	11																										
179-017	Salmon, chum (keta)	muscle	57	41																										
		liver	5	4																										
179-013	Salmon, cono (silver)	muscle	68	47																										
		liver	7	7																										
179-016	Salmon, pink	muscle	27	22																										
		liver	3	3																										
179-019	Salmon, sockeye (red)	muscle	62	47																										
		liver	4	4																										
079-015	Scad, round	h & g	3	3																										
006-041	Scamp	muscle	10	10																										
		liver	1	1																										
132-031	Sculpin, longhorn	muscle	1	0																										
114-016	Scup	muscle	72	45																										
135-010	Searobin, northern	muscle	78	33																										
135-011	Searobin, striped	muscle	10	9																										
045-012	SeatROUT, gray (weakfish)	muscle	72	47																										
		liver	3	3																										
		whole	10	11																										
045-007	SeatROUT, sand	muscle	18	18																										
045-010	SeatROUT, silver (white)	muscle	44	40																										
		liver	1	1																										
045-008	SeatROUT, spotted (speckled)	muscle	89	77																										
		liver	3	3																										
078-006	Shad, American	muscle	60	51																										
145-025	Shark, Atlantic, sharpnose	muscle	1	1																										
145-006	Shark, blacktip	muscle	16	16																										
		liver	4	3																										

Table 4.1. Distribution of Mean Antimony Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Antimony Content, ppm ^{2/}																								
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0	
Finfish																													
145-023	Shark, blue	muscle	14	14																									
		liver	9	7																									
145-010	Shark, dusky	muscle	4	3																									
145-009	Shark, sandbar	muscle	13	12																									
		liver	7	5																									
144-001	Shark, white	muscle	2	1																									
114-001	Sheepshead	muscle	60	39																									
		liver	2	2																									
150-005	Skate, little	muscle	54	18																									
		liver	2	2																									
150-012	Skate, winter	muscle	2	2																									
		liver	1	1																									
155-005	Snapper, blackfin	muscle	13	12																									
155-025	Snapper, gray	muscle	40	38																									
155-008	Snapper, gray (mangrove)	muscle	28	23																									
155-006	Snapper, red	muscle	38	29																									
155-024	Snapper, red (ehu)	muscle	40	34																									
155-015	Snapper, vermilion	muscle	36	28																									
		liver	2	1																									
155-013	Snapper, yellowtail	muscle	43	37																									
157-004	Snook	muscle	12	11																									
059-021	Sole, Dover	muscle	70	53																									
		liver	4	2																									
059-022	Sole, English	muscle	73	58																									
		liver	5	4																									
059-004	Sole, petrale	muscle	56	49																									
		liver	7	4																									
059-006	Sole, rex	muscle	61	51																									
059-014	Sole, rock	muscle	10	9																									
011-004	Spearfish, shortbill	muscle	15	15																									
		liver	4	2																									
045-020	Spot	muscle	54	36																									
166-003	Sturgeon, green	muscle	10	5																									
168-001	Surfperch, barred	muscle	20	20																									
200-003	Tarpon	muscle	11	9																									
		liver	2	1																									
185-022	Tautog	muscle	14	14																									
174-003	Tilefish	muscle	60	60																									
179-028	Trout, cutthroat	muscle	3	3																									
179-029	Trout, rainbow (steelhead)	muscle	9	9																									
		liver	1	1																									
091-019	Tuna, albacore	muscle	40	33																									
		liver	5	5																									
091-022	Tuna, bigeye	muscle	40	40																									
		liver	21	20																									
091-021	Tuna, blackfin	muscle	1	0																									
091-023	Tuna, bluefin	muscle	11	9																									
		liver	1	0																									
091-008	Tuna, skipjack	muscle	70	60																									
		liver	8	8																									
091-020	Tuna, yellowfin	muscle	80	74																									
		liver	26	23																									
091-006	Tunny, little	muscle	50	41																									
		liver	2	1																									
091-001	Wahoo	muscle	18	10																									
		liver	3	2																									
183-002	Wolffish, Atlantic	muscle	60	49																									
		liver	15	15																									
079-023	Yellowtail	muscle	24	22																									
Mollusca																													
187-005	Abalone, green	shucked	10	9																									
187-008	Abalone, red	shucked	10	8																									
191-003	Clam, butter	shucked	29	25																									
191-001	Clam, hard (quahog)	shucked	141	116																									
191-008	Clam, Pacific littleneck	shucked	1	1																									
243-002	Clam, razor	shucked	39	32																									
242-001	Clam, soft	shucked	19	0																									
244-005	Clam, surf	shucked	23	0																									
205-001	Octopus (marmoratus)	whole	4	3																									
		mantle	36	32																									

Table 4.2. Distribution of Mean Arsenic Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Arsenic Content, ppm ^{2/}																								
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0	
Finfish																													
145-023	Shark, blue	muscle	14	14																									
		liver	7	7																									
145-010	Shark, dusky	muscle	3	3																									
145-009	Shark, sandbar	muscle	11	11																									
		liver	7	7																									
144-001	Shark, white	muscle	1	1																									
114-001	Sheepshead	muscle	59	59																									
		liver	2	2																									
150-005	Skate, little	muscle	54	54																									
		liver	2	2																									
150-012	Skate, winter	muscle	2	2																									
		liver	1	1																									
155-005	Snapper, blackfin	muscle	11	11																									
155-025	Snapper, gray	muscle	39	39																									
155-008	Snapper, gray (mangrove)	muscle	26	25																									
155-006	Snapper, red	muscle	33	31																									
155-024	Snapper, red (ehu)	muscle	38	38																									
155-015	Snapper, vermillion	muscle	35	35																									
		liver	2	2																									
155-013	Snapper, yellowtail	muscle	43	43																									
157-004	Snook	muscle	12	12																									
059-021	Sole, Dover	muscle	64	64																									
		liver	3	3																									
059-022	Sole, English	muscle	70	70																									
		liver	4	4																									
059-004	Sole, petrale	muscle	53	53																									
		liver	6	6																									
059-006	Sole, rex	muscle	58	57																									
059-014	Sole, rock	muscle	10	10																									
011-004	Spearfish, shortbill	muscle	15	15																									
		liver	4	3																									
045-020	Spot	muscle	53	53																									
166-003	Sturgeon, green	muscle	10	10																									
168-001	Surfperch, barred	muscle	20	20																									
200-003	Tarpon	muscle	12	12																									
		liver	2	2																									
185-022	Tautog	muscle	14	14																									
174-003	Tilefish	muscle	59	59																									
179-028	Trout, cutthroat	muscle	3	3																									
179-029	Trout, rainbow (steelhead)	muscle	9	9																									
		liver	1	1																									
091-019	Tuna, albacore	muscle	40	40																									
		liver	4	4																									
091-022	Tuna, bigeye	muscle	37	37																									
		liver	19	19																									
091-021	Tuna, blackfin	muscle	1	1																									
091-023	Tuna, bluefin	muscle	11	11																									
		liver	1	1																									
091-008	Tuna, skipjack	muscle	69	69																									
		liver	5	5																									
091-020	Tuna, yellowfin	muscle	77	76																									
		liver	25	25																									
091-006	Tunny, little	muscle	47	46																									
		liver	2	2																									
091-001	Wahoo	muscle	18	16																									
		liver	2	2																									
183-002	Wolfish, Atlantic	muscle	60	60																									
		liver	14	14																									
079-023	Yellowtail	muscle	24	23																									
Mollusca																													
187-005	Abalone, green	shucked	10	10																									
187-008	Abalone, red	shucked	8	8																									
191-003	Clam, butter	shucked	28	28																									
191-001	Clam, hard (quahog)	shucked	140	140																									
191-008	Clam, Pacific littleneck	shucked	1	1																									
243-002	Clam, razor	shucked	38	38																									
242-001	Clam, soft	shucked	19	19																									
244-005	Clam, surf	shucked	23	23																									
205-001	Octopus (marmoratus)	whole	4	4																									
		mantle	34	34																									

Table 4.2. Distribution of Mean Arsenic Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Arsenic Content, ppm ^{2/}																								
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0	
Mollusca																													
189-001	Oyster, eastern	shucked	148	145																	S								
189-002	Oyster, Pacific (giant)	shucked	69	68																	S								
190-014	Scallop, Atlantic bay	adductor muscle	20	20												A													
190-016	Scallop, calico	shucked	10	10																			S						
		adductor muscle	19	19														A											
190-028	Scallop, pink	adductor muscle	5	5												A													
190-013	Scallop, sea (smooth)	adductor muscle	11	11												A													
188-003	Squid, Atlantic longfinned	whole	23	23																	W								
		mantle	110	110														N											
188-006	Squid, Pacific	whole	50	50												W													
188-014	Squid, shortfinned	mantle	90	90														N											
Crustacea																													
196-001	Crab, blue	body meat	34	34													B												
		claw meat	5	5													C												
		claw & body meat	52	52																	D								
196-011	Crab, dungeness	meat, unk.	39	39																	U								
		claw & body meat	6	6																		D							
196-012	Crab, king	meat, unk.	20	20																	U								
		claw & body meat	9	9																	D								
196-006	Crab, red, deep sea	meat, unk.	25	25																								U	
196-003	Crab, rock	meat, unk.	15	15																								U	
196-035	Crab, tanner (bairdi)	meat, unk.	50	50																								U	
194-012	Lobster, northern (American)	body meat	2	2																								B	
		claw meat	2	2																								C	
		tail meat	2	2																								T	
		leg meat	1	1																								F	
		claw & tail meat	79	79																								K	
194-002	Lobster, spiny (Atlantic)	tail meat	39	39																								T	
194-003	Lobster, spiny (Pacific)	tail meat	4	4																								T	
192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	17														P											
192-005	Shrimp, brown	tail, peeled	49	47																								P	
192-007	Shrimp, ocean	tail, peeled	10	10															P										
192-010	Shrimp, pink	tail, peeled	49	49																	P								
192-011	Shrimp, pink (northern)	tail, peeled	64	64																								P	
192-003	Shrimp, royal red	tail, peeled	12	12																									
192-004	Shrimp, white	tail, peeled	75	75																								P	

1/ The letters in the boxes correspond to the tissue or cut of fish analyzed, as follows: a, adductor muscle; b, body meat; c, claw meat; d, claw & body meat; e, headed; f, leg meat; g, gutted; h, headed and gutted; k, claw & tail meat; l, liver; m, muscle; n, mantle, skinless; p, tail, peeled; q, milt; r, roe; s, shucked; t, tail meat; u, meat, unk.; w, whole.

2/ Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g., 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

Table 4.3. Distribution of Mean Cadmium Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Cadmium Content, ppm ^{2/}																							
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0
Finfish																												
073-014	Grunt, white	muscle	17	17	M																							
033-011	Haddock	muscle	77	74	M																							
		liver	17	17		L																						
		whole	1	0	W																							
033-013	Hake, Pacific	muscle	49	38	M																							
		liver	1	1																								
033-020	Hake, red	muscle	65	65	M																							
033-012	Hake, silver (whiting)	muscle	81	79	M																							
		liver	3	3		L																						
033-024	Hake, spotted	muscle	65	65	M																							
033-025	Hake, white	muscle	69	66	M																							
		liver	31	29	L																							
059-011	Halibut, Pacific	muscle	37	30	M																							
		liver	16	16																								
143-001	Hammerhead, scalloped	muscle	12	12	M																							
143-005	Hammerhead, smooth	muscle	10	10	M																							
		liver	7	7																								
018-011	Harvestfish	muscle	3	3	M																							
		whole	16	16		W																						
078-011	Herring, Atlantic	muscle	24	24	M																							
		whole	63	63		W																						
		headed	6	6	E																							
		h & g	2	2		H																						
078-001	Herring, blueback	whole	1	1	W																							
078-012	Herring, Pacific	muscle	14	12	M																							
		whole	30	30		W																						
078-015	Herring, round	h & g	50	50		H																						
006-013	Hind, speckled	muscle	20	20	M																							
		liver	7	7																								
079-068	Jack, (mackerel scad)	muscle	39	38	M																							
079-053	Jack, akule	muscle	39	36	M																							
079-005	Jack, crevalle	muscle	49	41	M																							
		liver	4	4																								
079-069	Jack, crevalle (Hawaii)	muscle	40	40	M																							
149-004	Jacksmelt	whole	20	20		W																						
006-016	Jawfish	muscle	8	6	M																							
045-024	Kingfish, northern	muscle	6	6	M																							
045-021	Kingfish, southern	muscle	14	14	M																							
		liver	1	1																								
200-002	Ladyfish	muscle	2	1	M																							
071-005	Lingcod	muscle	78	66	M																							
		liver	13	13																								
091-013	Mackerel, Atlantic	muscle	80	80	M																							
091-012	Mackerel, chub	muscle	30	30	M																							
079-034	Mackerel, jack	muscle	10	10	M																							
		liver	1	1																								
		headed	4	4		E																						
091-014	Mackerel, king	muscle	107	91	M																							
		liver	10	10																								
		milt	1	1		Q																						
		roe	11	11		R																						
091-016	Mackerel, Spanish	muscle	108	89	M																							
		liver	4	4																								
144-003	Mako, shortfin	muscle	3	3	M																							
		liver	2	2																								
011-002	Marlin, blue	muscle	33	29		M																						
		liver	11	11																								
011-005	Marlin, striped	muscle	40	37		M																						
		liver	9	9																								
011-003	Marlin, white	muscle	53	51		M																						
		liver	9	9																								
162-012	Mempachi	muscle	20	17	M																							
		liver	1	1																								
078-010	Menhaden, Atlantic	muscle	10	10	M																							
		whole	100	100																								
078-008	Menhaden, Gulf	muscle	50	48	M																							
		whole	28	28		W																						
		gutted	9	9																								
078-009	Menhaden, yellowfin	whole	13	13		W																						
206-001	Milkfish	muscle	40	37	M																							

Table 4.3. Distribution of Mean Cadmium Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Cadmium Content, ppm ^{2/}																						
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0
Finfish																											
145-023	Shark, blue	muscle	14	14	M																						
		liver	9	9																							
145-010	Shark, dusky	muscle	4	4	M																						
145-009	Shark, sandbar	muscle	13	13	M																						
		liver	6	5																							
144-001	Shark, white	muscle	2	2	M																						
114-001	Sheepshead	muscle	60	55	M																						
		liver	2	2																							
150-005	Skate, little	muscle	54	54	M																						
		liver	2	2																							
150-012	Skate, winter	muscle	2	2	M																						
		liver	1	1																							
155-005	Snapper, blackfin	muscle	13	13	M																						
155-025	Snapper, gray	muscle	40	40	M																						
155-008	Snapper, gray (mangrove)	muscle	28	27	M																						
155-006	Snapper, red	muscle	38	26	M																						
155-024	Snapper, red (ehu)	muscle	40	40	M																						
155-015	Snapper, vermilion	muscle	36	31	M																						
		liver	2	2																							
155-013	Snapper, yellowtail	muscle	43	41	M																						
157-004	Snook	muscle	12	12	M																						
059-021	Sole, Dover	muscle	70	56	M																						
		liver	4	4																							
059-022	Sole, English	muscle	73	53	M																						
		liver	5	5																							
059-004	Sole, petrale	muscle	56	46	M																						
		liver	7	7																							
059-006	Sole, rex	muscle	61	44	M																						
059-014	Sole, rock	muscle	10	10	M																						
011-004	Spearfish, shortbill	muscle	15	15	M																						
		liver	4	4																							
045-020	Spot	muscle	54	43	M																						
166-003	Sturgeon, green	muscle	10	8	M																						
168-001	Surfperch, barred	muscle	20	20	M																						
200-003	Tarpon	muscle	12	11	M																						
		liver	2	2																							
185-022	Tautog	muscle	14	14	M																						
174-003	Tilefish	muscle	60	59	M																						
179-028	Trout, cutthroat	muscle	3	3	M																						
179-029	Trout, rainbow (steelhead)	muscle	8	8	M																						
		liver	1	1																							
091-019	Tuna, albacore	muscle	40	36	M																						
		liver	5	5																							
091-022	Tuna, bigeye	muscle	40	35	M																						
		liver	21	21																							
091-021	Tuna, blackfin	muscle	1	1	M																						
091-023	Tuna, bluefin	muscle	11	10	M																						
		liver	1	1																							
091-008	Tuna, skipjack	muscle	70	63	M																						
		liver	8	8																							
091-020	Tuna, yellowfin	muscle	80	76	M																						
		liver	26	26																							
091-006	Tunny, little	muscle	50	50	M																						
		liver	2	2																							
091-001	Wahoo	muscle	18	17	M																						
		liver	3	3																							
183-002	Wolffish, Atlantic	muscle	60	59	M																						
		liver	15	15																							
079-023	Yellowtail	muscle	23	23	M																						
Mollusca																											
187-005	Abalone, green	shucked	10	10																							
187-008	Abalone, red	shucked	10	9																							
191-003	Clam, butter	shucked	28	28																							
191-001	Clam, hard (quahog)	shucked	141	141																							
191-008	Clam, Pacific littleneck	shucked	1	1																							
243-002	Clam, razor	shucked	39	37																							
242-001	Clam, soft	shucked	19	19																							
244-005	Clam, surf	shucked	23	23																							
205-001	Octopus (marmoratus)	whole	4	4																							
		mantle	35	35																							

Table 4.4. Distribution of Mean Chromium Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Chromium Content, ppm ^{2/}																																						
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0															
189-001	Oyster, eastern	shucked	150	142																																							
189-002	Oyster, Pacific (giant)	shucked	70	67					S																																		
190-014	Scallop, Atlantic bay	adductor muscle	20	19		A																																					
190-016	Scallop, calico	shucked	10	10							S																																
		adductor muscle	19	18		A																																					
190-028	Scallop, pink	adductor muscle	5	5					A																																		
190-013	Scallop, sea (smooth)	adductor muscle	10	9					A																																		
188-003	Squid, Atlantic longfinned	whole	23	23						W																																	
		mantle	106	105						N																																	
188-006	Squid, Pacific	whole	49	47						W																																	
188-014	Squid, shortfinned	mantle	90	86						N																																	
Crustacea																																											
196-001	Crab, blue	body meat	35	35			B																																				
		claw meat	5	5						C																																	
		claw & body meat	54	53						D																																	
196-011	Crab, dungeness	meat, unk.	41	39				U																																			
		claw & body meat	8	8						D																																	
196-012	Crab, king	meat, unk.	20	20						U																																	
		claw & body meat	9	8						D																																	
196-006	Crab, red, deep sea	meat, unk.	24	24						U																																	
196-003	Crab, rock	meat, unk.	15	15						U																																	
196-035	Crab, tanner (bairdi)	meat, unk.	47	45						U																																	
194-012	Lobster, northern (American)	body meat	2	2								B																															
		claw meat	2	1									C																														
		tail meat	2	2						T																																	
		leg meat	2	2						F																																	
		claw & tail meat	79	78						K																																	
194-002	Lobster, spiny (Atlantic)	tail meat	40	38						T																																	
194-003	Lobster, spiny (Pacific)	tail meat	5	5						T																																	
192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	16						P																																	
192-005	Shrimp, brown	tail, peeled	52	48						P																																	
192-007	Shrimp, ocean	tail, peeled	10	10						P																																	
192-010	Shrimp, pink	tail, peeled	50	50						P																																	
192-011	Shrimp, pink (northern)	tail, peeled	61	60						P																																	
192-003	Shrimp, royal red	tail, peeled	12	12						P																																	
192-004	Shrimp, white	tail, peeled	77	73						P																																	

1/ The letters in the boxes correspond to the tissue or cut of fish analyzed, as follows: a, adductor muscle; b, body meat; c, claw meat; d, claw & body meat; e, headed; f, leg meat; g, gutted; h, headed and gutted; k, claw & tail meat; l, liver; m, muscle; n, mantle, skinless; p, tail, peeled; q, milt; r, roe; s, shucked; t, tail meat; u, meat, unk.; w, whole.

2/ Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g., 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

Table 4.5. Distribution of Mean Copper Levels in the Resource Survey; by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Copper Content, ppm ^{2/}																									
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 110.0			
Mollusca																														
189-001	Oyster, eastern	shucked	151	151																									S	
189-002	Oyster, Pacific (giant)	shucked	70	70																									S	
190-014	Scallop, Atlantic bay	adductor muscle	20	20			A																							
190-016	Scallop, calico	shucked	10	10															S											
		adductor muscle	20	20			A																							
190-028	Scallop, pink	adductor muscle	5	5			A																							
190-013	Scallop, sea (smooth)	adductor muscle	11	11			A																							
188-003	Squid, Atlantic longfinned	whole	22	22																									W	
		mantle	110	110															N											
188-006	Squid, Pacific	whole	50	50																									W	
188-014	Squid, shortfinned	mantle	92	92															N											
Crustacea																														
196-001	Crab, blue	body meat	35	35																									B	
		claw meat	5	5																									C	
		claw & body meat	54	54																									D	
196-011	Crab, dungeness	meat, unk.	42	42																									U	
		claw & body meat	8	8																										
196-012	Crab, king	meat, unk.	19	19																										
		claw & body meat	9	9																									D	
196-006	Crab, red, deep sea	meat, unk.	25	25																									U	
196-003	Crab, rock	meat, unk.	15	15																									U	
196-035	Crab, tanner (bairdi)	meat, unk.	50	50																									U	
194-012	Lobster, northern (American)	body meat	2	2																										
		claw meat	2	2																									B	
		tail meat	2	2																									C	
		leg meat	2	2																										
		claw & tail meat	79	79																									F	
194-002	Lobster, spiny (Atlantic)	tail meat	40	40																									K	
194-003	Lobster, spiny (Pacific)	tail meat	5	5																										
192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	17																									T	
192-005	Shrimp, brown	tail, peeled	53	53																										
192-007	Shrimp, ocean	tail, peeled	10	10																									P	
192-010	Shrimp, pink	tail, peeled	50	50																									P	
192-011	Shrimp, pink (northern)	tail, peeled	63	63																									P	
192-003	Shrimp, royal red	tail, peeled	12	12																									P	
192-004	Shrimp, white	tail, peeled	74	74																									P	

1/ The letters in the boxes correspond to the tissue or cut of fish analyzed, as follows: a, adductor muscle; b, body meat; c, claw meat; d, claw & body meat; e, headed; f, leg meat; g, gutted; h, headed and gutted; k, claw & tail meat; l, liver; m, muscle; n, mantle, skinless; p, tail, peeled; q, milt; r, roe; s, shucked; t, tail meat; u, meat, unk.; w, whole.

2/ Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g., 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

Table 4.6. Distribution of Mean Lead Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Lead Content, ppm ^{2/}																								
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0	
Finfish																													
094-010	Mojarra, yellowfin	muscle	10	10																									
098-003	Mullet, silver (white)	muscle	36	36																									
098-002	Mullet, striped	muscle	155	151																									
		liver	5	5																									
079-030	Palometa	muscle	2	2																									
131-023	Perch, ocean (Pacific)	muscle	30	27																									
		liver	18	18																									
131-052	Perch, ocean (redfish)	muscle	79	79																									
		liver	2	2																									
006-010	Perch, sand	muscle	1	1																									
168-005	Perch, shiner	whole	2	2																									
045-003	Perch, silver	muscle	20	20																									
007-001	Perch, white	muscle	27	27																									
		h & g	19	19																									
079-029	Permit	muscle	9	9																									
073-017	Pigfish	muscle	33	33																									
114-013	Pinfish, spottail	muscle	10	10																									
		liver	1	1																									
059-008	Plaice, American (dab)	muscle	66	66																									
		whole	1	1																									
033-017	Pollock	muscle	72	72																									
		liver	32	29																									
033-019	Pollock, walleye (Alaska)	muscle	48	48																									
		liver	3	3																									
079-028	Pompano, Florida	muscle	57	56																									
		liver	4	4																									
114-014	Porgy, red	muscle	22	22																									
		liver	1	1																									
056-018	Pout, ocean	muscle	34	34																									
		liver	3	3																									
131-061	Rockfish, bocaccio	muscle	48	46																									
		liver	4	4																									
131-063	Rockfish, canary	muscle	44	41																									
		liver	1	1																									
131-031	Rockfish, copper	muscle	10	10																									
131-043	Rockfish, yellowtail	muscle	20	19																									
079-004	Runner, blue	muscle	54	54																									
		liver	4	4																									
126-001	Sablefish	muscle	103	99																									
		liver	14	14																									
011-001	Sailfish	muscle	41	41																									
		liver	3	3																									
179-020	Salmon, chinook, (king)	muscle	110	108																									
		liver	20	19																									
179-017	Salmon, chum (keta)	muscle	55	55																									
		liver	5	5																									
179-018	Salmon, coho (silver)	muscle	67	65																									
		liver	7	7																									
179-016	Salmon, pink	muscle	26	25																									
		liver	3	3																									
179-019	Salmon, sockeye (red)	muscle	58	57																									
		liver	4	4																									
079-013	Scad, round	h & g	3	3																									
006-041	Scamp	muscle	10	10																									
		liver	1	1																									
132-031	Sculpin, longhorn	muscle	1	1																									
114-016	Scup	muscle	71	70																									
135-010	Searobin, northern	muscle	76	76																									
135-011	Searobin, striped	muscle	10	10																									
045-012	Seatrout, gray (weakfish)	muscle	70	69																									
		liver	3	3																									
		whole	10	10																									
045-007	Seatrout, sand	muscle	18	18																									
045-010	Seatrout, silver (white)	muscle	38	38																									
		liver	1	1																									
045-008	Seatrout, spotted (speckled)	muscle	88	80																									
		liver	3	3																									
078-006	Shad, American	muscle	60	60																									
145-025	Shark, Atlantic, sharpnose	muscle	1	1																									
145-006	Shark, blacktip	muscle	16	16																									
		liver	4	4																									

Table 4.6. Distribution of Mean Lead Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Lead Content, ppm ^{2/}																							
					<0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0
					Finfish																							
145-023	Shark, blue	muscle	14	14																								
		liver	9	9																								
145-010	Shark, dusky	muscle	4	4																								
145-009	Shark, sandbar	muscle	13	13																								
		liver	6	6																								
144-001	Shark, white	muscle	2	2																								
114-001	Sheepshead	muscle	55	55																								
		liver	2	2																								
150-005	Skate, little	muscle	54	54																								
		liver	2	2																								
150-012	Skate, winter	muscle	2	2																								
		liver	1	1																								
155-005	Snapper, blackfin	muscle	12	12																								
155-025	Snapper, gray	muscle	39	39																								
155-008	Snapper, gray (mangrove)	muscle	28	27																								
155-006	Snapper, red	muscle	35	34																								
155-024	Snapper, red (ehu)	muscle	39	39																								
155-015	Snapper, vermilion	muscle	36	35																								
		liver	2	2																								
155-013	Snapper, yellowtail	muscle	41	41																								
157-004	Snook	muscle	12	12																								
059-021	Sole, Dover	muscle	69	66																								
		liver	4	4																								
059-022	Sole, English	muscle	73	71																								
		liver	5	5																								
059-004	Sole, petrale	muscle	57	56																								
		liver	7	7																								
059-006	Sole, rex	muscle	61	60																								
059-014	Sole, rock	muscle	10	10																								
011-004	Spearfish, shortbill	muscle	14	14																								
		liver	4	4																								
045-020	Spot	muscle	54	53																								
166-003	Sturgeon, green	muscle	10	8																								
168-001	Surfperch, barred	muscle	20	20																								
200-003	Tarpon	muscle	12	12																								
		liver	2	2																								
185-022	Tautog	muscle	14	14																								
174-003	Tilefish	muscle	60	60																								
179-028	Trout, cutthroat	muscle	3	3																								
179-029	Trout, rainbow (steelhead)	muscle	9	9																								
		liver	1	1																								
091-019	Tuna, albacore	muscle	5	5																								
		liver	5	4																								
091-022	Tuna, bigeye	muscle	40	40																								
		liver	1	1																								
091-021	Tuna, blackfin	muscle	1	1																								
091-023	Tuna, bluefin	muscle	11	10																								
		liver	0	0																								
091-008	Tuna, skipjack	muscle	5	5																								
		liver	5	5																								
091-020	Tuna, yellowfin	muscle	3	3																								
		liver	2	2																								
091-006	Tunny, little	muscle	1	1																								
		liver	1	1																								
091-001	Wahoo	muscle	1	1																								
		liver	1	1																								
183-002	Wolffish, Atlantic	muscle	1	1																								
		liver	1	1																								
079-023	Yellowtail	muscle	2	2																								
Mollusca																												
187-005	Abalone, green	shucked	10	10																								
187-008	Abalone, red	shucked	10	9																								
191-003	Clam, butter	shucked	29	28																								
191-001	Clam, hard (quahog)	shucked	14	13																								
191-008	Clam, Pacific littleneck	shucked	1	1																								
243-002	Clam, razor	shucked	36	36																								
242-001	Clam, soft	shucked	19	19																								
244-005	Clam, surf	shucked	21	22																								
205-001	Octopus (marmoratus)	whole	4	4																								
		mantle	35	35																								

Table 4.6. Distribution of Mean Lead Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Lead Content, ppm ^{2/}																																		
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0											
Mollusca																																							
189-001	Oyster, eastern	shucked	151	149						S																													
189-002	Oyster, Pacific (giant)	shucked	70	64						S																													
190-014	Scallop, Atlantic bay	adductor muscle	20	20				A																															
190-016	Scallop, calico	shucked	10	10								S																											
		adductor muscle	19	18					A																														
190-028	Scallop, pink	adductor muscle	5	5				A																															
190-013	Scallop, sea (smooth)	adductor muscle	11	11					A																														
188-003	Squid, Atlantic longfinned	whole	22	22						W																													
		mantle	107	107						N																													
188-006	Squid, Pacific	whole	50	49						W																													
188-014	Squid, shortfinned	mantle	91	91						N																													
Crustacea																																							
196-001	Crab, blue	body meat	35	35							B																												
		claw meat	5	5								C																											
		claw & body meat	54	54							K																												
196-011	Crab, dungeness	meat, unk.	41	40							U																												
		claw & body meat	8	8							D																												
196-012	Crab, king	meat, unk.	20	20							U																												
		claw & body meat	8	8							D																												
196-006	Crab, red, deep sea	meat, unk.	24	24							U																												
196-003	Crab, rock	meat, unk.	15	15								U																											
196-035	Crab, tanner (bairdi)	meat, unk.	41	41							U																												
194-012	Lobster, northern (American)	body meat	2	2							B																												
		claw meat	2	2								C																											
		tail meat	2	2								T																											
		leg meat	2	2									F																										
		claw & tail meat	80	80								K																											
194-002	Lobster, spiny (Atlantic)	tail meat	40	40								T																											
194-003	Lobster, spiny (Pacific)	tail meat	5	5								T																											
192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	17								P																											
192-005	Shrimp, brown	tail, peeled	53	52								P																											
192-007	Shrimp, ocean	tail, peeled	10	10								P																											
192-010	Shrimp, pink	tail, peeled	49	49								P																											
192-011	Shrimp, pink (northern)	tail, peeled	64	64								P																											
192-003	Shrimp, royal red	tail, peeled	12	12								P																											
192-004	Shrimp, white	tail, peeled	77	73								P																											

1/ The letters in the boxes correspond to the tissue or cut of fish analyzed, as follows: a, adductor muscle; b, body meat; c, claw meat; d, claw & body meat; e, headed; f, leg meat; g, gutted; h, headed and gutted; k, claw & tail meat; l, liver; m, muscle; n, mantle, skinless; p, tail, peeled; q, milt; r, roe; s, shucked; t, tail meat; u, meat, unk.; w, whole.

2/ Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g., 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

Table 4.7. Distribution of Mean Manganese Levels in the Resource Survey, by Species

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Manganese Content, ppm ^{2/}																						
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0
078-005	Alewife	muscle	42	42				M																			
		whole	4	4																							
001-016	Anchovy, northern	whole	40	40																							
001-006	Anchovy, striped	h & g	40	40																							
002-002	Argentine, Atlantic	h & g	7	7				H																			
062-014	Ballyhoo	whole	57	57																							
005-002	Barracuda, Atlantic	muscle	7	7			M																				
005-001	Barracuda, Pacific	muscle	20	20			M																				
006-006	Bass, black sea	muscle	55	53			M																				
		liver	2	2																							
007-004	Bass, striped	muscle	112	110			M																				
		liver	3	3																							
012-001	Bluefish	muscle	73	73			M																				
		liver	4	4																							
091-011	Bonito, Atlantic	muscle	15	15			M																				
091-009	Bonito, Pacific	muscle	40	40			M																				
		liver	1	1																							
021-007	Bullhead, brown	muscle	4	4							M																
018-014	Butterfish	muscle	71	71			M																				
		whole	17	17																							
		h & g	1	1																							
021-010	Catfish, channel	muscle	20	20			M																				
023-002	Catfish, gaftopsail	muscle	34	33			M																				
		liver	3	3																							
023-001	Catfish, sea	muscle	47	47																							
		liver	6	6			M																				
021-002	Catfish, white	muscle	1	1			M																				
033-008	Cod, Atlantic	muscle	113	113			M																				
		liver	35	35																							
033-007	Cod, Pacific (gray)	muscle	58	54			M																				
		liver	15	15																							
045-026	Croaker, Atlantic	muscle	92	91				M																			
033-004	Cusk	muscle	76	76			M																				
		liver	18	18																							
037-004	Cusk-eel, fawn	muscle	2	2																							
145-018	Dogfish, smooth	muscle	95	95			M																				
141-007	Dogfish, spiny	muscle	115	114			M																				
		liver	29	29																							
041-002	Dolphin	muscle	63	62			M																				
		liver	28	28																							
045-019	Drum, banded	muscle	5	5				M																			
045-028	Drum, black	muscle	61	59			M																				
		liver	2	2																							
045-030	Drum, red	muscle	73	73			M																				
		liver	3	3																							
051-001	Eel, American	muscle	30	30																							
047-002	Eel, conger	muscle	1	1				M																			
153-009	Eulachon	whole	33	33																							
058-028	Flounder, fourspot	muscle	71	71				M																			
058-024	Flounder, Gulf	muscle	40	40																							
		liver	1	1																							
058-027	Flounder, southern	muscle	42	42				M																			
		liver	2	2																							
058-026	Flounder, summer (fluke)	muscle	42	42				M																			
		liver	2	2																							
058-030	Flounder, windowpane (s.dab)	muscle	18	18				M																			
059-030	Flounder, winter	muscle	123	123																							
		liver	2	2																							
059-005	Flounder, witch	muscle	70	70																							
059-016	Flounder, yellowtail	muscle	89	89																							
		liver	2	2																							
006-040	Gag	muscle	30	28				M																			
066-009	Goatfish	muscle	40	40																							
068-001	Goosefish	muscle	79	78				M																			
		liver	10	10																							
		h & g	1	1																							
006-037	Grouper, black	muscle	34	33				M																			
006-017	Grouper, red	muscle	41	40				M																			
006-038	Grouper, yellowmouth	muscle	10	10				M																			
		liver	1	1																							
073-015	Grunt, bluestriped (yellow)	muscle	16	16				M																			

Table 4.7. Distribution of Mean Manganese Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Manganese Content, ppm ^{2/}																								
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0	
Finfish																													
073-014	Grunt, white	muscle	17	17	M																								
033-011	Haddock	muscle	77	77		M																							
		liver	18	18																									
		whole	1	1					W																				
033-013	Hake, Pacific	muscle	49	48		M																							
		liver	1	1																									
033-020	Hake, red	muscle	65	65		M																							
033-012	Hake, silver (whiting)	muscle	83	82		M																							
		liver	3	3																									
033-024	Hake, spotted	muscle	65	65			M																						
033-025	Hake, white	muscle	70	70		M																							
		liver	31	31																									
059-011	Halibut, Pacific	muscle	37	36		M																							
		liver	16	16																									
143-001	Hammerhead, scalloped	muscle	12	12		M																							
143-005	Hammerhead, smooth	muscle	10	10		M																							
		liver	7	7																									
018-011	Harvestfish	muscle	3	3		M																							
		whole	16	16																									
078-011	Herring, Atlantic	muscle	24	24			M																						
		whole	63	63																									
		headed	6	6																									
		h & g	2	2																									
078-001	Herring, blueback	whole	1	1																									
078-012	Herring, Pacific	muscle	14	14																									
		whole	30	30																									
		h & g	50	50																									
006-013	Hind, speckled	muscle	19	19		M																							
		liver	7	7																									
079-068	Jack, (mackerel scad)	muscle	40	40																									
079-053	Jack, akule	muscle	39	39		M																							
079-005	Jack, crevalle	muscle	48	48		M																							
		liver	4	4																									
079-069	Jack, crevalle (Hawaii)	muscle	40	40		M																							
149-004	Jacksmelt	whole	20	20																									
006-016	Jewfish	muscle	8	8		M																							
045-024	Kingfish, northern	muscle	6	6			M																						
045-021	Kingfish, southern	muscle	14	14			M																						
		liver	1	1																									
200-002	Ladyfish	muscle	2	2																									
071-005	Lingcod	muscle	78	77			M																						
		liver	13	13																									
091-013	Mackerel, Atlantic	muscle	80	80			M																						
091-012	Mackerel, chub	muscle	29	28			M																						
079-034	Mackerel, jack	muscle	10	10			M																						
		liver	1	1																									
		headed	4	4																									
091-014	Mackerel, king	muscle	107	105			M																						
		liver	10	10																									
		milt	1	1																									
		roe	11	11																									
091-016	Mackerel, Spanish	muscle	109	107			M																						
		liver	4	4																									
144-003	Mako, shortfin	muscle	3	3		M																							
		liver	2	2																									
011-002	Marlin, blue	muscle	32	30			M																						
		liver	11	11																									
011-005	Marlin, striped	muscle	40	39			M																						
		liver	9	9																									
011-003	Marlin, white	muscle	54	53			M																						
		liver	10	10																									
162-012	Mempachi	muscle	20	18			M																						
		liver	1	1																									
078-010	Menhaden, Atlantic	muscle	10	10																									
		whole	101	101																									
078-008	Menhaden, Gulf	muscle	50	50																									
		whole	28	27																									
		guttled	9	9																									
078-009	Menhaden, yellowfin	whole	13	13																									
206-001	Milkfish	muscle	40	40			M																						

Table 4.7. Distribution of Mean Manganese Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Manganese Content, ppm ^{2/}																							
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0
Finfish																												
145-023	Shark, blue	muscle	13	13	M																							
		liver	9	9																								
145-010	Shark, dusky	muscle	4	4		M																						
145-009	Shark, sandbar	muscle	13	13	M																							
		liver	7	7																								
144-001	Shark, white	muscle	2	2	M																							
114-001	Sheepshead	muscle	60	60	M																							
		liver	2	2																								
150-005	Skate, little	muscle	53	53																								
		liver	2	2																								
150-012	Skate, winter	muscle	2	2																								
		liver	1	1																								
155-005	Snapper, blackfin	muscle	13	13	M																							
155-025	Snapper, gray	muscle	40	40	M																							
155-008	Snapper, gray (mangrove)	muscle	28	28	M																							
155-006	Snapper, red	muscle	38	36	M																							
155-024	Snapper, red (ehu)	muscle	40	40																								
155-015	Snapper, vermilion	muscle	36	36	M																							
		liver	2	2																								
155-013	Snapper, yellowtail	muscle	43	43	M																							
157-004	Snook	muscle	12	12	M																							
059-021	Sole, Dover	muscle	69	67	M																							
		liver	4	4																								
059-022	Sole, English	muscle	73	73		M																						
		liver	5	5																								
059-004	Sole, petrale	muscle	56	55	M																							
		liver	7	7																								
059-006	Sole, rex	muscle	60	60	M																							
059-014	Sole, rock	muscle	10	9	M																							
011-004	Spearfish, shortbill	muscle	15	15	M																							
		liver	4	4																								
045-020	Spot	muscle	54	53																								
166-003	Sturgeon, green	muscle	10	10		M																						
168-001	Surfperch, barred	muscle	20	20																								
200-003	Tarpon	muscle	12	12	M																							
		liver	2	2																								
185-022	Tautog	muscle	14	14		M																						
174-003	Tilefish	muscle	60	60	M																							
179-028	Trout, cutthroat	muscle	3	3	M																							
179-029	Trout, rainbow (steelhead)	muscle	9	9	M																							
		liver	1	1																								
091-019	Tuna, albacore	muscle	40	40	M																							
		liver	5	5																								
091-022	Tuna, bigeye	muscle	40	40	M																							
		liver	21	21																								
091-021	Tuna, blackfin	muscle	1	1	M																							
091-023	Tuna, bluefin	muscle	11	11	M																							
		liver	1	1																								
091-008	Tuna, skipjack	muscle	70	69	M																							
		liver	8	8																								
091-020	Tuna, yellowfin	muscle	79	78	M																							
		liver	26	26																								
091-006	Tunny, little	muscle	50	50	M																							
		liver	2	2																								
091-001	Wahoo	muscle	18	17	M																							
		liver	3	3																								
183-002	Wolffish, Atlantic	muscle	59	59	M																							
		liver	14	14																								
079-023	Yellowtail	muscle	23	23	M																							
Mollusca																												
187-005	Abalone, green	shucked	10	10																								
187-008	Abalone, red	shucked	10	10																								
191-003	Clam, butter	shucked	29	29		S																						
191-001	Clam, hard (quahog)	shucked	141	141																								
191-008	Clam, Pacific littleneck	shucked	1	1																								
243-002	Clam, razor	shucked	39	39																								
242-001	Clam, soft	shucked	19	19																								
244-005	Clam, surf	shucked	23	23																								
205-001	Octopus (marmoratus)	whole	4	4																								
		mantle	35	35		N																						

Table 4.8. Distribution of Mean Mercury Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Mercury Content, ppm ^{2/}																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
Finfish																										073-014	Grunт, white	muscle	17	17		M																				033-011	Haddock	muscle	77	69	M																					liver	18	1	L																					whole	1	1	W																						033-013	Hake, Pacific	muscle	49	48		M																				liver	1	0	L																					033-020	Hake, red	muscle	65	59		M																				033-012	Hake, silver (whiting)	muscle	83	60		M																				liver	3	0	L																					033-024	Hake, spotted	muscle	64	45		M																				033-025	Hake, white	muscle	70	60		M																				liver	31	7	L																					059-011	Halibut, Pacific	muscle	37	34		M																				liver	16	8			L																			143-001	Hammerhead, scalloped	muscle	12	12																						143-005	Hammerhead, smooth	muscle	10	10																						liver	7	7																						018-011	Harvestfish	muscle	3	3		M																				078-011	Herring, Atlantic	whole	16	1		W																				muscle	24	5		M																				078-001	Herring, blueback	whole	63	19		W																				headed	0	1		E																				078-001	Herring, blueback	h & g	2	2		H																				whole	1	0		W																				078-012	Herring, Pacific	muscle	14	14		M																				078-015	Herring, round	whole	30	1			W																			h & g	50	12		H																				006-013	Hind, speckled	muscle	20	20		M																				liver	7	7																						079-068	Jack, (mackerel scad)	muscle	38	19		M																				079-053	Jack, akule	muscle	39	37		M																				079-005	Jack, crevalle	muscle	49	49																						liver	4	4																						079-069	Jack, crevalle (Hawaii)	muscle	39	39																						149-004	Jacksmelt	whole	20	16		W																				006-016	Jewfish	muscle	7	8			M																			045-024	Kingfish, northern	muscle	7	2		M																				045-021	Kingfish, southern	muscle	14	12		M																				liver	1	1		L																				200-002	Ladyfish	muscle	2	2																						071-005	Lingcod	muscle	75	78			M																			liver	13	11																						091-013	Mackerel, Atlantic	muscle	87	43		M																				091-012	Mackerel, chub	muscle	31	28		M																				079-034	Mackerel, jack	muscle	10	10				M																		liver	1	1																						091-014	Mackerel, king	headed	4	1		E																				muscle	1	10			M																			091-016	Mackerel, Spanish	liver	1	1																						milt	1	1																						roe	11	11																							muscle	109	109		R																					144-003	Mako, shortfin	liver	4	3			L																			muscle	3	3																						011-002	Marlin, blue	liver	2	2																						muscle	33	33																						011-005	Marlin, striped	liver	11	11																						muscle	40	4																						011-003	Marlin, white	liver	9	9			L																			muscle	53	52																						162-012	Mempachi	liver	11	11																						muscle	20	20			M																			078-010	Menhaden, Atlantic	liver	1	1																						muscle	10	10			M																			078-008	Menhaden, Gulf	whole	100	2		W																				muscle	50	15			M																			078-009	Menhaden, yellowfin	whole	28	19		W																				guttled	8	4		G																				206-001	Milkfish	whole	13	8		W																						muscle	40	26		M																			
073-014	Grunт, white	muscle	17	17		M																				033-011	Haddock	muscle	77	69	M																							liver	18	1	L																					whole	1	1	W																						033-013	Hake, Pacific	muscle	49	48		M																						liver	1	0	L																					033-020	Hake, red	muscle	65	59		M																				033-012	Hake, silver (whiting)	muscle	83	60		M																						liver	3	0	L																					033-024	Hake, spotted	muscle	64	45		M																				033-025	Hake, white	muscle	70	60		M																						liver	31	7	L																					059-011	Halibut, Pacific	muscle	37	34		M																						liver	16	8			L																			143-001	Hammerhead, scalloped	muscle	12	12																						143-005	Hammerhead, smooth	muscle	10	10																								liver	7	7																						018-011	Harvestfish	muscle	3	3		M																				078-011	Herring, Atlantic	whole	16	1		W																						muscle	24	5		M																				078-001	Herring, blueback	whole	63	19		W																						headed	0	1		E																				078-001	Herring, blueback	h & g	2	2		H																						whole	1	0		W																				078-012	Herring, Pacific	muscle	14	14		M																				078-015	Herring, round	whole	30	1			W																					h & g	50	12		H																				006-013	Hind, speckled	muscle	20	20				M																				liver	7	7																						079-068	Jack, (mackerel scad)	muscle	38	19		M																				079-053	Jack, akule	muscle	39	37		M																				079-005	Jack, crevalle	muscle	49			49																						liver	4	4																						079-069	Jack, crevalle (Hawaii)	muscle	39	39																						149-004	Jacksmelt	whole	20	16		W																				006-016	Jewfish	muscle	7	8			M																			045-024	Kingfish, northern	muscle	7	2		M																				045-021	Kingfish, southern			muscle	14	12		M																				liver	1	1		L																				200-002	Ladyfish	muscle	2	2																								071-005	Lingcod	muscle	75	78			M																			liver	13	11																						091-013	Mackerel, Atlantic	muscle	87	43		M																				091-012	Mackerel, chub	muscle	31	28		M																						079-034	Mackerel, jack	muscle	10	10				M																		liver	1	1																								091-014	Mackerel, king	headed	4	1		E																				muscle	1	10			M																					091-016	Mackerel, Spanish	liver	1	1																						milt	1	1																						roe	11	11																							muscle	109	109		R																							144-003	Mako, shortfin	liver	4	3			L																			muscle	3	3																								011-002	Marlin, blue	liver	2	2																						muscle	33	33																								011-005	Marlin, striped	liver	11	11																						muscle	40	4																								011-003	Marlin, white	liver	9	9			L																			muscle	53	52																								162-012	Mempachi	liver	11	11																						muscle	20	20			M																					078-010	Menhaden, Atlantic	liver	1	1																						muscle	10	10					M																			078-008	Menhaden, Gulf	whole	100	2		W																				muscle	50			15			M																			078-009	Menhaden, yellowfin	whole	28	19		W																				guttled	8	4		G																				206-001	Milkfish	whole	13	8		W																					
033-011	Haddock	muscle	77	69	M																							liver	18	1	L																							whole	1	1	W																						033-013	Hake, Pacific	muscle	49	48		M																						liver	1	0	L																					033-020	Hake, red	muscle	65	59		M																				033-012	Hake, silver (whiting)	muscle	83	60		M																						liver	3	0	L																					033-024	Hake, spotted	muscle	64	45		M																				033-025	Hake, white	muscle	70	60		M																						liver	31	7	L																					059-011	Halibut, Pacific	muscle	37	34		M																						liver	16	8			L																			143-001	Hammerhead, scalloped	muscle	12	12																						143-005	Hammerhead, smooth	muscle	10	10																								liver	7	7																						018-011	Harvestfish	muscle	3	3		M																				078-011	Herring, Atlantic	whole	16	1		W																						muscle	24	5		M																				078-001	Herring, blueback	whole	63	19		W																						headed	0	1		E																				078-001	Herring, blueback	h & g	2	2		H																						whole	1	0		W																				078-012	Herring, Pacific	muscle	14	14		M																				078-015	Herring, round	whole	30	1			W																					h & g	50	12		H																				006-013	Hind, speckled	muscle	20	20		M																						liver	7	7																						079-068	Jack, (mackerel scad)	muscle	38	19		M																				079-053	Jack, akule	muscle	39	37		M																				079-005	Jack, crevalle	muscle	49	49																								liver	4	4																						079-069	Jack, crevalle (Hawaii)	muscle	39	39																						149-004	Jacksmelt	whole	20	16		W																				006-016	Jewfish	muscle	7	8			M																			045-024	Kingfish, northern	muscle	7	2		M																				045-021	Kingfish, southern	muscle	14	12		M																						liver	1	1		L																				200-002	Ladyfish	muscle	2	2																						071-005	Lingcod	muscle	75	78			M																					liver	13	11																						091-013	Mackerel, Atlantic	muscle	87	43		M																				091-012	Mackerel, chub	muscle	31	28		M																				079-034	Mackerel, jack	muscle	10	10				M																				liver	1	1																						091-014	Mackerel, king	headed	4	1		E																						muscle	1	10			M																			091-016	Mackerel, Spanish	liver	1	1																										milt	1	1																						roe	11	11																							muscle	109	109		R																					144-003	Mako, shortfin	liver	4	3			L																					muscle	3	3																						011-002	Marlin, blue	liver	2	2																								muscle	33	33																						011-005	Marlin, striped	liver	11	11																								muscle	40	4																						011-003	Marlin, white	liver	9	9			L																					muscle	53	52																						162-012	Mempachi	liver	11	11																								muscle	20	20			M																			078-010	Menhaden, Atlantic	liver	1	1																								muscle	10	10			M																			078-008	Menhaden, Gulf	whole	100	2		W																						muscle	50	15			M																			078-009	Menhaden, yellowfin	whole	28	19		W																						guttled	8	4		G																				206-001	Milkfish	whole	13	8		W																						muscle	40	26		M																	
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Table 4.8. Distribution of Mean Mercury Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Mercury Content, ppm ^{2/}																					
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	1.0 to 1.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0
094-010	Mojarra, yellowfin	muscle	10	6	M																					
098-003	Mullet, silver (white)	muscle	36	8	M																					
098-002	Mullet, striped	muscle	156	36	M																					
		liver	5	5	L																					
079-030	Palometta	muscle	2	2				M																		
131-023	Perch, ocean (Pacific)	muscle	30	21	M																					
		liver	17	5	L																					
131-052	Perch, ocean (redfish)	muscle	80	77		M																				
		liver	2	2		L																				
006-010	Perch, sand	muscle	1	1							M															
168-005	Perch, shiner	whole	2	0	W																					
045-003	Perch, silver	muscle	20	20	M																					
007-001	Perch, white	muscle	27	27		M																				
		h & g	18	16	H																					
079-029	Permit	muscle	9	9		M																				
073-017	Pigfish	muscle	34	32		M																				
114-013	Pinfish, spottail	muscle	10	10			M																			
		liver	1	1		L																				
059-008	Plaice, American (dab)	muscle	68	50	M																					
		whole	1	0	W																					
033-017	Pollock	muscle	73	70		M																				
		liver	32	10		L																				
033-019	Pollock, walleye (Alaska)	muscle	47	35		M																				
		liver	3	1		L																				
079-028	Pompano, Florida	muscle	61	56		M																				
		liver	4	3		L																				
114-014	Porgy, red	muscle	22	22			M																			
		liver	1	1				L																		
056-018	Pout, ocean	muscle	34	29		M																				
		liver	3	0		L																				
131-061	Rockfish, bocaccio	muscle	47	47			M																			
		liver	4	3		L																				
131-063	Rockfish, canary	muscle	44	43		M																				
		liver	2	1		L																				
131-031	Rockfish, copper	muscle	10	10		M																				
131-043	Rockfish, yellowtail	muscle	20	20		M																				
079-004	Runner, blue	muscle	55	53			M																			
		liver	4	4			L																			
126-001	Sablefish	muscle	102	99			M																			
		liver	15	15				L																		
011-001	Sailfish	muscle	43	42				M																		
		liver	3	3					L																	
179-020	Salmon, chinook, (king)	muscle	108	84		M										L										
		liver	22	11		L																				
179-017	Salmon, chum (keta)	muscle	55	30		M																				
		liver	5	3				L																		
179-018	Salmon, coho (silver)	muscle	69	49		M																				
		liver	7	4		L																				
179-016	Salmon, pink	muscle	29	11		M																				
		liver	3	0		L																				
179-019	Salmon, sockeye (red)	muscle	60	27		M																				
		liver	4	2		L																				
079-013	Scad, round	h & g	3	2		H																				
006-041	Scamp	muscle	10	10				M																		
		liver	1	1												L										
132-031	Sculpin, longhorn	muscle	1	1				M																		
114-016	Scup	muscle	72	47		M																				
135-010	Searobin, northern	muscle	77	73			M																			
135-011	Searobin, striped	muscle	10	10		M																				
045-012	Seatrout, gray (weakfish)	muscle	71	70			M																			
		liver	3	3		L																				
		whole	10	6		W																				
045-007	Seatrout, sand	muscle	18	14			M																			
045-010	Seatrout, silver (white)	muscle	43	30			M																			
		liver	1	1		L																				
045-008	Seatrout, spotted (speckled)	muscle	88	87			M																			
		liver	3	3		L																				
078-006	Shad, American	muscle	60	29		M																				
145-025	Shark, Atlantic, sharpnose	muscle	1	1						M																
145-006	Shark, blacktip	muscle	16	16							M															
		liver	4	3			L																			

Table 4.8. Distribution of Mean Mercury Levels in the Resource Survey, by Species (continued)

Ranges of Mean Mercury Content, pp-2/

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Mercury Content, pp-2/													
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 1.1	1.1 to 1.2	1.2 to 1.3	1.3 to 1.4
Mollusca																		
189-001	Oyster, eastern	shucked	153	73	S													
189-002	Oyster, Pacific (giant)	shucked	69	30	S													
190-014	Scallop, Atlantic bay	adductor muscle	20	2	A													
190-016	Scallop, calico	shucked	10	4	S													
		adductor muscle	20	7	A													
190-028	Scallop, pink	adductor muscle	5	1	A													
190-013	Scallop, sea (smooth)	adductor muscle	11	4	A													
188-003	Squid, Atlantic longfinned	whole	23	14	W													
		mantle	109	51	N													
188-006	Squid, Pacific	whole	9	7	W													
188-014	Squid, shortfinned	mantle	90	47	N													
Crustacea																		
196-001	Crab, blue	body meat	34	34	B													
		claw meat	1	1	C													
		claw & body meat	1	1	B													
196-011	Crab, dungeness	meat, unk.	10	10	U													
196-012	Crab, king	claw & body meat	9	9	D													
196-006	Crab, red, deep sea	meat, unk.	25	25	U													
196-003	Crab, rock	meat, unk.	15	15	U													
196-035	Crab, tanner (bairdi)	meat, unk.	49	35	U													
194-012	Lobster, northern (American)	body meat	2	2	B													
		claw meat	2	2	C													
		tail meat	2	2	T													
		leg meat	2	2	F													
		claw & tail meat	80	80	K													
194-002	Lobster, spiny (Atlantic)	tail meat	40	36	T													
194-003	Lobster, spiny (Pacific)	tail meat	5	5	T													
192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	6	P													
192-005	Shrimp, brown	tail, peeled	53	30	P													
192-007	Shrimp, ocean	tail, peeled	10	4	P													
192-010	Shrimp, pink	tail, peeled	15	23	P													
192-011	Shrimp, pink (northern)	tail, peeled	63	30	P													
192-003	Shrimp, royal red	tail, peeled	11	11	P													
192-004	Shrimp, white	tail, peeled	77	51	P													

1/ The letters in the boxes correspond to the tissue or cut of fish analyzed, as follows: a, adductor muscle; b, body meat; c, claw meat; d, claw & body meat; e, headed; f, leg meat; g, gutted; h, headed and gutted; k, claw & tail meat; l, liver; m, muscle; n, mantle, skinless; p, tail, peeled; q, meat; r, roe; s, shucked; t, tail meat; u, meat, unk.; w, whole.

2/ Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g., 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

Table 4.9. Distribution of Mean Molybdenum Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Molybdenum Content, ppm ^{2/}																							
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0
073-014	Grunt, white	muscle	17	2		M																						
033-011	Haddock	muscle	77	20		M																						
		liver	18	14			L																					
		whole	1	0		W																						
033-013	Hake, Pacific	muscle	48	8			M																					
		liver	1	1			L																					
033-020	Hake, red	muscle	65	16			M																					
033-012	Hake, silver (whiting)	muscle	83	26			M																					
		liver	3	3			L																					
033-024	Hake, spotted	muscle	65	3			M																					
033-025	Hake, white	muscle	70	24			M																					
		liver	70	22			L																					
059-011	Halibut, Pacific	muscle	37	11			M																					
		liver	16	10			L																					
143-001	Hammerhead, scalloped	muscle	12	5			M																					
143-005	Hammerhead, smooth	muscle	10	2			M																					
		liver	7	6							L																	
018-011	Harvestfish	muscle	3	0			M																					
		whole	16	15			W																					
078-011	Herring, Atlantic	muscle	24	7			M																					
		whole	63	56						W																		
		headed	6	4						E																		
		h & g	2	1						H																		
078-001	Herring, blueback	whole	1	0			W																					
078-012	Herring, Pacific	muscle	14	4										M														
		whole	30	24						W																		
078-015	Herring, round	h & g	50	35						H																		
006-013	Hind, speckled	muscle	20	1			M																					
		liver	7	7						L																		
079-068	Jack, (mackerel scad)	muscle	40	4			M																					
079-053	Jack, akule	muscle	39	9			M																					
079-005	Jack, crevalle	muscle	49	14									M															
		liver	4	3											L													
079-069	Jack, crevalle (Hawaii)	muscle	40	6						M																		
149-004	Jacksnelt	whole	20	15						W																		
006-016	Jewfish	muscle	8	4											M													
045-024	Kingfish, northern	muscle	6	0			M																					
045-021	Kingfish, southern	muscle	14	4																								
		liver	1	1						L																		
200-002	Ladyfish	muscle	2	0			M																					
071-005	Lingcod	muscle	78	20			M																					
		liver	13	12																								
091-013	Mackerel, Atlantic	muscle	80	15			M									L												
091-012	Mackerel, chub	muscle	30	16			M																					
079-034	Mackerel, jack	muscle	10	2						M																		
		liver	1	1											L													
		headed	4	3						H																		
091-014	Mackerel, king	muscle	107	20											M													
		liver	10	9												L												
		milt	1	0						Q																		
		roe	11	0						R																		
091-016	Mackerel, Spanish	muscle	109	33										M														
		liver	4	4																								
144-003	Mako, shortfin	muscle	3	1			M																					
		liver	2	1											L													
011-002	Marlin, blue	muscle	33	5										M														
		liver	11	8																								
011-005	Marlin, striped	muscle	40	2													M											
		liver	9	7														L										
011-003	Marlin, white	muscle	54	8										M														
		liver	10	10												L												
162-012	Mempachi	muscle	19	6							M																	
		liver	1	1						L																		
078-010	Menhaden, Atlantic	muscle	10	3							M																	
		whole	100	96											W													
078-008	Menhaden, Gulf	muscle	50	11							M																	
		whole	28	27														W										
		guttled	9	9																								
078-009	Menhaden, yellowfin	whole	13	12																								
206-001	Milkfish	muscle	40	4																								

Table 4.9. Distribution of Mean Molybdenum Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Molybdenum Content, ppm ^{2/}																						
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0
Finfish																											
094-010	Mojarra, yellowfin	muscle	10	6																							
098-003	Mullet, silver (white)	muscle	36	2		M																					
098-002	Mullet, striped	muscle	158	34			M																				
		liver	5	4																							
079-030	Palometa	muscle	2	0	M																						
131-023	Perch, ocean (Pacific)	muscle	30	6		M																					
		liver	18	15			L																				
131-052	Perch, ocean (redfish)	muscle	80	20			M																				
		liver	2	1				L																			
006-010	Perch, sand	muscle	1	0	M																						
168-005	Perch, shiner	whole	2	2				W																			
045-003	Perch, silver	muscle	20	7			M																				
007-001	Perch, white	muscle	27	8			M																				
		h & g	19	18					H																		
079-029	Permit	muscle	9	2						M																	
073-017	Pigfish	muscle	34	14			M																				
114-013	Pinfish, spottail	muscle	13	4						M																	
		liver	1	1						L																	
059-008	Plaice, American (dab)	muscle	68	9			M																				
		whole	1	1				W																			
033-017	Pollock	muscle	73	13				M																			
		liver	33	22			L																				
033-019	Pollock, walleye (Alaska)	muscle	48	9			M																				
		liver	3	3			L																				
079-028	Pompano, Florida	muscle	62	13			M																				
		liver	4	4							L																
114-014	Porgy, red	muscle	22	7			M																				
		liver	1	1						L																	
056-018	Pout, ocean	muscle	34	7			M																				
		liver	3	1						L																	
131-061	Rockfish, bocaccio	muscle	42	13			M																				
		liver	4	2						L																	
131-063	Rockfish, canary	muscle	43	17				M																			
		liver	1	0		L																					
131-031	Rockfish, copper	muscle	11	2				M																			
131-043	Rockfish, yellowtail	muscle	11	3				M																			
079-004	Runner, blue	muscle	58	17			M																				
		liver	4	2						L																	
126-001	Sablefish	muscle	123	28				M																			
		liver	14	7						L																	
011-001	Sailfish	muscle	42	4							M																
		liver	3	3							L																
179-020	Salmon, chinook, (king)	muscle	110	43				M																			
		liver	22	17							L																
179-017	Salmon, chum (keta)	muscle	57	17					M																		
		liver	5	4							L																
179-018	Salmon, coho (silver)	muscle	68	27				M																			
		liver	7	3							L																
179-016	Salmon, pink	muscle	27	15				M																			
		liver	4	3							L																
179-019	Salmon, sockeye (red)	muscle	62	11					M																		
		liver	4	4							L																
079-013	Scad, round	h & g	3	1					H																		
006-041	Scamp	muscle	11	3				M																			
		liver	11	3							L																
132-031	Sculpin, longhorn	muscle	1	0	M																						
114-016	Scup	muscle	72	21					M																		
135-010	Searobin, northern	muscle	78	13				M																			
135-011	Searobin, striped	muscle	11	0	M																						
045-012	Seatrout, gray (weakfish)	muscle	72	22				M																			
		liver	3	2							L																
		whole	10	10							W																
045-007	Seatrout, sand	muscle	18	8				M																			
045-010	Seatrout, silver (white)	muscle	44	8				M																			
		liver	1	1							L																
045-008	Seatrout, spotted (speckled)	muscle	89	18				M																			
		liver	3	2							L																
078-006	Shad, American	muscle	60	9				M																			
145-025	Shark, Atlantic, sharpnose	muscle	1	1					M																		
145-006	Shark, blacktip	muscle	16	6					M																		
		liver	4	2							L																

Table 4.9. Distribution of Mean Molybdenum Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Molybdenum Content, ppm ^{2/}																							
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0
Finfish																												
145-023	Shark, blue	muscle	14	6		M																						
		liver	9	8																								
145-010	Shark, dusky	muscle	4	0	M																							
145-009	Shark, sandbar	muscle	13	5			M																					
		liver	6	5				L																				
144-001	Shark, white	muscle	2	0	M																							
114-001	Sheepshead	muscle	60	11				M																				
		liver	2	2					L																			
150-005	Skate, little	muscle	54	27			M																					
		liver	2	2						L																		
150-012	Skate, winter	muscle	2	1		M																						
		liver	1	1						L																		
155-005	Snapper, blackfin	muscle	13	5		M																						
155-025	Snapper, gray	muscle	40	7				M																				
155-008	Snapper, gray (mangrove)	muscle	28	3					M																			
155-006	Snapper, red	muscle	38	8				M																				
155-024	Snapper, red (ehu)	muscle	40	5				M																				
155-015	Snapper, vermilion	muscle	36	8							M																	
		liver	2	1				L																				
155-013	Snapper, yellowtail	muscle	43	8			M																					
157-004	Snook	muscle	12	5			M																					
059-021	Sole, Dover	muscle	69	13				M																				
		liver	4	4				L																				
059-022	Sole, English	muscle	72	23					M																			
		liver	5	3						L																		
059-004	Sole, petrale	muscle	56	21					M																			
		liver	7	6						L																		
059-006	Sole, rex	muscle	61	10						M																		
059-014	Sole, rock	muscle	10	5					M																			
011-004	Spearfish, shortbill	muscle	15	4			M																					
		liver	4	2						L																		
045-020	Spot	muscle	54	12				M																				
166-003	Sturgeon, green	muscle	10	3							M																	
168-001	Surfperch, barred	muscle	20	11				M																				
200-003	Tarpon	muscle	12	3				M																				
		liver	2	1								L																
185-022	Tautog	muscle	14	5					M																			
174-003	Tilefish	muscle	60	6				M																				
179-028	Trout, cutthroat	muscle	3	1			M																					
179-029	Trout, rainbow (steelhead)	muscle	9	2				M																				
		liver	1	1									L															
091-019	Tuna, albacore	muscle	40	11						M																		
		liver	5	5																								
091-022	Tuna, bigeye	muscle	40	9							M																	
		liver	21	21																		L						
091-021	Tuna, blackfin	muscle	1	0		M																						
091-023	Tuna, bluefin	muscle	11	3					M																			
		liver	1	1										L														
091-008	Tuna, skipjack	muscle	70	14						M																		
		liver	8	6										L														
091-020	Tuna, yellowfin	muscle	80	18							M																	
		liver	26	25																		L						
091-006	Tunny, little	muscle	50	5								M																
		liver	2	2											L													
091-001	Wahoo	muscle	18	4												M												
		liver	3	3																		L						
183-002	Wolffish, Atlantic	muscle	60	10				M																				
		liver	15	12							L																	
079-023	Yellowtail	muscle	24	3									M															
Mollusca																												
187-005	Abalone, green	shucked	10	9																			S					
187-008	Abalone, red	shucked	9	2																				S				
191-003	Clam, butter	shucked	29	22										S														
191-001	Clam, hard (quahog)	shucked	137	122											S													
191-008	Clam, Pacific littleneck	shucked	-1	1								S																
243-002	Clam, razor	shucked	39	19											S													
242-001	Clam, soft	shucked	19	19												S												
244-005	Clam, surf	shucked	23	23												S												
205-001	Octopus (marmoratus)	whole	4	4													W											
		mantle	36	7																			N					

Table 4.9. Distribution of Mean Molybdenum Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Molybdenum Content, ppm ^{2/}																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
Mollusca																													189-001	Oyster, eastern	shucked	152	100																									189-002	Oyster, Pacific (giant)	shucked	70	41			S																						190-014	Scallop, Atlantic bay	adductor muscle	20	14		A																							190-016	Scallop, calico	shucked	10	10				S																							adductor muscle	20	13								A																	190-028	Scallop, pink	adductor muscle	5	0	A																								190-013	Scallop, sea (smooth)	adductor muscle	11	5												A													188-003	Squid, Atlantic longfinned	whole	23	8		W																									mantle	110	25			N																						188-006	Squid, Pacific	whole	50	22		W																							188-014	Squid, shortfinned	mantle	92	22		N																							Crustacea																														196-001	Crab, blue	body meat	35	24		B																									claw meat	5	1			C																								claw & body meat	53	34			D																						196-011	Crab, dungeness	meat, unk.	42	17		U																									claw & body meat	8	5			D																						196-012	Crab, king	meat, unk.	20	17		U																									claw & body meat	9	3			D																						196-006	Crab, red, deep sea	meat, unk.	25	11		U																							196-003	Crab, rock	meat, unk.	15	13		U																							196-035	Crab, tanner (bairdi)	meat, unk.	50	8		U																							194-012	Lobster, northern (American)	body meat	2	2			E																								claw meat	2	0		C																									tail meat	2	1			T																								leg meat	2	1			F																								claw & tail meat	80	43			K																						194-002	Lobster, spiny (Atlantic)	tail meat	40	17				T																					194-003	Lobster, spiny (Pacific)	tail meat	5	5				T																					192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	3				P																					192-005	Shrimp, brown	tail, peeled	53	15					P																				192-007	Shrimp, ocean	tail, peeled	10	3					P																				192-010	Shrimp, pink	tail, peeled	50	25					P																				192-011	Shrimp, pink (northern)	tail, peeled	64	19					P																				192-003	Shrimp, royal red	tail, peeled	12	6					P																				192-004	Shrimp, white	tail, peeled	76	27					P																			
189-001	Oyster, eastern	shucked	152	100																									189-002	Oyster, Pacific (giant)	shucked	70	41			S																						190-014	Scallop, Atlantic bay	adductor muscle	20	14		A																							190-016	Scallop, calico	shucked	10	10				S																							adductor muscle	20	13								A																	190-028	Scallop, pink	adductor muscle	5	0	A																								190-013	Scallop, sea (smooth)	adductor muscle	11	5												A													188-003	Squid, Atlantic longfinned	whole	23	8		W																									mantle	110	25			N																						188-006	Squid, Pacific	whole	50	22		W																							188-014	Squid, shortfinned	mantle	92	22		N																							Crustacea																														196-001	Crab, blue	body meat	35	24		B																									claw meat	5	1			C																								claw & body meat	53	34			D																						196-011	Crab, dungeness	meat, unk.	42	17		U																									claw & body meat	8	5			D																						196-012	Crab, king	meat, unk.	20	17		U																									claw & body meat	9	3			D																						196-006	Crab, red, deep sea	meat, unk.	25	11		U																							196-003	Crab, rock	meat, unk.	15	13		U																							196-035	Crab, tanner (bairdi)	meat, unk.	50	8		U																							194-012	Lobster, northern (American)	body meat	2	2			E																								claw meat	2	0		C																									tail meat	2	1			T																								leg meat	2	1			F																								claw & tail meat	80	43			K																						194-002	Lobster, spiny (Atlantic)	tail meat	40	17				T																					194-003	Lobster, spiny (Pacific)	tail meat	5	5				T																					192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	3				P																					192-005	Shrimp, brown	tail, peeled	53	15					P																				192-007	Shrimp, ocean	tail, peeled	10	3					P																				192-010	Shrimp, pink	tail, peeled	50	25					P																				192-011	Shrimp, pink (northern)	tail, peeled	64	19					P																				192-003	Shrimp, royal red	tail, peeled	12	6					P																				192-004	Shrimp, white	tail, peeled	76	27					P																																																
189-002	Oyster, Pacific (giant)	shucked	70	41			S																						190-014	Scallop, Atlantic bay	adductor muscle	20	14		A																							190-016	Scallop, calico	shucked	10	10				S																							adductor muscle	20	13								A																	190-028	Scallop, pink	adductor muscle	5	0	A																								190-013	Scallop, sea (smooth)	adductor muscle	11	5												A													188-003	Squid, Atlantic longfinned	whole	23	8		W																									mantle	110	25			N																						188-006	Squid, Pacific	whole	50	22		W																							188-014	Squid, shortfinned	mantle	92	22		N																							Crustacea																														196-001	Crab, blue	body meat	35	24		B																									claw meat	5	1			C																								claw & body meat	53	34			D																						196-011	Crab, dungeness	meat, unk.	42	17		U																									claw & body meat	8	5			D																						196-012	Crab, king	meat, unk.	20	17		U																									claw & body meat	9	3			D																						196-006	Crab, red, deep sea	meat, unk.	25	11		U																							196-003	Crab, rock	meat, unk.	15	13		U																							196-035	Crab, tanner (bairdi)	meat, unk.	50	8		U																							194-012	Lobster, northern (American)	body meat	2	2			E																								claw meat	2	0		C																									tail meat	2	1			T																								leg meat	2	1			F																								claw & tail meat	80	43			K																						194-002	Lobster, spiny (Atlantic)	tail meat	40	17				T																					194-003	Lobster, spiny (Pacific)	tail meat	5	5				T																					192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	3				P																					192-005	Shrimp, brown	tail, peeled	53	15					P																				192-007	Shrimp, ocean	tail, peeled	10	3					P																				192-010	Shrimp, pink	tail, peeled	50	25					P																				192-011	Shrimp, pink (northern)	tail, peeled	64	19					P																				192-003	Shrimp, royal red	tail, peeled	12	6					P																				192-004	Shrimp, white	tail, peeled	76	27					P																																																																													
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1/ The letters in the boxes correspond to the tissue or cut of fish analyzed, as follows: a, adductor muscle; b, body meat; c, claw meat; d, claw & body meat; e, headed; f, leg meat; g, gutted; h, headed and gutted; k, claw & tail meat; l, liver; m, muscle; n, mantle, skinless; p, tail, peeled; q, milt; r, roe; s, shucked; t, tail meat; u, meat, unk.; w, whole.

2/ Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g., 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

Table 4.10. Distribution of Mean Nickel Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Nickel Content, ppm ^{2/}																						
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0
073-014	Grunt, white	muscle	17	17	M																						
033-011	Haddock	muscle	77	77	M																						
		liver	18	18				L																			
		whole	1	1		W																					
033-013	Hake, Pacific	muscle	49	43	M																						
		liver	1	1		L																					
033-020	Hake, red	muscle	65	5	M																						
033-012	Hake, silver (whiting)	muscle	83	82	M																						
		liver	3	3		L																					
033-024	Hake, spotted	muscle	64	63	M																						
033-025	Hake, white	muscle	79	70	M																						
		liver	3	3		L																					
059-011	Halibut, Pacific	muscle	37	35	M																						
		liver	1	15		L																					
143-001	Hammerhead, scalloped	muscle	12	12		M																					
143-005	Hammerhead, smooth	muscle	4	4		M																					
		liver	7	6				L																			
018-011	Harvestfish	muscle	3	3		M																					
		whole	16	16			W																				
078-011	Herring, Atlantic	muscle	24	24		M																					
		whole	63	63			W																				
		headed	6	6			E																				
		h & g	2	2			H																				
078-001	Herring, blueback	whole	1	1		W																					
078-012	Herring, Pacific	muscle	14	14		M																					
		whole	1	10			W																				
078-015	Herring, round	h & g	1	1			H																				
006-013	Hind, speckled	muscle	19	19		M																					
		liver	1	1			L																				
079-068	Jack, (mackerel scad)	muscle	39	39		M																					
079-053	Jack, akule	muscle	36	36		M																					
079-005	Jack, crevalle	muscle	42	42		M																					
		liver	1	1			L																				
079-069	Jack, crevalle (Hawaii)	muscle	42	42		M																					
149-004	Jacksmelt	whole	1	1			W																				
006-016	Jewfish	muscle	3	3		M																					
045-024	Kingfish, northern	muscle	3	3		M																					
045-021	Kingfish, southern	muscle	3	3		M																					
		liver	1	1			L																				
200-002	Ladyfish	muscle	1	1			M																				
071-005	Lingcod	muscle	1	1		M																					
		liver	1	12			L																				
091-013	Mackerel, Atlantic	muscle	5	5		M																					
091-012	Mackerel, chub	muscle	3	3		M																					
079-034	Mackerel, jack	muscle	1	1		M																					
		liver	1	1			L																				
		headed	1	4			F																				
091-014	Mackerel, king	muscle	1	1		M																					
		liver	1	1			L																				
		milt	1	1																							
		roe	1	1			R																				
091-016	Mackerel, Spanish	muscle	1	7		M																					
		liver	1	1			L																				
144-003	Mako, shortfin	muscle	1	1		M																					
		liver	1	1			L																				
011-002	Marlin, blue	muscle	1	1		M																					
		liver	1	1			L																				
011-005	Marlin, striped	muscle	1	1		M																					
		liver	1	3			L																				
011-003	Marlin, white	muscle	1	1		M																					
		liver	1	1			L																				
162-012	Mempachi	muscle	1	1		M																					
		liver	1	1			L																				
078-010	Menhaden, Atlantic	muscle	1	1		M																					
		whole	1	1			W																				
078-008	Menhaden, Gulf	muscle	1	1		M																					
		whole	1	1			W																				
		gutted	1	1			G																				
078-009	Menhaden, yellowfin	whole	1	1			W																				
206-001	Milkfish	muscle	1	3		M																					

Table 4.11. Distribution of Mean Selenium Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Selenium Content, ppm ^{2/}																							
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0
Finfish																												
145-023	Shark, blue	muscle	12	12																								
		liver	7	7																								
145-010	Shark, dusky	muscle	3	3																								
145-009	Shark, sandbar	muscle	11	11																								
		liver	7	7																								
144-001	Shark, white	muscle	1	1																								
114-001	Sheepshead	muscle	59	59																								
		liver	2	2																								
150-005	Skate, little	muscle	52	52																								
		liver	2	2																								
150-012	Skate, winter	muscle	2	2																								
		liver	1	1																								
155-005	Snapper, blackfin	muscle	11	11																								
155-025	Snapper, gray	muscle	40	40																								
155-008	Snapper, gray (mangrove)	muscle	26	26																								
155-006	Snapper, red	muscle	33	33																								
155-024	Snapper, red (ehu)	muscle	39	39																								
155-015	Snapper, vermilion	muscle	35	34																								
		liver	2	2																								
155-013	Snapper, yellowtail	muscle	42	42																								
157-004	Snook	muscle	12	12																								
059-021	Sole, Dover	muscle	65	65																								
		liver	3	3																								
059-022	Sole, English	muscle	70	70																								
		liver	5	5																								
059-004	Sole, petrale	muscle	53	53																								
		liver	6	6																								
059-006	Sole, rex	muscle	57	57																								
059-014	Sole, rock	muscle	9	8																								
011-004	Spearfish, shortbill	muscle	15	15																								
		liver	4	4																								
045-020	Spot	muscle	53	53																								
166-003	Sturgeon, green	muscle	10	10																								
168-001	Surfperch, barred	muscle	20	20																								
200-003	Tarpon	muscle	12	12																								
		liver	2	2																								
185-022	Tautog	muscle	14	14																								
174-003	Tilefish	muscle	59	59																								
179-028	Trout, cutthroat	muscle	2	2																								
179-029	Trout, rainbow (steelhead)	muscle	9	9																								
		liver	-	-																								
091-019	Tuna, albacore	muscle	40	40																								
		liver	5	5																								
091-022	Tuna, bigeye	muscle	35	35																								
		liver	16	16																								
091-021	Tuna, blackfin	muscle	1	1																								
091-023	Tuna, bluefin	muscle	11	11																								
		liver	1	1																								
091-008	Tuna, skipjack	muscle	67	67																								
		liver	1	1																								
091-020	Tuna, yellowfin	muscle	76	76																								
		liver	21	21																								
091-006	Tunny, little	muscle	48	48																								
		liver	2	2																								
091-001	Wahoo	muscle	18	18																								
		liver	2	2																								
183-002	Wolfish, Atlantic	muscle	60	59																								
		liver	14	14																								
079-023	Yellowtail	muscle	24	24																								
Mollusca																												
187-005	Abalone, green	shucked	10	9		S																						
187-008	Abalone, red	shucked	9	7			S																					
191-003	Clam, butter	shucked	28	28				S																				
191-001	Clam, hard (quahog)	shucked	136	136					S																			
191-008	Clam, Pacific littleneck	shucked	1	1						S																		
243-002	Clam, razor	shucked	38	38						S																		
242-001	Clam, soft	shucked	19	19							S																	
244-005	Clam, surf	shucked	23	23								S																
205-001	Octopus (marmoratus)	whole	4	4																								
		mantle	36	36									N															

Table 4.11. Distribution of Mean Selenium Levels in the Resources Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Selenium Content, ppm ^{2/}																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
Mollusca																													189-001	Oyster, eastern	shucked	145	144										S														189-002	Oyster, Pacific (giant)	shucked	69	69										S														190-014	Scallop, Atlantic bay	adductor muscle	19	19			A																					190-016	Scallop, calico	shucked	10	9			S																							adductor muscle	20	20				A																				190-028	Scallop, pink	adductor muscle	5	5		A																						190-013	Scallop, sea (smooth)	adductor muscle	11	11			A																					188-003	Squid, Atlantic longfinned	whole	22	22									W																	mantle	109	109							N																	188-006	Squid, Pacific	whole	50	50				W																				188-014	Squid, shortfinned	mantle	90	90					N																			Crustacea																												196-001	Crab, blue	body meat	30	30									B																	claw meat	5	5										C																claw & body meat	50	50										D														196-011	Crab, dungeness	meat, unk.	38	38				U																						claw & body meat	7	7										D														196-012	Crab, king	meat, unk.	20	20				U																						claw & body meat	9	9				D																				196-006	Crab, red, deep sea	meat, unk.	25	25														U										196-003	Crab, rock	meat, unk.	15	15														U										196-035	Crab, tanner (bairdi)	meat, unk.	50	50					U																			194-012	Lobster, northern (American)	body meat	2	2										B																claw meat	2	2					C																					tail meat	2	2															T											leg meat	1	1																										claw & tail meat	73	73										F														194-002	Lobster, spiny (Atlantic)	tail meat	38	37				T																				194-003	Lobster, spiny (Pacific)	tail meat	4	4				T																				192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	17					P																			192-005	Shrimp, brown	tail, peeled	49	49															P									192-007	Shrimp, ocean	tail, peeled	10	10					P																			192-010	Shrimp, pink	tail, peeled	48	48						P																		192-011	Shrimp, pink (northern)	tail, peeled	64	64							P																	192-003	Shrimp, royal red	tail, peeled	12	12								P																192-004	Shrimp, white	tail, peeled	76	75											P												
189-001	Oyster, eastern	shucked	145	144										S														189-002	Oyster, Pacific (giant)	shucked	69	69										S														190-014	Scallop, Atlantic bay	adductor muscle	19	19			A																					190-016	Scallop, calico	shucked	10	9			S																							adductor muscle	20	20				A																				190-028	Scallop, pink	adductor muscle	5	5		A																						190-013	Scallop, sea (smooth)	adductor muscle	11	11			A																					188-003	Squid, Atlantic longfinned	whole	22	22									W																	mantle	109	109							N																	188-006	Squid, Pacific	whole	50	50				W																				188-014	Squid, shortfinned	mantle	90	90					N																			Crustacea																												196-001	Crab, blue	body meat	30	30									B																	claw meat	5	5										C																claw & body meat	50	50										D														196-011	Crab, dungeness	meat, unk.	38	38				U																						claw & body meat	7	7										D														196-012	Crab, king	meat, unk.	20	20				U																						claw & body meat	9	9				D																				196-006	Crab, red, deep sea	meat, unk.	25	25														U										196-003	Crab, rock	meat, unk.	15	15														U										196-035	Crab, tanner (bairdi)	meat, unk.	50	50					U																			194-012	Lobster, northern (American)	body meat	2	2										B																claw meat	2	2					C																					tail meat	2	2															T											leg meat	1	1																										claw & tail meat	73	73										F														194-002	Lobster, spiny (Atlantic)	tail meat	38	37				T																				194-003	Lobster, spiny (Pacific)	tail meat	4	4				T																				192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	17					P																			192-005	Shrimp, brown	tail, peeled	49	49															P									192-007	Shrimp, ocean	tail, peeled	10	10					P																			192-010	Shrimp, pink	tail, peeled	48	48						P																		192-011	Shrimp, pink (northern)	tail, peeled	64	64							P																	192-003	Shrimp, royal red	tail, peeled	12	12								P																192-004	Shrimp, white	tail, peeled	76	75											P																																									
189-002	Oyster, Pacific (giant)	shucked	69	69										S														190-014	Scallop, Atlantic bay	adductor muscle	19	19			A																					190-016	Scallop, calico	shucked	10	9			S																							adductor muscle	20	20				A																				190-028	Scallop, pink	adductor muscle	5	5		A																						190-013	Scallop, sea (smooth)	adductor muscle	11	11			A																					188-003	Squid, Atlantic longfinned	whole	22	22									W																	mantle	109	109							N																	188-006	Squid, Pacific	whole	50	50				W																				188-014	Squid, shortfinned	mantle	90	90					N																			Crustacea																												196-001	Crab, blue	body meat	30	30									B																	claw meat	5	5										C																claw & body meat	50	50										D														196-011	Crab, dungeness	meat, unk.	38	38				U																						claw & body meat	7	7										D														196-012	Crab, king	meat, unk.	20	20				U																						claw & body meat	9	9				D																				196-006	Crab, red, deep sea	meat, unk.	25	25														U										196-003	Crab, rock	meat, unk.	15	15														U										196-035	Crab, tanner (bairdi)	meat, unk.	50	50					U																			194-012	Lobster, northern (American)	body meat	2	2										B																claw meat	2	2					C																					tail meat	2	2															T											leg meat	1	1																										claw & tail meat	73	73										F														194-002	Lobster, spiny (Atlantic)	tail meat	38	37				T																				194-003	Lobster, spiny (Pacific)	tail meat	4	4				T																				192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	17					P																			192-005	Shrimp, brown	tail, peeled	49	49															P									192-007	Shrimp, ocean	tail, peeled	10	10					P																			192-010	Shrimp, pink	tail, peeled	48	48						P																		192-011	Shrimp, pink (northern)	tail, peeled	64	64							P																	192-003	Shrimp, royal red	tail, peeled	12	12								P																192-004	Shrimp, white	tail, peeled	76	75											P																																																																					
190-014	Scallop, Atlantic bay	adductor muscle	19	19			A																					190-016	Scallop, calico	shucked	10	9			S																							adductor muscle	20	20				A																				190-028	Scallop, pink	adductor muscle	5	5		A																						190-013	Scallop, sea (smooth)	adductor muscle	11	11			A																					188-003	Squid, Atlantic longfinned	whole	22	22									W																	mantle	109	109							N																	188-006	Squid, Pacific	whole	50	50				W																				188-014	Squid, shortfinned	mantle	90	90					N																			Crustacea																												196-001	Crab, blue	body meat	30	30									B																	claw meat	5	5										C																claw & body meat	50	50										D														196-011	Crab, dungeness	meat, unk.	38	38				U																						claw & body meat	7	7										D														196-012	Crab, king	meat, unk.	20	20				U																						claw & body meat	9	9				D																				196-006	Crab, red, deep sea	meat, unk.	25	25														U										196-003	Crab, rock	meat, unk.	15	15														U										196-035	Crab, tanner (bairdi)	meat, unk.	50	50					U																			194-012	Lobster, northern (American)	body meat	2	2										B																claw meat	2	2					C																					tail meat	2	2															T											leg meat	1	1																										claw & tail meat	73	73										F														194-002	Lobster, spiny (Atlantic)	tail meat	38	37				T																				194-003	Lobster, spiny (Pacific)	tail meat	4	4				T																				192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	17					P																			192-005	Shrimp, brown	tail, peeled	49	49															P									192-007	Shrimp, ocean	tail, peeled	10	10					P																			192-010	Shrimp, pink	tail, peeled	48	48						P																		192-011	Shrimp, pink (northern)	tail, peeled	64	64							P																	192-003	Shrimp, royal red	tail, peeled	12	12								P																192-004	Shrimp, white	tail, peeled	76	75											P																																																																																																	
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		adductor muscle	20	20				A																				190-028	Scallop, pink	adductor muscle	5	5		A																						190-013	Scallop, sea (smooth)	adductor muscle	11	11			A																					188-003	Squid, Atlantic longfinned	whole	22	22									W																	mantle	109	109							N																	188-006	Squid, Pacific	whole	50	50				W																				188-014	Squid, shortfinned	mantle	90	90					N																			Crustacea																												196-001	Crab, blue	body meat	30	30									B																	claw meat	5	5										C																claw & body meat	50	50										D														196-011	Crab, dungeness	meat, unk.	38	38				U																						claw & body meat	7	7										D														196-012	Crab, king	meat, unk.	20	20				U																						claw & body meat	9	9				D																				196-006	Crab, red, deep sea	meat, unk.	25	25														U										196-003	Crab, rock	meat, unk.	15	15														U										196-035	Crab, tanner (bairdi)	meat, unk.	50	50					U																			194-012	Lobster, northern (American)	body meat	2	2										B																claw meat	2	2					C																					tail meat	2	2															T											leg meat	1	1																										claw & tail meat	73	73										F														194-002	Lobster, spiny (Atlantic)	tail meat	38	37				T																				194-003	Lobster, spiny (Pacific)	tail meat	4	4				T																				192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	17					P																			192-005	Shrimp, brown	tail, peeled	49	49															P									192-007	Shrimp, ocean	tail, peeled	10	10					P																			192-010	Shrimp, pink	tail, peeled	48	48						P																		192-011	Shrimp, pink (northern)	tail, peeled	64	64							P																	192-003	Shrimp, royal red	tail, peeled	12	12								P																192-004	Shrimp, white	tail, peeled	76	75											P																																																																																																																																																									
190-028	Scallop, pink	adductor muscle	5	5		A																						190-013	Scallop, sea (smooth)	adductor muscle	11	11			A																					188-003	Squid, Atlantic longfinned	whole	22	22									W																	mantle	109	109							N																	188-006	Squid, Pacific	whole	50	50				W																				188-014	Squid, shortfinned	mantle	90	90					N																			Crustacea																												196-001	Crab, blue	body meat	30	30									B																	claw meat	5	5										C																claw & body meat	50	50										D														196-011	Crab, dungeness	meat, unk.	38	38				U																						claw & body meat	7	7										D														196-012	Crab, king	meat, unk.	20	20				U																						claw & body meat	9	9				D																				196-006	Crab, red, deep sea	meat, unk.	25	25														U										196-003	Crab, rock	meat, unk.	15	15														U										196-035	Crab, tanner (bairdi)	meat, unk.	50	50					U																			194-012	Lobster, northern (American)	body meat	2	2										B																claw meat	2	2					C																					tail meat	2	2															T											leg meat	1	1																										claw & tail meat	73	73										F														194-002	Lobster, spiny (Atlantic)	tail meat	38	37				T																				194-003	Lobster, spiny (Pacific)	tail meat	4	4				T																				192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	17					P																			192-005	Shrimp, brown	tail, peeled	49	49															P									192-007	Shrimp, ocean	tail, peeled	10	10					P																			192-010	Shrimp, pink	tail, peeled	48	48						P																		192-011	Shrimp, pink (northern)	tail, peeled	64	64							P																	192-003	Shrimp, royal red	tail, peeled	12	12								P																192-004	Shrimp, white	tail, peeled	76	75											P																																																																																																																																																																																					
190-013	Scallop, sea (smooth)	adductor muscle	11	11			A																					188-003	Squid, Atlantic longfinned	whole	22	22									W																	mantle	109	109							N																	188-006	Squid, Pacific	whole	50	50				W																				188-014	Squid, shortfinned	mantle	90	90					N																			Crustacea																												196-001	Crab, blue	body meat	30	30									B																	claw meat	5	5										C																claw & body meat	50	50										D														196-011	Crab, dungeness	meat, unk.	38	38				U																						claw & body meat	7	7										D														196-012	Crab, king	meat, unk.	20	20				U																						claw & body meat	9	9				D																				196-006	Crab, red, deep sea	meat, unk.	25	25														U										196-003	Crab, rock	meat, unk.	15	15														U										196-035	Crab, tanner (bairdi)	meat, unk.	50	50					U																			194-012	Lobster, northern (American)	body meat	2	2										B																claw meat	2	2					C																					tail meat	2	2															T											leg meat	1	1																										claw & tail meat	73	73										F														194-002	Lobster, spiny (Atlantic)	tail meat	38	37				T																				194-003	Lobster, spiny (Pacific)	tail meat	4	4				T																				192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	17					P																			192-005	Shrimp, brown	tail, peeled	49	49															P									192-007	Shrimp, ocean	tail, peeled	10	10					P																			192-010	Shrimp, pink	tail, peeled	48	48						P																		192-011	Shrimp, pink (northern)	tail, peeled	64	64							P																	192-003	Shrimp, royal red	tail, peeled	12	12								P																192-004	Shrimp, white	tail, peeled	76	75											P																																																																																																																																																																																																																	
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		claw & body meat	9	9				D																				196-006	Crab, red, deep sea	meat, unk.	25	25														U										196-003	Crab, rock	meat, unk.	15	15														U										196-035	Crab, tanner (bairdi)	meat, unk.	50	50					U																			194-012	Lobster, northern (American)	body meat	2	2										B																claw meat	2	2					C																					tail meat	2	2															T											leg meat	1	1																										claw & tail meat	73	73										F														194-002	Lobster, spiny (Atlantic)	tail meat	38	37				T																				194-003	Lobster, spiny (Pacific)	tail meat	4	4				T																				192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	17					P																			192-005	Shrimp, brown	tail, peeled	49	49															P									192-007	Shrimp, ocean	tail, peeled	10	10					P																			192-010	Shrimp, pink	tail, peeled	48	48						P																		192-011	Shrimp, pink (northern)	tail, peeled	64	64							P																	192-003	Shrimp, royal red	tail, peeled	12	12								P																192-004	Shrimp, white	tail, peeled	76	75											P																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
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196-003	Crab, rock	meat, unk.	15	15														U										196-035	Crab, tanner (bairdi)	meat, unk.	50	50					U																			194-012	Lobster, northern (American)	body meat	2	2										B																claw meat	2	2					C																					tail meat	2	2															T											leg meat	1	1																										claw & tail meat	73	73										F														194-002	Lobster, spiny (Atlantic)	tail meat	38	37				T																				194-003	Lobster, spiny (Pacific)	tail meat	4	4				T																				192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	17					P																			192-005	Shrimp, brown	tail, peeled	49	49															P									192-007	Shrimp, ocean	tail, peeled	10	10					P																			192-010	Shrimp, pink	tail, peeled	48	48						P																		192-011	Shrimp, pink (northern)	tail, peeled	64	64							P																	192-003	Shrimp, royal red	tail, peeled	12	12								P																192-004	Shrimp, white	tail, peeled	76	75											P																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
196-035	Crab, tanner (bairdi)	meat, unk.	50	50					U																			194-012	Lobster, northern (American)	body meat	2	2										B																claw meat	2	2					C																					tail meat	2	2															T											leg meat	1	1																										claw & tail meat	73	73										F														194-002	Lobster, spiny (Atlantic)	tail meat	38	37				T																				194-003	Lobster, spiny (Pacific)	tail meat	4	4				T																				192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	17					P																			192-005	Shrimp, brown	tail, peeled	49	49															P									192-007	Shrimp, ocean	tail, peeled	10	10					P																			192-010	Shrimp, pink	tail, peeled	48	48						P																		192-011	Shrimp, pink (northern)	tail, peeled	64	64							P																	192-003	Shrimp, royal red	tail, peeled	12	12								P																192-004	Shrimp, white	tail, peeled	76	75											P																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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192-010	Shrimp, pink	tail, peeled	48	48						P																		192-011	Shrimp, pink (northern)	tail, peeled	64	64							P																	192-003	Shrimp, royal red	tail, peeled	12	12								P																192-004	Shrimp, white	tail, peeled	76	75											P																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
192-011	Shrimp, pink (northern)	tail, peeled	64	64							P																	192-003	Shrimp, royal red	tail, peeled	12	12								P																192-004	Shrimp, white	tail, peeled	76	75											P																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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^{1/} The letters in the boxes correspond to the tissue or cut of fish analyzed, as follows: a, adductor muscle; b, body meat; c, claw meat; d, claw & body meat; e, headed; f, leg meat; g, gutted; h, headed and gutted; k, claw & tail meat; l, liver; m, muscle; n, mantle, skinless; p, tail, peeled; q, milt; r, roe; s, shucked; t, tail meat; u, meat, unk.; w, whole.

^{2/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g., 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

Table 4.12. Distribution of Silver Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Silver Content, ppm ^{2/}																									
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0		
Finfish																														
145-023	Shark, blue	muscle	14	13	M																									
		liver	9	7	L																									
145-010	Shark, dusky	muscle	4	3	M																									
145-009	Shark, sandbar	muscle	13	11	M																									
		liver	7	4	L																									
144-001	Shark, white	muscle	2	2	M																									
114-001	Sheepshead	muscle	60	53	M																									
		liver	2	2	L																									
150-005	Skate, little	muscle	54	54	M																									
		liver	2	2	L																									
150-012	Skate, winter	muscle	2	1	M																									
		liver	1	1	L																									
155-005	Snapper, blackfin	muscle	13	12	M																									
155-025	Snapper, gray	muscle	40	38	M																									
155-008	Snapper, gray (mangrove)	muscle	28	25	M																									
155-006	Snapper, red	muscle	38	28	M																									
155-024	Snapper, red (ehu)	muscle	40	36	M																									
155-015	Snapper, vermilion	muscle	36	22	M																									
		liver	2	2	L																									
155-013	Snapper, yellowtail	muscle	43	40	M																									
157-004	Snook	muscle	12	12	M																									
059-021	Sole, Dover	muscle	70	39	M																									
		liver	4	3	L																									
059-022	Sole, English	muscle	73	46	M																									
		liver	5	5	L																									
059-004	Sole, petrale	muscle	57	38	M																									
		liver	7	3	L																									
059-006	Sole, rex	muscle	61	33	M																									
059-014	Sole, rock	muscle	10	10	M																									
011-004	Spearfish, shortbill	muscle	15	14	M																									
		liver	4	4	L																									
045-020	Spot	muscle	54	40	M																									
166-003	Sturgeon, green	muscle	10	7	M																									
168-001	Surfperch, barred	muscle	20	20	M																									
200-003	Tarpon	muscle	12	9	M																									
		liver	2	2	L																									
185-022	Tautog	muscle	14	14	M																									
174-003	Tilefish	muscle	60	45	M																									
179-028	Trout, cutthroat	muscle	3	3	M																									
179-029	Trout, rainbow (steelhead)	muscle	9	9	M																									
		liver	1	1	L																									
091-019	Tuna, albacore	muscle	40	29	M																									
		liver	5	4	L																									
091-022	Tuna, bigeye	muscle	40	29	M																									
		liver	21	19	L																									
091-021	Tuna, blackfin	muscle	1	1	M																									
091-023	Tuna, bluefin	muscle	11	8	M																									
		liver	1	1	L																									
091-008	Tuna, skipjack	muscle	69	55	M																									
		liver	8	6	L																									
091-020	Tuna, yellowfin	muscle	80	65	M																									
		liver	26	25	L																									
091-006	Tunny, little	muscle	50	43	M																									
		liver	2	2	L																									
091-001	Wahoo	muscle	18	14	M																									
		liver	3	3	L																									
183-002	Wolfish, Atlantic	muscle	60	56	M																									
		liver	15	15	L																									
079-023	Yellowtail	muscle	23	21	M																									
Mollusca																														
187-005	Abalone, green	shucked	10	10							S																			
187-008	Abalone, red	shucked	10	9							S																			
191-003	Clam, butter	shucked	29	29							S																			
191-001	Clam, hard (quahog)	shucked	140	140							S																			
191-008	Clam, Pacific littleneck	shucked	1	1							S																			
243-002	Clam, razor	shucked	39	31	S																									
242-001	Clam, soft	shucked	19	19	S																									
244-005	Clam, surf	shucked	23	23	S																									
205-001	Octopus (marmoratus)	whole	4	4							W																			
		mantle	36	36	N																									

Table 4.12 Distribution of Silver Levels in the Resource Survey, by Species (continued)

Species Number		Species	Tissue/ ¹	Total # Samples	# samples in mean	Ranges of Mean Silver Content, ppm ^{2/}																						
						< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0
Mollusca																												
189-001	Oyster, eastern	shucked	151	150				S																				
189-002	Oyster, Pacific (giant)	shucked	70	68			S																					
190-014	Scallop, Atlantic bay	adductor muscle	20	20	A																							
190-016	Scallop, calico	shucked	10	9		S																						
		adductor muscle	20	14	A																							
190-028	Scallop, pink	adductor muscle	5	5	A																							
190-013	Scallop, sea (smooth)	adductor muscle	11	11	A																							
186-003	Squid, Atlantic longfinned	whole	23	23		W																						
		mantle	110	109	N																							
188-006	Squid, Pacific	whole	50	50	W																							
188-014	Squid, shortfinned	mantle	92	92	N																							
Crustacea																												
196-001	Crab, blue	body meat	35	35		B																						
		claw meat	5	5		C																						
		claw & body meat	54	54				D																				
196-011	Crab, dungeness	meat, unk.	42	40		U																						
		claw & body meat	7	7				D																				
196-012	Crab, king	meat, unk.	20	20		U																						
		claw & body meat	9	9		D																						
196-006	Crab, red, deep sea	meat, unk.	24	24		U'																						
196-003	Crab, rock	meat, unk.	15	15				U																				
196-035	Crab, tanner (bairdi)	meat, unk.	50	46		U			U																			
194-012	Lobster, northern (American)	body meat	2	2		B																						
		claw meat	2	2						C																		
		tail meat	2	2				T																				
		leg meat	2	2							F																	
		claw & tail meat	80	80					K																			
194-002	Lobster, spiny (Atlantic)	tail meat	40	32		T																						
194-003	Lobster, spiny (Pacific)	tail meat	5	5		T																						
192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	17		P																						
192-005	Shrimp, brown	tail, peeled	53	44		P																						
192-007	Shrimp, ocean	tail, peeled	10	9		P																						
192-010	Shrimp, pink	tail, peeled	50	44		P																						
192-011	Shrimp, pink (northern)	tail, peeled	64	64		P																						
192-003	Shrimp, royal red	tail, peeled	12	12		P																						
192-004	Shrimp, white	tail, peeled	77	61		P																						

^{1/} The letters in the boxes correspond to the tissue or cut of fish analyzed, as follows: a, adductor muscle; b, body meat; c, claw meat; d, claw & body meat; e, headed; f, leg meat; g, gutted; h, headed and gutted; k, claw & tail meat; l, liver; m, muscle; n, mantle, skinless; p, tail, peeled; q, milt; r, roe; s, shucked; t, tail meat; u, meat, unk.; w, whole.

^{2/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g., 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

Table 4.14. Distribution of Mean Vanadium Levels in the Resource Survey, by Species

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Vanadium Content, ppm ^{2/}																									
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0		
078-005	Alewife	muscle	43	11		M																								
		whole	4	3					W																					
001-016	Anchovy, northern	whole	40	40																										
001-006	Anchovy, striped	h & g	40	39					H																					
002-002	Argentine, Atlantic	h & g	7	3					H																					
062-014	Ballyhoo	whole	56	54										W																
005-002	Barracuda, Atlantic	muscle	7	0	M																									
005-001	Barracuda, Pacific	muscle	20	1	M																									
006-006	Bass, black sea	muscle	55	16		M																								
		liver	2	2																										
007-004	Bass, striped	muscle	117	13		M																								
		liver	3	2																										
012-001	Bluefish	muscle	72	16		M																								
		liver	4	2																										
091-011	Bonito, Atlantic	muscle	15	0	M																									
091-009	Bonito, Pacific	muscle	40	10																										
		liver	1	1	L																									
021-007	Bullhead, brown	muscle	4	0	M																									
018-014	Butterfish	muscle	71	18		M																								
		whole	17	10																										
		h & g	1	1																										
021-010	Catfish, channel	muscle	20	2																										
023-002	Catfish, gafftopsail	muscle	34	9																										
		liver	3	3																										
023-001	Catfish, sea	muscle	47	17																										
		liver	6	6																										
021-002	Catfish, white	muscle	1	1		M																								
033-008	Cod, Atlantic	muscle	114	28		M																								
		liver	36	8		L																								
033-007	Cod, Pacific (gray)	muscle	59	9																										
		liver	16	1	L																									
045-026	Croaker, Atlantic	muscle	91	23		M																								
033-004	Cusk	muscle	76	11		M																								
		liver	18	14																										
037-004	Cusk-eel, fawn	muscle	2	2																										
145-018	Dogfish, smooth	muscle	95	15		M																								
141-007	Dogfish, spiny	muscle	114	24																										
		liver	29	6		L																								
041-002	Dolphin	muscle	62	15																										
		liver	28	5		L																								
045-019	Drum, banded	muscle	5	3		M																								
045-028	Drum, black	muscle	61	7																										
		liver	2	1		L																								
045-030	Drum, red	muscle	73	16		M																								
		liver	3	3	L																									
051-001	Eel, American	muscle	30	7																										
047-002	Eel, conger	muscle	1	1	M																									
153-009	Eulachon	whole	33	19																										
058-028	Flounder, fourspot	muscle	70	9		M																								
058-024	Flounder, Gulf	muscle	41	7																										
		liver	1	1	L																									
058-027	Flounder, southern	muscle	42	8																										
		liver	2	1																										
058-026	Flounder, summer (fluke)	muscle	42	11																										
		liver	2	1	L																									
058-030	Flounder, windowpane (s.dab)	muscle	18	2																										
059-030	Flounder, winter	muscle	123	25																										
		liver	2	2																										
059-005	Flounder, witch	muscle	71	10		M																								
059-016	Flounder, yellowtail	muscle	89	24		M																								
		liver	2	2		L																								
006-040	Gag	muscle	30	8																										
066-009	Goatfish	muscle	40	5		M																								
068-001	Goosefish	muscle	81	11																										
		liver	10	4																										
		h & g	1	1	H																									
006-037	Grouper, black	muscle	34	10																										
006-017	Grouper, red	muscle	41	7		M																								
006-038	Grouper, yellowmouth	muscle	10	3																										
		liver	1	1																										
073-015	Grunt, bluestriped (yellow)	muscle	16	3																										

Table 4.14. Distribution of Mean Vanadium Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Vanadium Content, ppm ^{2/}																								
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0		
Finfish																													
094-010	Mojarra, yellowfin	muscle	10	5																									
098-003	Mullet, silver (white)	muscle	36	13																									
098-002	Mullet, striped	muscle	158	40																									
		liver	5	5																									
079-030	Palometa	muscle	2	0	M																								
131-023	Perch, ocean (Pacific)	muscle	30	3			M																						
		liver	18	10			L																						
131-052	Perch, ocean (redfish)	muscle	80	16			M																						
		liver	2	1			L																						
006-010	Perch, sand	muscle	1	0	M																								
168-005	Perch, shiner	whole	2	2																									
045-003	Perch, silver	muscle	20	11			M																						
007-001	Perch, white	muscle	27	9			M																						
		h & g	18	17																									
079-029	Permit	muscle	9	2			M																						
073-017	Pigfish	muscle	34	12			M																						
114-013	Pinfish, spottail	muscle	10	8			M																						
		liver	1	1																									
059-008	Plaice, American (dab)	muscle	68	14			M																						
		whole	1	1																									
033-017	Pollock	muscle	73	21			M																						
		liver	33	9			L																						
033-019	Pollock, walleye (Alaska)	muscle	48	11			M																						
		liver	3	0	L																								
079-028	Pompano, Florida	muscle	59	18			M																						
		liver	4	2																									
114-014	Porgy, red	muscle	22	5			M																						
		liver	1	1																									
056-018	Pout, ocean	muscle	34	3			M																						
		liver	3	1																									
131-061	Rockfish, bocaccio	muscle	48	11			M																						
		liver	4	2																									
131-063	Rockfish, canary	muscle	43	14			M																						
		liver	1	1																									
131-031	Rockfish, copper	muscle	10	2			M																						
131-043	Rockfish, yellowtail	muscle	20	2																									
079-004	Runner, blue	muscle	56	16			M																						
		liver	4	1																									
126-001	Sablefish	muscle	103	24																									
		liver	14	4																									
011-001	Sailfish	muscle	42	7																									
		liver	3	0	L																								
179-020	Salmon, chinook, (king)	muscle	110	41			M																						
		liver	22	6			L																						
179-017	Salmon, chum (keta)	muscle	57	22			M																						
		liver	5	4																									
179-018	Salmon, coho (silver)	muscle	67	23			M																						
		liver	7	3			L																						
179-016	Salmon, pink	muscle	27	10																									
		liver	3	1			L																						
179-019	Salmon, sockeye (red)	muscle	61	24			M																						
		liver	4	2																									
079-013	Scad, round	h & g	3	3																									
006-041	Scamp	muscle	10	2																									
		liver	1	1																									
132-031	Sculpin, longhorn	muscle	1	0	M																								
114-016	Scup	muscle	72	26																									
135-010	Searobin, northern	muscle	78	25			M																						
135-011	Searobin, striped	muscle	10	3			M																						
045-012	Seatrout, gray (weakfish)	muscle	72	21			M																						
		liver	3	1			L																						
		whole	10	10																									
045-007	Seatrout, sand	muscle	18	6			M																						
045-010	Seatrout, silver (white)	muscle	44	7			M																						
		liver	1	0	L																								
045-008	Seatrout, spotted (speckled)	muscle	89	20			M																						
		liver	3	0	L																								
078-006	Shad, American	muscle	60	10			M																						
145-025	Shark, Atlantic, sharpnose	muscle	1	0	M																								
145-006	Shark, blacktip	muscle	16	8																									
		liver	4	0	L																								

Table 4.14. Distribution of Mean Vanadium Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Vanadium Content, ppm ^{2/}																							
					< 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.4	0.4 to 0.5	0.5 to 0.6	0.6 to 0.7	0.7 to 0.8	0.8 to 0.9	0.9 to 1.0	1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0
Mollusca																												
189-001	Oyster, eastern	shucked	152	110														S										
189-002	Oyster, Pacific (giant)	shucked	70	53						S																		
190-014	Scallop, Atlantic bay	adductor muscle	20	8			A																					
190-016	Scallop, calico	shucked	10	9														S										
		adductor muscle	20	8					A																			
190-028	Scallop, pink	adductor muscle	5	0	A																							
190-013	Scallop, sea (smooth)	adductor muscle	11	1								A																
188-003	Squid, Atlantic longfinned	whole	23	8				W																				
		mantle	110	18				N																				
188-006	Squid, Pacific	whole	50	15				W																				
188-014	Squid, shortfinned	mantle	92	31				N																				
Crustacea																												
196-001	Crab, blue	body meat	35	19				B																				
		claw meat	5	4						C																		
		claw & body meat	53	30						D																		
196-011	Crab, dungeness	meat, unk.	42	18						U																		
		claw & body meat	8	4				D																				
196-012	Crab, king	meat, unk.	20	13						U																		
		claw & body meat	9	3				D																				
196-006	Crab, red, deep sea	meat, unk.	25	14						U																		
196-003	Crab, rock	meat, unk.	15	11						U																		
196-035	Crab, tanner (bairdi)	meat, unk.	50	13						U																		
194-012	Lobster, northern (American)	body meat	2	1							B																	
		claw meat	2	0	C																							
		tail meat	2	1				T																				
		leg meat	2	1				F																				
		claw & tail meat	80	41						K																		
194-002	Lobster, spiny (Atlantic)	tail meat	40	16						T																		
194-003	Lobster, spiny (Pacific)	tail meat	5	2						T																		
192-012	Shrimp, Alaska (sidestripe)	tail, peeled	17	8						P																		
192-005	Shrimp, brown	tail, peeled	52	24						P																		
192-007	Shrimp, ocean	tail, peeled	10	2						P																		
192-010	Shrimp, pink	tail, peeled	50	30							P																	
192-011	Shrimp, pink (northern)	tail, peeled	64	22							P																	
192-003	Shrimp, royal red	tail, peeled	12	7						P																		
192-004	Shrimp, white	tail, peeled	76	28							P																	

^{1/} The letters in the boxes correspond to the tissue or cut of fish analyzed, as follows: a, adductor muscle; b, body meat; c, claw meat; d, claw & body meat; e, headed; f, leg meat; g, gutted; h, headed and gutted; k, claw & tail meat; l, liver; m, muscle; n, mantle, skinless; p, tail, peeled; q, milt; r, roe; s, shucked; t, tail meat; u, meat, unk.; w, whole.

^{2/} Mean analytical values falling on the upper limit of each range are included in the next higher range (e.g., 0.2 is included in the range 0.2 to 0.3 ppm and not 0.1 to 0.2 ppm).

Table 4.15. Distribution of Mean Zinc Levels in the Resource Survey, by Species (continued)

Species Number	Species	Tissue ^{1/}	Total # Samples	# samples in mean	Ranges of Mean Zinc Content, ppm ^{2/}																					
					1.0 to 2.0	2.0 to 3.0	3.0 to 4.0	4.0 to 5.0	5.0 to 6.0	6.0 to 7.0	7.0 to 8.0	8.0 to 9.0	9.0 to 10.0	10.0 to 20.0	20.0 to 30.0	30.0 to 40.0	40.0 to 50.0	50.0 to 60.0	60.0 to 70.0	70.0 to 80.0	80.0 to 90.0	90.0 to 100.0	100.0 to 200.0	200.0 to 300.0	300.0 to 400.0	400.0 to 500.0
Finfish																										
145-023	Shark, blue	muscle	14	14					M																	
		liver	9	9							L															
145-010	Shark, dusky	muscle	4	4																						
145-009	Shark, sandbar	muscle	13	13					M																	
		liver	7	7									L													
144-001	Shark, white	muscle	2	2				M																		
114-001	Sheepshead	muscle	59	59				M																		
		liver	2	2																				L		
150-005	Skate, little	muscle	54	54							M															
		liver	2	2									L													
150-012	Skate, winter	muscle	2	2					M																	
		liver	1	1										L												
155-005	Snapper, blackfin	muscle	13	13		M																				
155-025	Snapper, gray	muscle	39	39			M																			
155-008	Snapper, gray (mangrove)	muscle	28	28				M																		
155-006	Snapper, red	muscle	37	37				M																		
155-024	Snapper, red (ehu)	muscle	40	40			M																			
155-015	Snapper, vermilion	muscle	36	36			M																			
		liver	2	2																			L			
155-013	Snapper, yellowtail	muscle	43	43			M																			
157-004	Snook	muscle	12	12			M																			
059-021	Sole, Dover	muscle	68	68			M																			
		liver	4	4											L											
059-022	Sole, English	muscle	73	73				M																		
		liver	5	5											L											
059-004	Sole, petrale	muscle	57	57				M																		
		liver	7	7																		L				
059-006	Sole, rex	muscle	60	60			M																			
059-014	Sole, rock	muscle	10	10			M																			
011-004	Spearfish, shortbill	muscle	15	15					M																	
		liver	4	4											L											
045-020	Spot	muscle	52	52					M																	
166-003	Sturgeon, green	muscle	10	10				M																		
168-001	Surfperch, barred	muscle	20	20							M															
200-003	Tarpon	muscle	12	12								M														
		liver	2	2																		L				
185-022	Tautog	muscle	13	13				M																		
174-003	Tilefish	muscle	60	60				M																		
179-028	Trout, cutthroat	muscle	3	3				M																		
179-029	Trout, rainbow (steelhead)	muscle	9	9		M																				
		liver	1	1									L													
091-019	Tuna, albacore	muscle	39	39				M						L												
		liver	5	5											L											
091-022	Tuna, bigeye	muscle	40	40				M																		
		liver	21	20																		L				
091-021	Tuna, blackfin	muscle	1	1					M																	
091-023	Tuna, bluefin	muscle	10	10					M																	
		liver	1	1											L											
091-008	Tuna, skipjack	muscle	70	70							M															
		liver	8	8								M										L				
091-020	Tuna, yellowfin	muscle	80	80					M																	
		liver	26	26																		L				
091-006	Tunny, little	muscle	50	50							M															
		liver	2	2																			L			
091-001	Wahoo	muscle	18	18					M																	
		liver	3	3																				L		
183-002	Wolfish, Atlantic	muscle	60	60							M															
		liver	15	15																						
079-023	Yellowtail	muscle	23	23					M								L									
Mollusca																										
187-005	Abalone, green	shucked	9	9													S									
187-008	Abalone, red	shucked	10	10																						
191-003	Clam, butter	shucked	29	29																		S				
191-001	Clam, hard (quahog)	shucked	139	139																			S			
191-008	Clam, Pacific littleneck	shucked	1	1						S																
243-002	Clam, razor	shucked	38	38																			S			
242-001	Clam, soft	shucked	19	19																			S			
244-005	Clam, surf	shucked	23	23																			S			
205-001	Octopus (marmuratus)	whole	4	4																				W		
		mantle	35	35																					N	

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES:
BY TISSUE AND LOCATION

LOCATION LEVEL 5

MARLIN, BLUE		MAKAIRA NIGRICANS						011002	AREA- SOUTH ATLANTIC			SITE- C2		LIVER		
LENGTH WEIGHT	NUM NUM	2 MEAN	3.505	S. D.	0.072	LOW	3.454	HIGH	3.556							
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0001	0002
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0001	0000	0000	0001	0000
MEAN	5.675	0.645	0.905	2.763	13.375	0.028	0.170	1.433	210.50	9.255	0.000	0.222	0.265	1.000	0.630	
S. D.	0.926	0.148	0.290	0.301	2.581	0.004	0.113	1.050	135.90	12.537	0.000	0.000	0.191	0.000	0.700	
LOW	5.020	0.540	0.700	2.550	11.550	0.025	0.090	0.690	114.40	0.390	0.000	0.000	0.130	0.000	0.000	
HIGH	6.330	0.750	1.110	2.975	15.200	0.030	0.250	2.175	306.59	18.120	0.000	0.222	0.400	1.000	0.630	

MARLIN, BLUE		MAKAIRA NIGRICANS						011002	AREA- SOUTH ATLANTIC			SITE- M1		MUSCLE	
LENGTH WEIGHT	NUM NUM	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003
N DET.	0000	0000	0000	0001	0000	0001	0000	0000	0000	0000	0001	0003	0000	0000	0000
MEAN	1.162	0.312	0.077	1.595	1.390	0.018	0.057	0.248	5.44	0.137	0.235	0.000	0.120	0.522	0.417
S. D.	0.906	0.105	0.021	0.460	0.051	0.011	0.006	0.085	1.28	0.034	0.191	0.000	0.010	0.115	0.216
LOW	0.120	0.190	0.060	1.270	1.335	0.010	0.050	0.150	4.00	0.110	0.100	0.000	0.110	0.395	0.190
HIGH	1.765	0.375	0.100	1.920	1.435	0.025	0.060	0.305	6.47	0.175	0.370	0.000	0.130	0.620	0.620

MARLIN, BLUE		MAKAIRA NIGRICANS						011002	AREA- SOUTH ATLANTIC			SITE- M1		LIVER	
LENGTH WEIGHT	NUM NUM	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0003	0002	0002	0002	0001	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0000	0002	0000	0000	0000
MEAN	6.857	0.530	1.405	1.113	2.500	0.020	1.220	7.840	59.38	0.740	0.595	0.000	1.290	0.455	0.625
S. D.	4.500	0.226	5.961	0.230	0.000	0.000	1.287	5.968	22.10	0.707	0.049	0.000	0.240	0.021	0.092
LOW	2.070	0.370	7.190	0.950	0.000	0.000	0.310	3.620	43.75	0.240	0.560	0.000	1.120	0.440	0.560
HIGH	11.000	0.690	15.620	1.275	2.500	0.020	2.130	12.060	75.00	1.240	0.630	0.000	1.460	0.470	0.690

MARLIN, BLUE		MAKAIRA NIGRICANS						011002	AREA- SOUTH ATLANTIC			SITE- M4		MUSCLE	
LENGTH WEIGHT	NUM NUM	1 MEAN	2.530	S. D.	0.000	LOW	2.530	HIGH	2.530						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0001	0001	0000	0000	0000
MEAN	3.650	0.160	0.080	5.150	1.700	0.000	0.060	0.070	6.88	0.090	0.000	0.000	0.140	0.560	0.560
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	3.650	0.160	0.080	5.150	1.700	0.000	0.060	0.070	6.88	0.090	0.000	0.000	0.140	0.560	0.560

MARLIN, BLUE		MAKAIRA NIGRICANS						011002	AREA- HAWAII			SITE- D5		MUSCLE	
LENGTH WEIGHT	NUM NUM	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0004	0004	0004	0004	0004	0004	0003	0004	0004	0004	0004	0004	0004	0004	0004
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0003	0004	0000	0001	0000
MEAN	1.785	0.321	0.109	1.910	1.230	0.026	0.120	0.459	4.49	0.155	0.120	0.000	0.089	0.357	0.549
S. D.	0.421	0.066	0.034	1.444	0.382	0.007	0.028	0.356	1.08	0.103	0.000	0.000	0.028	0.040	0.116
LOW	1.370	0.250	0.080	0.550	0.780	0.015	0.090	0.110	3.50	0.040	0.000	0.000	0.070	0.310	0.440
HIGH	2.200	0.410	0.145	3.833	1.713	0.030	0.145	0.875	5.75	0.290	0.120	0.000	0.130	0.380	0.690

MARLIN, BLUE		MAKAIRA NIGRICANS						011002	AREA- HAWAII			SITE- H4		MUSCLE	
LENGTH WEIGHT	NUM NUM	8 MEAN	2.512	S. D.	0.429	LOW	2.250	HIGH	3.550						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0008	0008	0008	0007	0007	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008
N DET.	0000	0001	0002	0000	0000	0002	0000	0000	0000	0000	0007	0005	0000	0001	0001
MEAN	2.776	0.404	0.144	3.563	2.216	0.052	0.171	0.220	5.97	0.361	0.440	0.403	0.120	0.781	0.468
S. D.	2.075	0.105	0.097	2.517	1.193	0.043	0.096	0.087	3.39	0.234	0.000	0.337	0.039	0.459	0.171
LOW	0.130	0.295	0.070	0.700	0.940	0.010	0.040	0.110	2.45	0.050	0.000	0.130	0.060	0.250	0.350
HIGH	6.565	0.575	0.300	7.300	4.000	0.130	0.295	0.350	13.57	0.700	0.440	0.780	0.160	1.500	0.845

MARLIN, BLUE		MAKAIRA NIGRICANS						011002	AREA- HAWAII			SITE- H4		LIVER	
LENGTH WEIGHT	NUM NUM	5 MEAN	2.626	S. D.	0.526	LOW	2.251	HIGH	3.550						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0004	0005	0005	0004	0004	0005	0005	0005	0005	0005	0005	0005	0005	0005	0004
N DET.	0000	0000	0000	0001	0000	0000	0001	0000	0000	0001	0000	0002	0000	0002	0000
MEAN	10.294	0.760	17.781	4.647	10.001	0.094	0.265	17.164	43.41	0.395	0.462	0.438	1.674	1.177	0.433
S. D.	6.801	0.392	8.809	1.629	10.218	0.067	0.037	7.974	35.95	0.195	0.292	0.078	0.857	0.887	0.109
LOW	4.530	0.250	2.740	3.180	3.155	0.010	0.210	4.940	7.50	0.110	0.160	0.350	0.440	0.630	0.330
HIGH	19.800	1.310	24.750	6.400	25.200	0.180	0.290	26.070	98.21	0.540	0.780	0.500	2.610	2.200	0.550

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

MARLIN, BLUE			MAKAIRA NIGRICANS					011002 AREA- HAWAII				SITE- J5 MUSCLE			
LENGTH	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	113.400				
WEIGHT	NUM	2	MEAN	91.174	S. D.	31.433	LOW	68.947	HIGH						
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0002	0002	0000	0000	0000
MEAN	5.062	0.359	0.335	1.292	2.305	0.046	0.191	0.540	6.98	0.227	0.000	0.000	0.195	0.685	0.530
S. D.	6.008	0.037	0.262	1.261	1.549	0.000	0.027	0.283	1.90	0.146	0.000	0.000	0.148	0.078	0.099
LOW	0.813	0.333	0.150	0.400	1.210	0.000	0.172	0.340	5.63	0.123	0.000	0.000	0.090	0.630	0.460
HIGH	9.310	0.385	0.520	2.183	3.400	0.046	0.210	0.740	8.32	0.330	0.000	0.000	0.300	0.740	0.600

MARLIN, BLUE			MAKAIRA NIGRICANS					011002 AREA- HAWAII				SITE- J5 LIVER			
LENGTH	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	113.400				
WEIGHT	NUM	2	MEAN	91.174	S. D.	31.433	LOW	68.947	HIGH						
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0302	0002	0002	0002	0002
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0002	0000	0001	0000
MEAN	2.375	0.595	4.210	3.123	4.475	0.120	0.415	7.400	74.82	0.380	0.720	0.000	1.005	1.250	1.170
S. D.	1.025	0.672	3.041	0.110	2.722	0.127	0.389	4.907	39.15	0.212	0.000	0.000	0.516	0.000	0.325
LOW	1.650	0.120	2.060	3.045	2.550	0.030	0.140	3.930	47.14	0.230	0.000	0.000	0.640	0.000	0.940
HIGH	3.100	1.070	6.360	3.200	6.400	0.210	0.690	10.870	102.50	0.530	0.720	0.000	1.370	1.250	1.400

MARLIN, WHITE			TETRAPTURUS ALBIDUS					011003 AREA- NORTH ATLANTIC				SITE- M9 MUSCLE			
LENGTH	NUM	21	MEAN	1.595	S. D.	0.087	LOW	1.410	HIGH	1.720					
WEIGHT	NUM	21	MEAN	23.674	S. D.	3.500	LOW	17.236	HIGH	31.300					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0020	0020	0021	0020	0021	0021	0020	0021	0021	0021	0021	0021	0021	0021	0020
N DET.	0001	0000	0000	0000	0000	0005	0000	0000	0000	0000	0019	0020	0000	0001	0000
MEAN	0.690	0.520	0.106	3.080	0.788	0.026	0.208	0.259	6.42	0.153	0.470	0.080	0.114	0.570	0.438
S. D.	0.418	0.565	0.055	1.077	0.251	0.024	0.164	0.144	0.96	0.044	0.042	0.000	0.075	0.168	0.159
LOW	0.050	0.130	0.060	1.450	0.020	0.010	0.060	0.060	3.63	0.070	0.440	0.000	0.030	0.310	0.080
HIGH	1.730	2.560	0.280	5.000	1.320	0.110	0.630	0.510	7.88	0.230	0.500	0.080	0.190	0.940	0.795

MARLIN, WHITE			TETRAPTURUS ALBIDUS					011003 AREA- NORTH ATLANTIC				SITE- R6 MUSCLE			
LENGTH	NUM	1	MEAN	1.650	S. D.	0.000	LOW	1.650	HIGH	1.650					
WEIGHT	NUM	1	MEAN	24.040	S. D.	0.000	LOW	24.040	HIGH	24.040					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0301	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000
MEAN	0.690	0.430	0.100	2.100	1.120	0.010	0.060	0.190	6.30	0.150	0.120	0.000	0.100	0.370	0.370
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.690	0.430	0.100	2.100	1.120	0.010	0.060	0.190	6.30	0.150	0.120	0.000	0.100	0.370	0.370

MARLIN, WHITE			TETRAPTURUS ALBIDUS					011003 AREA- NORTH ATLANTIC				SITE- R9 MUSCLE			
LENGTH	NUM	15	MEAN	1.984	S. D.	0.277	LOW	1.500	HIGH	2.311					
WEIGHT	NUM	15	MEAN	23.300	S. D.	3.962	LOW	18.598	HIGH	31.751					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0015	0015	0015	0012	0012	0015	0015	0015	0015	0015	0015	0015	0015	0015	0014
N DET.	0000	0000	0002	0000	0000	0009	0000	0000	0000	0002	0013	0012	0001	0004	0000
MEAN	0.599	0.524	0.081	2.367	0.815	0.032	0.173	0.227	5.60	0.292	0.215	0.100	0.084	0.779	0.418
S. D.	0.378	0.220	0.031	1.153	0.273	0.012	0.096	0.107	1.90	0.221	0.219	0.000	0.032	0.469	0.363
LOW	0.160	0.200	0.040	0.180	0.500	0.010	0.020	0.060	2.62	0.050	0.060	0.100	0.030	0.250	0.010
HIGH	1.505	1.050	0.130	3.800	1.260	0.040	0.386	0.430	8.57	0.810	0.370	0.100	0.140	1.780	1.500

MARLIN, WHITE			TETRAPTURUS ALBIDUS					011003 AREA- NORTH ATLANTIC				SITE- R9 LIVER			
LENGTH	NUM	4	MEAN	2.191	S. D.	0.139	LOW	2.007	HIGH	2.311					
WEIGHT	NUM	4	MEAN	25.798	S. D.	5.456	LOW	18.598	HIGH	31.751					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0004	0004	0003	0004	0004	0004	0004	0004	0004	0004	0304	0004	0004	0004	0004
N DET.	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0000	0001	0000	0000	0000
MEAN	0.440	0.565	4.840	3.800	6.191	0.030	0.193	10.280	56.54	0.268	0.375	0.180	0.745	0.970	1.045
S. D.	0.415	0.364	1.268	0.995	5.929	0.020	0.174	6.802	36.76	0.140	0.232	0.087	0.361	0.495	0.491
LOW	0.070	0.300	3.500	2.725	2.500	0.010	0.070	5.130	30.63	0.060	0.130	0.060	0.380	0.620	0.750
HIGH	1.020	1.030	6.020	4.800	15.000	0.050	0.440	20.300	109.38	0.370	0.620	0.280	1.230	1.320	1.780

MARLIN, WHITE			TETRAPTURUS ALBIDUS					011003 AREA- SOUTH ATLANTIC				SITE- C2 MUSCLE			
LENGTH	NUM	1	MEAN	1.510	S. D.	0.000	LOW	1.510	HIGH	1.510					
WEIGHT	NUM	1	MEAN	19.050	S. D.	0.000	LOW	19.050	HIGH	19.050					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0001	0001	0000	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0001	0001	0000	0000	0000
MEAN	0.290	0.380	0.000	1.550	0.780	0.000	0.130	0.420	6.19	0.170	0.000	0.000	0.110	0.630	0.360
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.290	0.380	0.000	1.550	0.780	0.000	0.130	0.420	6.19	0.170	0.000	0.000	0.110	0.630	0.360

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

BUTTERFISH				PEPRILUS TRIACANTHUS				018014 AREA- NORTH ATLANTIC				SITE- 02 MUSCLE					
LENGTH WEIGHT	NUM NUM	1 MEAN	MEAN	0.141	S. D.	0.000	LOW	0.141	HIGH	0.141	HIGH	0.141	HIGH				
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0001	0000	0000	0000	0000	0000
MEAN	0.000	0.320	0.110	4.000	0.630	0.070	0.182	0.655	9.28	0.320	0.000	0.000	0.250	1.250	0.500		
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000		
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000		
HIGH	0.000	0.320	0.110	4.000	0.630	0.070	0.182	0.655	9.28	0.320	0.000	0.000	0.250	1.250	0.500		

BUTTERFISH				PEPRILUS TRIACANTHUS				018014 AREA- NORTH ATLANTIC				SITE- 03 MUSCLE					
LENGTH WEIGHT	NUM NUM	3 MEAN	MEAN	0.169	S. D.	0.015	LOW	0.154	HIGH	0.184	HIGH	0.184	HIGH				
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
NUMBER	0003	0003	0003	0003	0003	0003	0002	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003
N DET.	0002	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0002	0000	0000	0000	0000	0000
MEAN	0.240	0.353	0.052	3.070	0.517	0.042	0.378	0.527	6.92	0.260	0.060	0.060	0.145	0.783	0.622		
S. D.	0.000	0.094	0.008	0.893	0.206	0.026	0.004	0.088	0.54	0.062	0.000	0.000	0.022	0.220	0.225		
LOW	0.000	0.250	0.045	2.487	0.320	0.020	0.375	0.440	6.44	0.210	0.000	0.000	0.130	0.630	0.470		
HIGH	0.240	0.435	0.060	4.098	0.730	0.070	0.380	0.615	7.50	0.330	0.060	0.060	0.170	1.035	0.880		

BUTTERFISH				PEPRILUS TRIACANTHUS				018014 AREA- NORTH ATLANTIC				SITE- 06 MUSCLE					
LENGTH WEIGHT	NUM NUM	4 MEAN	MEAN	0.183	S. D.	0.020	LOW	0.157	HIGH	0.201	HIGH	0.201	HIGH				
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
NUMBER	0004	0003	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004
N DET.	0002	0000	0000	0000	0000	0000	0000	0000	0000	0000	0003	0002	0000	0000	0000	0000	0000
MEAN	0.040	0.407	0.081	1.844	0.524	0.040	0.239	0.340	7.02	0.199	0.060	0.155	0.131	0.888	0.615		
S. D.	0.028	0.325	0.059	0.791	0.116	0.021	0.150	0.032	2.21	0.042	0.000	0.134	0.051	0.061	0.091		
LOW	0.020	0.190	0.045	1.225	0.390	0.020	0.120	0.305	5.19	0.155	0.000	0.060	0.085	0.815	0.560		
HIGH	0.060	0.780	0.170	3.000	0.650	0.065	0.455	0.380	10.00	0.255	0.060	0.250	0.200	0.940	0.750		

BUTTERFISH				PEPRILUS TRIACANTHUS				018014 AREA- NORTH ATLANTIC				SITE- P1 MUSCLE					
LENGTH WEIGHT	NUM NUM	19 MEAN	MEAN	0.152	S. D.	0.013	LOW	0.132	HIGH	0.179	HIGH	0.179	HIGH				
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
NUMBER	0019	0018	0019	0018	0018	0019	0018	0019	0019	0019	0019	0019	0019	0019	0019	0019	0019
N DET.	0013	0000	0001	0001	0000	0002	0000	0000	0000	0000	0012	0011	0000	0001	0000	0000	0000
MEAN	0.032	0.453	0.081	2.844	0.461	0.041	0.190	0.526	7.44	0.220	0.150	0.296	0.155	0.886	0.612		
S. D.	0.018	0.192	0.029	1.168	0.164	0.010	0.178	0.197	2.13	0.084	0.077	0.216	0.038	0.256	0.230		
LOW	0.010	0.225	0.050	1.300	0.180	0.020	0.030	0.215	4.72	0.070	0.060	0.060	0.095	0.480	0.220		
HIGH	0.060	0.940	0.170	5.725	0.716	0.060	0.830	1.000	14.28	0.450	0.280	0.630	0.230	1.580	1.130		

BUTTERFISH				PEPRILUS TRIACANTHUS				018014 AREA- NORTH ATLANTIC				SITE- R3 MUSCLE					
LENGTH WEIGHT	NUM NUM	5 MEAN	MEAN	0.130	S. D.	0.016	LOW	0.116	HIGH	0.155	HIGH	0.155	HIGH				
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
NUMBER	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0003	0000	0000	0000	0000	0000	0000	0000	0000	0000	0005	0005	0000	0000	0000	0000	0000
MEAN	0.065	0.547	0.075	2.588	0.608	0.040	0.119	0.591	8.01	0.181	0.000	0.000	0.269	0.606	0.587		
S. D.	0.035	0.317	0.010	0.810	0.177	0.016	0.054	0.077	0.68	0.059	0.000	0.000	0.056	0.139	0.109		
LOW	0.040	0.315	0.065	1.375	0.335	0.020	0.060	0.480	7.19	0.090	0.000	0.000	0.180	0.440	0.490		
HIGH	0.090	1.100	0.090	3.400	0.735	0.060	0.190	0.690	9.00	0.240	0.000	0.000	0.320	0.750	0.755		

BUTTERFISH				PEPRILUS TRIACANTHUS				018014 AREA- NORTH ATLANTIC				SITE- S4 MUSCLE					
LENGTH WEIGHT	NUM NUM	1 MEAN	MEAN	0.156	S. D.	0.000	LOW	0.156	HIGH	0.156	HIGH	0.156	HIGH				
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0001	0000	0000	0000	0000	0000
MEAN	0.000	0.190	0.120	0.510	0.080	0.040	0.060	0.750	3.25	0.380	0.000	0.000	0.310	0.560	0.300		
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000		
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000		
HIGH	0.000	0.190	0.120	0.510	0.080	0.040	0.060	0.750	3.25	0.380	0.000	0.000	0.310	0.560	0.300		

CATFISH, WHITE				ICTALURUS CATUS				021002 AREA- NORTH ATLANTIC				SITE- M8 MUSCLE					
LENGTH WEIGHT	NUM NUM	1 MEAN	MEAN	0.205	S. D.	0.000	LOW	0.205	HIGH	0.205	HIGH	0.205	HIGH				
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0000	0000
MEAN	0.145	0.315	0.045	0.666	0.170	0.070	0.060	0.415	7.78	0.120	0.000	0.240	0.250	0.540	0.285		
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000		
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000		
HIGH	0.145	0.315	0.045	0.666	0.170	0.070	0.060	0.415	7.78	0.120	0.000	0.240	0.250	0.540	0.285		

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
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BY TISSUE AND LOCATION

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LOCATION LEVEL 5

CUSK				BROSME	BROSME	033004 AREA- NJRTH ATLANTIC				SITE- J7				MUSCLE		
LENGTH WEIGHT	NUM NUM	4 MEAN MEAN	MEAN	0.743 S. D.	S. D.	0.153 LOW	LOW	0.600 HIGH	HIGH	0.960 HIGH	0.960 HIGH	0.960 HIGH	0.960 HIGH	MANG PPM	ANTIMONY PPM	TIN PPM
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	TIN PPM	TIN PPM
NUMBER	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.343	0.408	0.073	2.994	0.452	0.036	0.186	0.188	4.11	0.210	0.060	0.280	0.228	0.555	0.571	0.571
S. D.	0.175	0.188	0.022	2.827	0.166	0.016	0.166	0.082	0.99	0.061	0.000	0.088	0.199	0.336	0.336	0.336
LOW	0.130	0.250	0.050	0.260	0.250	0.025	0.060	0.080	3.28	0.150	0.000	0.130	0.280	0.220	0.220	0.220
HIGH	0.540	0.625	0.100	5.450	0.620	0.060	0.430	0.280	5.31	0.280	0.360	0.280	0.320	0.750	1.015	1.015

CUSK				BROSME	BROSME	033004 AREA- NJRTH ATLANTIC				SITE- J7				LIVER		
LENGTH WEIGHT	NUM NUM	1 MEAN MEAN	MEAN	0.780 S. D.	S. D.	0.000 LOW	LOW	0.780 HIGH	HIGH	0.780 HIGH	0.780 HIGH	0.780 HIGH	0.780 HIGH	MANG PPM	ANTIMONY PPM	TIN PPM
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	TIN PPM	TIN PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.060	0.310	0.170	4.955	1.480	0.010	0.060	1.190	11.94	0.250	0.000	0.090	0.640	0.630	0.530	0.530
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.060	0.310	0.170	4.955	1.480	0.010	0.060	1.190	11.94	0.250	0.000	0.090	0.640	0.630	0.530	0.530

CUSK				BROSME	BROSME	033004 AREA- NJRTH ATLANTIC				SITE- J8				MUSCLE		
LENGTH WEIGHT	NUM NUM	1 MEAN MEAN	MEAN	0.700 S. D.	S. D.	0.000 LOW	LOW	0.700 HIGH	HIGH	0.700 HIGH	0.700 HIGH	0.700 HIGH	0.700 HIGH	MANG PPM	ANTIMONY PPM	TIN PPM
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	TIN PPM	TIN PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.520	0.440	0.060	1.300	0.750	0.010	0.130	0.420	5.81	0.370	0.000	0.110	0.630	0.500	0.500	0.500
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.520	0.440	0.060	1.300	0.750	0.010	0.130	0.420	5.81	0.370	0.000	0.110	0.630	0.500	0.500	0.500

CUSK				BROSME	BROSME	033004 AREA- NORTH ATLANTIC				SITE- K4				MUSCLE		
LENGTH WEIGHT	NUM NUM	8 MEAN MEAN	MEAN	0.673 S. D.	S. D.	0.100 LOW	LOW	0.500 HIGH	HIGH	0.790 HIGH	0.790 HIGH	0.790 HIGH	0.790 HIGH	MANG PPM	ANTIMONY PPM	TIN PPM
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	TIN PPM	TIN PPM
NUMBER	0010	0009	0010	0010	0009	0010	0010	0009	0010	0010	0010	0010	0010	0010	0010	0010
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.275	0.424	0.064	2.660	0.607	0.029	0.106	0.211	4.65	0.165	0.130	0.360	0.151	0.595	0.518	0.518
S. D.	0.136	0.202	0.020	0.973	0.210	0.011	0.046	0.096	0.92	0.057	0.000	0.236	0.054	0.170	0.164	0.164
LOW	0.110	0.190	0.040	1.337	0.263	0.010	0.056	0.090	3.50	0.085	0.000	0.190	0.090	0.375	0.340	0.340
HIGH	0.540	0.760	0.100	4.600	0.900	0.050	0.190	0.370	6.31	0.240	0.130	0.630	0.280	0.970	0.910	0.910

CUSK				BROSME	BROSME	033004 AREA- NJRTH ATLANTIC				SITE- K4				LIVER		
LENGTH WEIGHT	NUM NUM	2 MEAN MEAN	MEAN	0.740 S. D.	S. D.	0.000 LOW	LOW	0.690 HIGH	HIGH	0.790 HIGH	0.790 HIGH	0.790 HIGH	0.790 HIGH	MANG PPM	ANTIMONY PPM	TIN PPM
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	TIN PPM	TIN PPM
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0001	0000	0000	0001	0001
MEAN	0.120	0.470	0.475	4.475	4.175	0.020	0.130	1.435	10.47	0.140	0.190	0.880	0.560	0.750	0.390	0.390
S. D.	0.000	0.311	0.488	2.652	1.308	0.014	0.000	0.007	6.24	0.000	0.000	0.000	0.453	0.000	0.000	0.000
LOW	0.000	0.250	0.130	2.600	3.250	0.010	0.130	1.430	6.06	0.140	0.000	0.000	0.240	0.000	0.000	0.000
HIGH	0.120	0.690	0.820	6.350	5.100	0.030	0.130	1.440	14.88	0.140	0.190	0.880	0.880	0.750	0.390	0.390

CUSK				BROSME	BROSME	033004 AREA- NORTH ATLANTIC				SITE- K5				MUSCLE		
LENGTH WEIGHT	NUM NUM	4 MEAN MEAN	MEAN	0.678 S. D.	S. D.	0.050 LOW	LOW	0.610 HIGH	HIGH	0.730 HIGH	0.730 HIGH	0.730 HIGH	0.730 HIGH	MANG PPM	ANTIMONY PPM	TIN PPM
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	TIN PPM	TIN PPM
NUMBER	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004
N DET.	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	0004	0003	0000	0000	0000	0000
MEAN	0.273	0.353	0.056	2.478	0.508	0.016	0.125	0.170	3.47	0.145	0.300	0.440	0.139	0.409	0.429	0.429
S. D.	0.129	0.139	0.005	0.691	0.076	0.006	0.056	0.041	0.32	0.055	0.000	0.000	0.010	0.128	0.083	0.083
LOW	0.110	0.190	0.050	1.608	0.400	0.010	0.060	0.130	3.18	0.080	0.000	0.000	0.125	0.310	0.345	0.345
HIGH	0.390	0.530	0.060	3.300	0.575	0.025	0.160	0.225	3.87	0.195	0.000	0.440	0.150	0.590	0.500	0.500

CUSK				BROSME	BROSME	033004 AREA- NJRTH ATLANTIC				SITE- K5				LIVER		
LENGTH WEIGHT	NUM NUM	2 MEAN MEAN	MEAN	0.710 S. D.	S. D.	0.000 LOW	LOW	0.690 HIGH	HIGH	0.730 HIGH	0.730 HIGH	0.730 HIGH	0.730 HIGH	MANG PPM	ANTIMONY PPM	TIN PPM
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	TIN PPM	TIN PPM
NUMBER	0002	0002	0002	0002	0000	0001	0002	0001	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0001	0000	0000	0000	0000	0000	0002	0000	0000	0000	0001	0001	0000	0000	0000	0000
MEAN	0.170	0.130	0.540	1.675	0.000	0.010	0.000	0.490	15.53	0.180	0.190	0.810	0.510	0.575	0.170	0.170
S. D.	0.000	0.000	0.552	1.732	0.000	0.000	0.000	0.000	1.46	0.085	0.300	0.000	0.467	0.332	0.028	0.028
LOW	0.000	0.130	0.150	0.450	0.000	0.000	0.000	0.000	14.50	0.120	0.000	0.000	0.180	0.340	0.150	0.150
HIGH	0.170	0.130	0.930	2.900	0.000	0.010	0.000	0.490	16.56	0.240	0.190	0.810	0.840	0.610	0.190	0.190

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
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LOCATION LEVEL 5

COD, PAC. (GRAY)		GADUS MACROCEPHALUS							033007 AREA- PACIFIC NORTHWEST			SITE- N1		MUSCLE	
LENGTH WEIGHT	NUM NUM	10 MEAN	0.526 S. D.	0.040 S. D.	LOW	0.450 HIGH	0.570 HIGH	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0010	0010	0010	0008	0008	0010	0010	0010	0010	0010	0010	0010	0010	0010	0009
N DET.	0000	0001	0003	0000	0000	0005	0002	0000	0000	0004	0008	0009	0000	0002	0000
MEAN	0.261	0.615	0.095	10.200	0.401	0.037	0.127	0.173	3.73	0.199	0.105	1.020	0.159	0.856	0.632
S. D.	0.089	0.555	0.014	8.614	0.174	0.010	0.065	0.040	0.88	0.097	0.064	0.000	0.077	0.666	0.241
LOW	0.163	0.150	0.040	3.322	0.120	0.025	0.050	0.125	2.68	0.070	0.060	0.000	0.070	0.250	0.350
HIGH	0.400	1.780	0.070	30.250	0.620	0.050	0.225	0.253	5.33	0.320	0.150	1.020	0.325	1.750	0.970

COD, PAC. (GRAY)		GADUS MACROCEPHALUS							033007 AREA- PACIFIC NORTHWEST			SITE- N1		LIVER	
LENGTH WEIGHT	NUM NUM	2 MEAN	0.460 S. D.	0.014 S. D.	LOW	0.450 HIGH	0.470 HIGH	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0000	0000	0001	0000	0000	0000	0000	0000	0000	0001	0000	0002	0000	0000	0000
MEAN	0.098	0.268	0.110	8.538	3.643	0.873	0.170	10.565	25.25	0.360	0.160	0.000	1.638	0.150	0.153
S. D.	0.110	0.350	0.000	0.053	2.790	0.180	0.099	0.714	3.69	0.000	0.057	0.000	0.357	0.141	0.039
LOW	0.020	0.020	0.000	8.500	1.670	0.745	0.100	10.060	22.64	0.000	0.120	0.000	1.385	0.050	0.125
HIGH	0.175	0.515	0.110	8.575	5.616	1.000	0.240	11.070	27.86	0.360	0.200	0.000	1.890	0.250	0.180

COD, PAC. (GRAY)		GADUS MACROCEPHALUS							033007 AREA- ALASKA			SITE- K7		MUSCLE	
LENGTH WEIGHT	NUM NUM	9 MEAN	0.666 S. D.	0.065 S. D.	LOW	0.600 HIGH	0.760 HIGH	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0009	0009	0009	0009	0008	0009	0009	0009	0009	0009	0009	0009	0009	0009	0008
N DET.	0000	0000	0000	0000	0000	0006	0000	0000	0000	0000	0008	0009	0000	0000	0000
MEAN	0.130	0.323	0.095	4.536	0.291	0.025	0.163	0.251	4.04	0.144	0.060	0.000	0.087	0.483	0.477
S. D.	0.086	0.056	0.012	1.998	0.156	0.009	0.124	0.070	0.48	0.056	0.000	0.000	0.009	0.075	0.095
LOW	0.020	0.230	0.040	7.000	0.140	0.020	0.060	0.160	3.38	0.070	0.000	0.000	0.075	0.370	0.355
HIGH	0.310	0.380	0.075	7.000	0.630	0.035	0.345	0.355	4.81	0.225	0.060	0.000	0.100	0.595	0.630

COD, PAC. (GRAY)		GADUS MACROCEPHALUS							033007 AREA- ALASKA			SITE- N6		MUSCLE	
LENGTH WEIGHT	NUM NUM	10 MEAN	0.666 S. D.	0.058 S. D.	LOW	0.590 HIGH	0.750 HIGH	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0009	0010	0010	0010	0009	0010	0010	0010	0010	0010	0010	0010	0009	0010	0010
N DET.	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0006	0007	0000	0000	0000
MEAN	0.154	0.423	0.049	7.798	0.620	0.034	0.206	0.280	4.27	0.187	0.213	0.302	0.171	0.615	0.539
S. D.	0.095	0.161	0.014	3.300	0.290	0.006	0.122	0.121	1.53	0.055	0.145	0.223	0.062	0.264	0.144
LOW	0.020	0.250	0.030	3.250	0.330	0.030	0.095	0.060	2.75	0.060	0.360	0.060	0.105	0.130	0.250
HIGH	0.315	0.785	0.075	12.960	1.205	0.045	0.500	0.500	8.12	0.270	0.410	0.500	0.320	0.940	0.750

COD, PAC. (GRAY)		GADUS MACROCEPHALUS							033007 AREA- ALASKA			SITE- N6		LIVER	
LENGTH WEIGHT	NUM NUM	5 MEAN	0.707 S. D.	0.042 S. D.	LOW	0.645 HIGH	0.750 HIGH	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0005	0005	0005	0005	0000	0005	0005	0005	0005	0005	0004	0005	0004	0005	0005
N DET.	0002	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	0005	0000	0000	0000
MEAN	0.047	0.505	0.376	3.729	0.000	0.066	0.192	3.075	22.54	0.252	0.383	0.000	2.010	0.550	0.440
S. D.	0.038	0.188	0.212	2.058	0.000	0.079	0.130	2.154	4.72	0.116	0.396	0.000	0.860	0.326	0.269
LOW	0.020	0.310	0.150	2.600	0.000	0.010	0.010	0.880	15.00	0.390	0.310	0.000	1.130	0.130	0.360
HIGH	0.090	0.750	0.700	7.400	0.000	0.190	0.330	5.090	26.72	0.410	0.440	0.000	3.190	0.940	0.750

COD, ATL.		GADUS MORHUA							033008 AREA- NORTH ATLANTIC			SITE- I2		MUSCLE	
LENGTH WEIGHT	NUM NUM	7 MEAN	0.871 S. D.	0.220 S. D.	LOW	0.410 HIGH	1.040 HIGH	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007
N DET.	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0007	0006	0000	0000	0000
MEAN	0.222	0.409	0.061	5.374	0.501	0.034	0.174	0.212	3.84	0.169	0.000	0.190	0.124	0.563	0.431
S. D.	0.133	0.176	0.019	2.519	0.114	0.015	0.154	0.034	0.43	0.037	0.000	0.000	0.035	0.177	0.170
LOW	0.040	0.190	0.040	3.375	0.375	0.015	0.060	0.180	2.97	0.120	0.000	0.000	0.090	0.300	0.220
HIGH	0.430	0.750	0.090	9.300	0.720	0.060	0.440	0.270	4.38	0.210	0.000	0.190	0.180	0.750	0.690

COD, ATL.		GADUS MORHUA							033008 AREA- NORTH ATLANTIC			SITE- I2		LIVER	
LENGTH WEIGHT	NUM NUM	6 MEAN	0.948 S. D.	0.091 S. D.	LOW	0.800 HIGH	1.340 HIGH	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0006	0006	0006	0006	0005	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006
N DET.	0005	0000	0000	0000	0000	0000	0001	0000	0000	0000	0003	0005	0000	0000	0000
MEAN	0.110	0.488	0.097	7.988	1.234	0.202	0.202	3.770	13.92	0.178	0.167	0.310	0.698	0.312	0.260
S. D.	0.000	0.313	0.067	5.882	0.851	0.231	0.242	2.829	5.50	0.082	0.372	0.000	0.478	0.171	0.196
LOW	0.000	0.060	0.050	2.300	0.600	0.010	0.060	0.970	6.50	0.090	0.120	0.000	0.210	0.120	0.060
HIGH	0.110	1.000	0.230	16.550	2.440	0.510	0.630	9.060	21.88	0.300	0.250	0.310	1.330	0.630	0.560

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

COD, ATL.		GADUS MORHUA							033008 AREA- NORTH ATLANTIC			SITE- J8		LIVER		
LENGTH WEIGHT	NUM NUM	4 MEAN	0.764	S. D.	0.184	LOW	0.663	HIGH	1.040							
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
NUMBER	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	
N DET.	0002	0000	0000	0000	0000	0000	0001	0000	0000	0001	0002	0004	0000	0000	0000	
MEAN	0.158	0.549	0.105	5.362	0.696	0.185	0.087	5.850	15.67	0.107	0.225	0.000	0.398	0.553	0.398	
S. D.	0.145	0.415	0.062	2.640	0.305	0.129	0.023	5.691	13.57	0.059	0.049	0.000	0.278	0.574	0.397	
LOW	0.055	0.150	0.040	3.700	0.250	0.010	0.060	1.570	4.40	0.040	0.190	0.000	0.140	0.190	0.060	
HIGH	0.260	1.120	0.180	9.300	0.940	0.320	0.100	14.210	35.36	0.150	0.260	0.000	0.780	1.410	0.900	

COD, ATL.		GADUS MORHUA							033008 AREA- NORTH ATLANTIC			SITE- K2		MUSCLE	
LENGTH WEIGHT	NUM NUM	8 MEAN	0.712	S. D.	0.216	LOW	0.434	HIGH	1.020						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008
N DET.	0000	0000	0001	0000	0000	0002	0000	0000	0000	0000	0305	0005	0000	0001	0000
MEAN	0.074	0.334	0.052	3.423	0.632	0.044	0.119	0.218	4.25	0.210	0.333	0.360	0.159	0.959	0.763
S. D.	0.065	0.140	0.011	1.611	0.244	0.010	0.052	0.085	0.95	0.077	0.239	0.375	0.047	0.313	0.424
LOW	0.020	0.155	0.036	1.100	0.345	0.030	0.060	0.030	3.47	0.126	0.060	0.060	0.075	0.580	0.390
HIGH	0.195	0.500	0.070	6.133	1.040	0.060	0.205	0.280	6.23	0.360	0.500	0.780	0.205	1.500	1.750

COD, ATL.		GADUS MORHUA							033008 AREA- NORTH ATLANTIC			SITE- K2		LIVER	
LENGTH WEIGHT	NUM NUM	6 MEAN	0.791	S. D.	0.186	LOW	0.465	HIGH	1.020						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0006	0006	0006	0005	0004	0006	0006	0006	0006	0006	0306	0006	0006	0005	0006
N DET.	0005	0000	0001	0000	0000	0001	0000	0000	0000	0301	0001	0005	0000	0001	0000
MEAN	0.010	0.435	0.161	3.674	0.810	0.072	0.191	3.690	13.33	0.244	0.264	0.400	0.500	0.355	0.309
S. D.	0.000	0.217	0.098	3.176	0.233	0.058	0.137	1.282	3.86	0.159	0.156	0.000	0.213	0.124	0.325
LOW	0.000	0.250	0.040	0.300	0.520	0.010	0.040	2.120	8.21	0.090	0.100	0.000	0.220	0.200	0.060
HIGH	0.010	0.850	0.290	8.020	1.040	0.130	0.400	5.750	17.85	0.510	0.500	0.400	0.800	0.500	0.890

COD, ATL.		GADUS MORHUA							033008 AREA- NORTH ATLANTIC			SITE- N2		MUSCLE	
LENGTH WEIGHT	NUM NUM	7 MEAN	0.589	S. D.	0.089	LOW	0.510	HIGH	0.780						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011
N DET.	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	0010	0009	0000	0010	0000
MEAN	0.168	0.455	0.068	2.649	0.386	0.034	0.434	0.263	4.44	0.234	0.190	0.140	0.187	0.410	0.509
S. D.	0.166	0.201	0.024	1.673	0.147	0.009	0.280	0.109	1.41	0.032	0.000	0.113	0.076	0.000	0.103
LOW	0.060	0.190	0.040	0.100	0.145	0.020	0.125	0.080	2.75	0.180	0.300	0.060	0.080	0.000	0.370
HIGH	0.580	0.810	0.130	6.125	0.600	0.050	0.815	0.510	7.75	0.280	0.190	0.220	0.320	0.410	0.690

COD, ATL.		GADUS MORHUA							033008 AREA- NORTH ATLANTIC			SITE- N2		LIVER	
LENGTH WEIGHT	NUM NUM	4 MEAN	0.605	S. D.	0.120	LOW	0.510	HIGH	0.780						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0005	0004	0005	0005	0005	0005	0005	0005	0005	0005	0305	0005	0005	0005	0005
N DET.	0002	0000	0000	0000	0000	0000	0002	0000	0000	0000	0000	0004	0000	0004	0000
MEAN	0.057	0.313	0.252	3.246	0.751	0.076	0.167	4.360	16.60	0.328	0.252	0.250	0.662	0.440	0.360
S. D.	0.064	0.102	0.229	1.490	0.339	0.094	0.097	2.338	6.28	0.217	0.114	0.000	0.238	0.000	0.063
LOW	0.020	0.190	0.130	1.720	0.260	0.010	0.060	2.060	6.85	0.130	0.130	0.000	0.290	0.000	0.250
HIGH	0.130	0.440	0.660	5.225	1.100	0.240	0.250	8.050	21.88	0.610	0.410	0.250	0.910	0.440	0.410

COD, ATL.		GADUS MORHUA							033008 AREA- NORTH ATLANTIC			SITE- N3		MUSCLE	
LENGTH WEIGHT	NUM NUM	5 MEAN	0.606	S. D.	0.104	LOW	0.448	HIGH	0.735						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0005	0004	0000	0000	0000
MEAN	0.109	0.612	0.067	4.373	0.496	0.029	0.145	0.266	4.29	0.212	0.000	0.280	0.146	0.664	0.503
S. D.	0.047	0.341	0.037	1.788	0.125	0.011	0.087	0.064	0.53	0.029	0.000	0.000	0.040	0.219	0.215
LOW	0.030	0.280	0.035	3.231	0.330	0.010	0.060	0.175	3.69	0.180	0.000	0.000	0.115	0.440	0.220
HIGH	0.150	1.060	0.130	7.500	0.620	0.035	0.285	0.325	5.12	0.255	0.000	0.280	0.215	0.965	0.690

COD, ATL.		GADUS MORHUA							033008 AREA- NORTH ATLANTIC			SITE- O2		MUSCLE	
LENGTH WEIGHT	NUM NUM	10 MEAN	0.547	S. D.	0.060	LOW	0.481	HIGH	0.675						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0010	0009	0009	0010	0009	0009	0009	0009	0009	0009	0009	0009	0009	0009	0009
N DET.	0000	0000	0001	0000	0000	0001	0001	0000	0000	0000	0008	0005	0000	0000	0000
MEAN	0.097	0.396	0.051	5.326	0.330	0.026	0.122	0.233	3.41	0.213	0.330	0.203	0.125	0.600	0.590
S. D.	0.054	0.243	0.020	2.691	0.184	0.014	0.049	0.091	1.36	0.065	0.000	0.167	0.073	0.278	0.845
LOW	0.020	0.120	0.020	2.050	0.140	0.010	0.070	0.080	0.87	0.140	0.000	0.060	0.030	0.060	0.250
HIGH	0.205	0.810	0.075	9.500	0.780	0.050	0.200	0.340	5.47	0.350	0.060	0.380	0.270	0.905	2.930

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

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LOCATION LEVEL 5

POLLOCK				POLLACHIUS VIRENS				033017 AREA- NORTH ATLANTIC			SITE- K7			MUSCLE	
LENGTH WEIGHT	NUM NUM	4 MEAN MEAN	4 MEAN MEAN	0.588 2.212	S. D. S. D.	0.074 0.750	LOW LOW	0.480 1.134	HIGH HIGH	0.640 2.722	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM					
NUMBER N DET.	0004 0000	0004 0000	0004 0001	0003 0000	0003 0000	0004 0002	0004 0000	0004 0000	0004 0000	0004 0000	0004 0003	0004 0000	0004 0000	0004 0001	
MEAN	0.109	0.299	0.045	3.664	0.463	0.050	0.127	0.393	3.64	0.411	1.120	0.260	0.113	0.967	
S. D.	0.033	0.140	0.009	1.992	0.116	0.028	0.083	0.026	1.15	0.184	0.000	0.000	0.025	0.394	
LOW	0.060	0.145	0.040	1.900	0.340	0.030	0.070	0.375	2.09	0.280	0.000	0.000	0.080	0.630	
HIGH	0.130	0.485	0.055	5.825	0.570	0.070	0.250	0.430	4.81	0.680	1.120	0.260	0.140	1.400	
POLLOCK				POLLACHIUS VIRENS				033017 AREA- NORTH ATLANTIC			SITE- K7			LIVER	
LENGTH WEIGHT	NUM NUM	2 MEAN MEAN	2 MEAN MEAN	0.552 1.852	S. D. S. D.	0.101 1.015	LOW LOW	0.480 1.134	HIGH HIGH	0.623 2.570	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM					
NUMBER N DET.	0002 0002	0002 0001	0002 0000	0002 0000	0002 0000	0002 0001	0002 0001	0002 0000	0002 0000	0002 0000	0002 0002	0002 0000	0002 0000	0002 0000	
MEAN	0.000	0.125	0.080	5.608	0.723	0.010	0.200	2.073	7.03	0.115	0.180	0.000	0.433	0.418	
S. D.	0.000	0.000	0.042	4.873	0.456	0.000	0.000	1.969	1.99	0.092	0.000	0.000	0.216	0.067	
LOW	0.000	0.000	0.050	2.162	0.400	0.000	0.000	0.680	5.62	0.050	0.000	0.000	0.280	0.370	
HIGH	0.000	0.125	0.110	9.053	1.045	0.010	0.200	3.465	8.43	0.180	0.180	0.000	0.585	0.465	
POLLOCK				POLLACHIUS VIRENS				033017 AREA- NORTH ATLANTIC			SITE- O2			MUSCLE	
LENGTH WEIGHT	NUM NUM	2 MEAN MEAN	2 MEAN MEAN	0.930 0.000	S. D. S. D.	0.113 0.000	LOW LOW	0.850 0.000	HIGH HIGH	1.010 0.000	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM					
NUMBER N DET.	0002 0000	0001 0000	0002 0000	0002 0000	0002 0000	0002 0000	0002 0000	0002 0000	0002 0000	0002 0000	0002 0002	0002 0000	0002 0000	0002 0000	
MEAN	0.283	0.280	0.080	4.525	0.415	0.020	0.280	0.468	3.35	0.318	0.000	0.000	0.103	0.795	
S. D.	0.131	0.000	0.071	0.672	0.049	0.000	0.311	0.230	0.76	0.173	0.000	0.000	0.018	0.120	
LOW	0.190	0.000	0.030	4.050	0.380	0.020	0.060	0.305	2.81	0.195	0.000	0.000	0.090	0.190	
HIGH	0.375	0.280	0.130	5.000	0.450	0.020	0.500	0.630	3.88	0.440	0.000	0.000	0.115	0.880	
POLLOCK				POLLACHIUS VIRENS				033017 AREA- NORTH ATLANTIC			SITE- O2			LIVER	
LENGTH WEIGHT	NUM NUM	2 MEAN MEAN	2 MEAN MEAN	0.930 0.000	S. D. S. D.	0.113 0.000	LOW LOW	0.850 0.000	HIGH HIGH	1.010 0.000	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM					
NUMBER N DET.	0002 0001	0002 0000	0002 0000	0002 0000	0002 0000	0002 0001	0002 0001	0002 0000	0002 0000	0002 0000	0002 0001	0002 0001	0002 0000	0002 0000	
MEAN	0.020	0.298	0.155	3.081	1.120	0.020	0.030	4.303	16.45	0.130	0.120	0.310	0.465	0.435	
S. D.	0.000	0.202	0.035	0.892	0.141	0.000	0.000	3.157	6.21	0.042	0.000	0.000	0.021	0.049	
LOW	0.000	0.155	0.130	2.450	1.020	0.000	0.000	2.070	12.06	0.100	0.000	0.000	0.450	0.400	
HIGH	0.020	0.440	0.180	3.712	1.220	0.020	0.030	6.535	20.84	0.160	0.120	0.310	0.480	0.470	
POLLOCK, WALLEYE (ALASKA)				THERAGRA CHALCOGRAMMA				033019 AREA- PACIFIC NORTHWEST			SITE- I7			MUSCLE	
LENGTH WEIGHT	NUM NUM	1 MEAN MEAN	1 MEAN MEAN	0.400 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.400 0.000	HIGH HIGH	0.400 0.000	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM					
NUMBER N DET.	0001 0000	0001 0000	0001 0001	0001 0000	0001 0000	0001 0001	0001 0000	0001 0000	0001 0000	0001 0000	0001 0001	0001 0000	0001 0000	0001 0000	
MEAN	0.190	1.030	0.000	3.200	0.330	0.000	0.250	0.360	3.61	0.290	0.000	0.000	0.180	1.250	
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	
HIGH	0.190	1.030	0.000	3.200	0.330	0.000	0.250	0.360	3.61	0.290	0.000	0.000	0.180	1.250	
POLLOCK, WALLEYE (ALASKA)				THERAGRA CHALCOGRAMMA				033019 AREA- PACIFIC NORTHWEST			SITE- N1			MUSCLE	
LENGTH WEIGHT	NUM NUM	9 MEAN MEAN	9 MEAN MEAN	0.391 0.000	S. D. S. D.	0.043 0.000	LOW LOW	0.345 0.000	HIGH HIGH	0.495 0.000	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM					
NUMBER N DET.	0009 0000	0009 0000	0009 0003	0009 0000	0009 0001	0009 0002	0009 0000	0009 0000	0009 0000	0008 0001	0009 0006	0009 0000	0009 0000	0009 0000	
MEAN	0.148	0.466	0.063	3.997	0.453	0.056	0.258	0.274	3.41	0.238	0.185	0.397	0.156	0.694	
S. D.	0.045	0.471	0.027	1.485	0.331	0.016	0.265	0.074	0.91	0.080	0.048	0.075	0.058	0.296	
LOW	0.085	0.150	0.040	1.600	0.080	0.035	0.050	0.140	1.88	0.110	0.130	0.310	0.060	0.340	
HIGH	0.210	1.690	0.110	5.926	1.180	0.080	0.840	0.390	5.00	0.360	0.220	0.440	0.250	1.060	
POLLOCK, WALLEYE (ALASKA)				THERAGRA CHALCOGRAMMA				033019 AREA- ALASKA			SITE- L7			MUSCLE	
LENGTH WEIGHT	NUM NUM	5 MEAN MEAN	5 MEAN MEAN	0.475 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.475 0.000	HIGH HIGH	0.475 0.000	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM					
NUMBER N DET.	0005 0000	0005 0000	0005 0000	0005 0000	0005 0000	0005 0001	0005 0000	0005 0000	0005 0000	0005 0000	0005 0005	0005 0004	0005 0000	0005 0000	
MEAN	0.116	0.411	0.077	3.175	0.220	0.039	0.098	0.290	3.67	0.244	0.000	0.190	0.092	0.866	
S. D.	0.095	0.187	0.020	1.770	0.069	0.002	0.044	0.071	0.32	0.107	0.000	0.000	0.022	0.300	
LOW	0.040	0.240	0.060	0.925	0.130	0.035	0.040	0.190	3.31	0.080	0.000	0.000	0.060	0.630	
HIGH	0.220	0.720	0.105	4.625	0.310	0.040	0.130	0.380	4.16	0.340	0.000	0.190	0.110	1.250	

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

DOLPHIN		CORYPHAENA HIPPURUS							041002 AREA- SOUTH ATLANTIC			SITE- M1 MUSCLE			
LENGTH WEIGHT	NUM NUM	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	MERCURY PPM	9 LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010
N DET.	0000	0000	0001	0000	0000	0003	0001	0000	0000	0000	0007	0008	0001	0001	0000
MEAN	0.175	0.440	0.107	4.463	0.775	0.043	0.158	0.398	5.72	0.322	0.207	0.450	0.202	1.127	0.431
S. D.	0.114	0.183	0.029	1.406	0.148	0.008	0.072	0.079	2.19	0.130	0.144	0.354	0.089	0.431	0.146
LOW	0.035	0.140	0.055	1.875	0.520	0.030	0.070	0.300	3.23	0.175	0.100	0.200	0.113	0.525	0.250
HIGH	0.335	0.725	0.150	6.400	0.970	0.055	0.280	0.520	10.17	0.545	0.370	0.700	0.335	1.780	0.550

DOLPHIN		CORYPHAENA HIPPURUS							041002 AREA- SOUTH ATLANTIC			SITE- M1 LIVER			
LENGTH WEIGHT	NUM NUM	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	MERCURY PPM	1 LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.110	0.150	0.980	3.120	1.865	0.010	0.000	1.900	28.90	0.100	0.500	0.200	0.460	0.700	0.650
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.110	0.150	0.980	3.120	1.865	0.010	0.000	1.900	28.90	0.100	0.500	0.200	0.460	0.700	0.650

DOLPHIN		CORYPHAENA HIPPURUS							041002 AREA- GULF			SITE- L5 MUSCLE			
LENGTH WEIGHT	NUM NUM	1 MEAN	1.403	S. D.	0.000	LOW	1.403	HIGH	1.403	0.000	0.000	0.000	0.000	0.000	0.000
	MERCURY PPM	2 LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0002	0000	0002	0000
MEAN	0.350	0.345	0.055	3.875	0.770	0.030	0.160	0.625	4.32	0.205	0.000	0.000	0.090	0.300	0.545
S. D.	0.255	0.049	0.021	1.520	0.382	0.000	0.042	0.049	0.26	0.092	0.000	0.000	0.014	0.000	0.021
LOW	0.170	0.310	0.040	2.800	0.500	0.030	0.130	0.590	4.13	0.140	0.000	0.000	0.080	0.000	0.530
HIGH	0.530	0.380	0.070	4.950	1.040	0.030	0.190	0.660	4.50	0.270	0.000	0.000	0.100	0.000	0.560

DOLPHIN		CORYPHAENA HIPPURUS							041002 AREA- HAWAII			SITE- C3 MUSCLE			
LENGTH WEIGHT	NUM NUM	1 MEAN	0.829	S. D.	0.000	LOW	0.829	HIGH	0.829	0.000	0.000	0.000	0.000	0.000	0.000
	MERCURY PPM	1 LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0000
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.040	0.630	0.210	0.900	0.370	0.020	0.140	1.130	3.69	0.160	0.200	0.001	0.060	0.810	0.000
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.300	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.040	0.630	0.210	0.900	0.370	0.020	0.140	1.130	3.69	0.160	0.200	0.000	0.060	0.810	0.000

DOLPHIN		CORYPHAENA HIPPURUS							041002 AREA- HAWAII			SITE- C3 LIVER			
LENGTH WEIGHT	NUM NUM	1 MEAN	0.829	S. D.	0.000	LOW	0.829	HIGH	0.829	0.000	0.000	0.000	0.000	0.000	0.000
	MERCURY PPM	1 LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0001	0001	0001	0001	0000	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.000	0.500	1.290	2.300	0.000	0.050	0.130	5.630	18.44	0.150	0.250	0.250	0.620	0.630	0.310
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.000	0.500	1.290	2.300	0.000	0.050	0.130	5.630	18.44	0.150	0.250	0.250	0.620	0.630	0.310

DOLPHIN		CORYPHAENA HIPPURUS							041002 AREA- HAWAII			SITE- D5 MUSCLE			
LENGTH WEIGHT	NUM NUM	4 MEAN	0.585	S. D.	0.000	LOW	0.469	HIGH	0.731	0.000	0.000	0.000	0.000	0.000	0.000
	MERCURY PPM	33 LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0033	0033	0033	0033	0031	0033	0033	0033	0033	0033	0033	0033	0033	0033	0032
N DET.	0002	0000	0000	0000	0000	0004	0000	0000	0000	0000	0017	0023	0000	0000	0000
MEAN	0.111	0.464	0.059	3.034	0.644	0.028	0.170	0.349	3.81	0.183	0.192	0.411	0.088	0.682	0.492
S. D.	0.085	0.232	0.023	1.096	0.222	0.013	0.116	0.161	1.26	0.053	0.137	0.259	0.026	0.265	0.155
LOW	0.020	0.060	0.030	1.433	0.140	0.015	0.060	0.110	2.12	0.090	0.060	0.060	0.050	0.155	0.190
HIGH	0.385	1.060	0.120	6.900	1.300	0.080	0.470	0.870	9.50	0.305	0.630	1.000	0.146	1.190	0.750

DOLPHIN		CORYPHAENA HIPPURUS							041002 AREA- HAWAII			SITE- D5 LIVER			
LENGTH WEIGHT	NUM NUM	1 MEAN	0.585	S. D.	0.000	LOW	0.585	HIGH	0.585	0.000	0.000	0.000	0.000	0.000	0.000
	MERCURY PPM	21 LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0021	0020	0021	0020	0011	0021	0020	0021	0019	0021	0021	0021	0021	0021	0019
N DET.	0010	0000	0000	0000	0000	0002	0000	0000	0000	0000	0005	0019	0000	0000	0000
MEAN	0.036	0.596	1.988	3.852	1.995	0.043	0.215	9.253	24.14	0.219	0.464	0.265	1.031	0.770	0.585
S. D.	0.030	0.362	0.850	2.461	0.717	0.025	0.142	7.179	6.74	0.106	0.206	0.064	0.483	0.386	0.236
LOW	0.020	0.060	0.490	0.700	1.300	0.010	0.040	2.050	10.63	0.060	0.220	0.220	0.200	0.250	0.310
HIGH	0.120	1.380	3.800	10.450	3.675	0.110	0.630	28.280	34.37	0.480	1.000	0.310	1.810	1.500	1.250

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

DRUM, RED		SCIAENOPS OCELLATA							045030 AREA- GULF			SITE- C9 MUSCLE				
LENGTH	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	0.000	0.000	VANADIUM	MANG	ANTIMONY	TIN
WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	0.000	0.000	PPM	PPM	PPM	PPM
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB					
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM					
NUMBER	0010	0009	0010	0010	0010	0010	0007	0010	0010	0010	0010	0010	0010	0010	0010	0010
N DET.	0000	0000	0000	0000	0000	0002	0001	0000	0000	0000	0010	0010	0000	0000	0001	0000
MEAN	0.413	0.406	0.083	4.168	0.610	0.020	0.162	0.314	3.69	0.142	0.000	0.000	0.095	0.587	0.415	
S. D.	0.241	0.189	0.042	2.362	0.168	0.012	0.101	0.037	0.73	0.065	0.000	0.000	0.024	0.194	0.180	
LOW	0.150	0.130	0.040	1.750	0.300	0.010	0.060	0.250	1.88	0.070	0.000	0.000	0.050	0.310	0.300	
HIGH	0.800	0.690	0.190	8.000	0.900	0.040	0.310	0.380	4.44	0.270	0.000	0.000	0.130	0.940	0.560	

DRUM, RED		SCIAENOPS OCELLATA							045030 AREA- GULF			SITE- G3 MUSCLE				
LENGTH	NUM	11	MEAN	0.615	S. D.	0.065	LOW	0.500	HIGH	0.710	0.710	VANADIUM	MANG	ANTIMONY	TIN	
WEIGHT	NUM	11	MEAN	2.758	S. D.	0.989	LOW	1.531	HIGH	4.763	4.763	PPM	PPM	PPM	PPM	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB					
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM					
NUMBER	0012	0012	0012	0012	0012	0012	0012	0012	0012	0011	0012	0012	0012	0012	0012	
N DET.	0000	0000	0005	0001	0000	0006	0001	0001	0000	0001	0012	0009	0000	0003	0000	
MEAN	0.215	0.477	0.061	2.037	0.830	0.091	0.188	0.188	4.27	0.309	0.000	0.100	0.179	0.788	0.633	
S. D.	0.052	0.215	0.042	0.723	0.208	0.079	0.092	0.086	1.30	0.205	0.000	0.030	0.136	0.381	0.354	
LOW	0.145	0.150	0.020	0.800	0.580	0.020	0.070	0.070	2.46	0.105	0.000	0.070	0.030	0.370	0.300	
HIGH	0.310	0.740	0.140	2.800	1.245	0.190	0.330	0.320	6.71	0.680	0.000	0.130	0.540	1.500	1.450	

DRUM, RED		SCIAENOPS OCELLATA							045030 AREA- GULF			SITE- G3 LIVER				
LENGTH	NUM	1	MEAN	0.627	S. D.	0.000	LOW	0.627	HIGH	2.880	2.880	VANADIUM	MANG	ANTIMONY	TIN	
WEIGHT	NUM	1	MEAN	2.880	S. D.	0.000	LOW	2.880	HIGH	2.880	2.880	PPM	PPM	PPM	PPM	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB					
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM					
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	
MEAN	0.240	0.630	2.260	1.400	1.880	0.010	0.150	12.690	15.75	0.370	0.310	0.000	1.080	0.870	0.590	
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	
HIGH	0.240	0.630	2.260	1.400	1.880	0.010	0.150	12.690	15.75	0.370	0.310	0.000	1.080	0.870	0.590	

DRUM, RED		SCIAENOPS OCELLATA							045030 AREA- GULF			SITE- G5 MUSCLE				
LENGTH	NUM	6	MEAN	0.601	S. D.	0.025	LOW	0.560	HIGH	1.929	1.929	VANADIUM	MANG	ANTIMONY	TIN	
WEIGHT	NUM	6	MEAN	2.459	S. D.	0.371	LOW	1.929	HIGH	2.951	2.951	PPM	PPM	PPM	PPM	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB					
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM					
NUMBER	0006	0006	0006	0006	0006	0006	0006	0006	0006	0306	0006	0006	0006	0006	0006	
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0006	0004	0000	0006	0000	
MEAN	0.096	0.329	0.061	3.436	0.624	0.030	0.195	0.276	3.61	0.236	0.000	0.235	0.163	0.000	0.518	
S. D.	0.038	0.143	0.009	1.202	0.262	0.009	0.101	0.110	0.25	0.025	0.000	0.064	0.033	0.000	0.088	
LOW	0.050	0.130	0.050	2.050	0.210	0.020	0.095	0.150	3.13	0.210	0.000	0.190	0.120	0.000	0.380	
HIGH	0.155	0.470	0.070	4.816	1.010	0.045	0.380	0.425	3.81	0.280	0.000	0.280	0.200	0.000	0.610	

DRUM, RED		SCIAENOPS OCELLATA							045030 AREA- GULF			SITE- L5 MUSCLE				
LENGTH	NUM	3	MEAN	0.254	S. D.	0.020	LOW	0.234	HIGH	0.176	0.176	VANADIUM	MANG	ANTIMONY	TIN	
WEIGHT	NUM	3	MEAN	0.213	S. D.	0.037	LOW	0.176	HIGH	0.250	0.250	PPM	PPM	PPM	PPM	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB					
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM					
NUMBER	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	
N DET.	0000	0000	0001	0000	0000	0001	0000	0000	0000	0000	0003	0002	0000	0001	0000	
MEAN	0.108	0.517	0.065	4.985	0.687	0.035	0.226	0.242	4.75	0.393	0.000	1.130	0.302	1.678	0.897	
S. D.	0.060	0.127	0.035	1.830	0.307	0.007	0.125	0.010	0.96	0.143	0.000	0.000	0.228	0.350	0.612	
LOW	0.050	0.370	0.040	2.900	0.480	0.030	0.125	0.230	3.96	0.250	0.000	0.000	0.160	1.430	0.490	
HIGH	0.170	0.590	0.090	6.325	1.040	0.040	0.366	0.250	5.82	0.535	0.000	1.130	0.565	1.925	1.600	

DRUM, RED		SCIAENOPS OCELLATA							045030 AREA- GULF			SITE- L8 MUSCLE				
LENGTH	NUM	8	MEAN	0.636	S. D.	0.054	LOW	0.570	HIGH	2.140	2.140	VANADIUM	MANG	ANTIMONY	TIN	
WEIGHT	NUM	8	MEAN	3.103	S. D.	0.774	LOW	2.140	HIGH	4.360	4.360	PPM	PPM	PPM	PPM	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB					
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM					
NUMBER	0008	0008	0008	0007	0007	0008	0008	0007	0008	0008	0308	0008	0008	0008	0007	
N DET.	0000	0000	0002	0000	0000	0005	0001	0000	0000	0301	0007	0006	0000	0004	0000	
MEAN	0.146	0.670	0.083	6.624	0.384	0.060	0.165	0.339	4.76	0.229	0.060	0.280	0.144	0.771	0.546	
S. D.	0.093	0.487	0.025	3.653	0.188	0.026	0.045	0.157	0.54	0.090	0.000	0.311	0.066	0.271	0.441	
LOW	0.020	0.190	0.060	3.300	0.175	0.030	0.110	0.040	3.93	0.070	0.000	0.060	0.080	0.500	0.350	
HIGH	0.280	1.630	0.120	13.250	0.630	0.080	0.250	0.540	5.71	0.370	0.060	0.500	0.290	1.060	1.600	

DRUM, RED		SCIAENOPS OCELLATA							045030 AREA- GULF			SITE- L8 LIVER				
LENGTH	NUM	1	MEAN	0.636	S. D.	0.000	LOW	0.636	HIGH	3.103	3.103	VANADIUM	MANG	ANTIMONY	TIN	
WEIGHT	NUM	1	MEAN	3.103	S. D.	0.000	LOW	3.103	HIGH	3.103	3.103	PPM	PPM	PPM	PPM	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB					
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM					
NUMBER	0001	0001	0001	0000	0000	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	
N DET.	0000	0000	0000	0000	0000	0000	0000	0001	0001	0000	0000	0001	0000	0000	0000	
MEAN	0.230	0.560	0.180	0.000	0.000	0.040	0.190	0.000	0.00	0.690	0.310	0.000	0.590	0.530	0.630	
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	
HIGH	0.230	0.560	0.180	0.000	0.000	0.040	0.190	0.000	0.00	0.690	0.310	0.000	0.590	0.530	0.630	

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

POUT, OCEAN				MACROZOARCES AMERICANUS				056018	AREA- NORTH	ATLANTIC	SITE- I9	MUSCLE			
LENGTH	NUM	11	MEAN	0.727	S. D.	0.155	LOW	0.347	HIGH	0.870					
WEIGHT	NUM	8	MEAN	1.873	S. D.	0.964	LOW	0.186	HIGH	2.921					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0011	0011	0011	0010	0010	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0010	0010	0000	0001	0000
MEAN	0.109	0.257	0.067	2.971	0.522	0.032	0.204	0.297	8.61	0.215	0.060	0.130	0.125	0.666	0.563
S. D.	0.052	0.132	0.027	1.088	0.310	0.011	0.180	0.127	3.30	0.089	0.000	0.000	0.066	0.163	0.122
LOW	0.052	0.130	0.030	0.710	0.100	0.010	0.040	0.040	4.50	0.110	0.000	0.000	0.070	0.410	0.360
HIGH	0.200	0.560	0.120	5.170	1.130	0.050	0.650	0.475	14.40	0.395	0.060	0.130	0.305	0.940	0.750

POUT, OCEAN				MACROZOARCES AMERICANUS				056018	AREA- NORTH	ATLANTIC	SITE- I9	LIVER			
LENGTH	NUM	1	MEAN	0.793	S. D.	0.000	LOW	0.793	HIGH	0.793					
WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.000	0.380	1.630	5.050	1.750	0.080	0.380	4.500	20.63	0.250	0.250	0.440	0.600	0.560	1.750
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.000	0.380	1.630	5.050	1.750	0.080	0.380	4.500	20.63	0.250	0.250	0.440	0.600	0.560	1.750

POUT, OCEAN				MACROZOARCES AMERICANUS				056018	AREA- NORTH	ATLANTIC	SITE- J7	MUSCLE			
LENGTH	NUM	1	MEAN	0.585	S. D.	0.000	LOW	0.585	HIGH	0.585					
WEIGHT	NUM	1	MEAN	0.944	S. D.	0.000	LOW	0.944	HIGH	0.944					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0001	0000	0000	0000
MEAN	0.000	0.380	0.080	2.725	0.700	0.030	0.060	0.630	12.50	0.230	0.000	0.000	0.110	0.780	0.630
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.000	0.380	0.080	2.725	0.700	0.030	0.060	0.630	12.50	0.230	0.000	0.000	0.110	0.780	0.630

POUT, OCEAN				MACROZOARCES AMERICANUS				056018	AREA- NORTH	ATLANTIC	SITE- J9	MUSCLE			
LENGTH	NUM	1	MEAN	0.540	S. D.	0.000	LOW	0.540	HIGH	0.540					
WEIGHT	NUM	1	MEAN	0.830	S. D.	0.000	LOW	0.830	HIGH	0.830					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0001	0001	0000	0000	0000
MEAN	0.040	0.480	0.090	6.750	0.490	0.000	0.130	0.220	11.88	0.180	0.000	0.000	0.140	0.750	1.090
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.040	0.480	0.090	6.750	0.490	0.000	0.130	0.220	11.88	0.180	0.000	0.000	0.140	0.750	1.090

POUT, OCEAN				MACROZOARCES AMERICANUS				056018	AREA- NORTH	ATLANTIC	SITE- N2	MUSCLE			
LENGTH	NUM	11	MEAN	0.547	S. D.	0.101	LOW	0.378	HIGH	0.720					
WEIGHT	NUM	11	MEAN	1.015	S. D.	0.426	LOW	0.336	HIGH	1.861					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0010	0011	0000	0009	0000
MEAN	0.139	0.368	0.097	1.915	0.515	0.033	0.155	0.282	10.04	0.000	0.310	0.000	0.115	0.375	0.529
S. D.	0.045	0.268	0.056	0.585	0.160	0.010	0.062	0.109	2.29	0.056	0.000	0.000	0.037	0.177	0.179
LOW	0.070	0.190	0.055	0.970	0.260	0.020	0.060	0.125	6.75	0.145	0.000	0.000	0.060	0.250	0.345
HIGH	0.220	1.130	0.250	2.830	0.780	0.050	0.250	0.500	15.38	0.370	0.310	0.000	0.190	0.500	1.000

POUT, OCEAN				MACROZOARCES AMERICANUS				056018	AREA- NORTH	ATLANTIC	SITE- N3	MUSCLE			
LENGTH	NUM	5	MEAN	0.552	S. D.	0.038	LOW	0.514	HIGH	0.605					
WEIGHT	NUM	5	MEAN	1.067	S. D.	0.259	LOW	0.694	HIGH	1.328					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0005	0005	0005	0004	0004	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0003	0000	0000	0000
MEAN	0.131	0.476	0.052	3.563	0.834	0.039	0.115	0.383	12.00	0.212	0.055	0.175	0.105	0.687	0.411
S. D.	0.081	0.140	0.016	1.193	0.266	0.019	0.031	0.065	1.74	0.036	0.023	0.021	0.005	0.178	0.132
LOW	0.060	0.285	0.035	2.483	0.606	0.020	0.080	0.315	10.78	0.170	0.030	0.160	0.100	0.485	0.220
HIGH	0.225	0.655	0.070	5.183	1.120	0.070	0.160	0.490	15.00	0.240	0.075	0.190	0.110	0.940	0.565

POUT, OCEAN				MACROZOARCES AMERICANUS				056018	AREA- NORTH	ATLANTIC	SITE- P1	MUSCLE			
LENGTH	NUM	3	MEAN	0.685	S. D.	0.035	LOW	0.660	HIGH	0.725					
WEIGHT	NUM	3	MEAN	1.143	S. D.	0.210	LOW	0.967	HIGH	1.376					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003
N DET.	0002	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0003	0000	0000	0000
MEAN	0.030	0.252	0.037	3.139	0.997	0.035	0.228	0.197	14.23	0.240	0.110	0.000	0.067	0.528	0.615
S. D.	0.000	0.107	0.008	1.234	0.111	0.009	0.123	0.115	5.42	0.045	0.071	0.000	0.042	0.151	0.118
LOW	0.000	0.190	0.030	2.000	0.905	0.025	0.155	0.130	9.25	0.195	0.060	0.000	0.020	0.390	0.530
HIGH	0.030	0.375	0.045	4.450	1.120	0.040	0.370	0.330	20.00	0.285	0.160	0.000	0.100	0.690	0.750

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

SOLE, PETRALE				EOPSETTA JORDANI				059004 AREA- CALIFORNIA				SITE- F4 MUSCLE			
LENGTH WEIGHT	NUM NUM	10 MEAN	MEAN	0.396 S. D.	S. D.	0.040 LOW	LOW	0.340 HIGH	HIGH	0.450					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0010	0010	0009	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010
N DET.	0000	0000	0000	0000	0000	0001	0002	0000	0000	0000	0006	0003	0000	0001	0000
MEAN	0.175	0.669	0.105	2.367	0.503	0.076	0.128	0.516	3.71	0.374	0.188	0.293	0.153	0.966	0.820
S. D.	0.259	0.301	0.031	1.529	0.258	0.033	0.071	0.199	0.82	0.126	0.255	0.174	0.058	0.437	0.359
LOW	0.020	0.240	0.070	0.850	0.190	0.030	0.050	0.130	2.13	0.210	0.060	0.090	0.030	0.250	0.380
HIGH	0.880	1.100	0.170	4.975	0.930	0.140	0.240	0.820	4.91	0.590	0.570	0.620	0.250	1.630	1.370

SOLE, PETRALE				EOPSETTA JORDANI				059004 AREA- CALIFORNIA				SITE- F4 LIVER			
LENGTH WEIGHT	NUM NUM	1 MEAN	MEAN	0.389 S. D.	S. D.	0.000 LOW	LOW	0.389 HIGH	HIGH	0.389					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0001	0001	0001	0000	0000	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0001	0000	0000	0000	0000	0001	0000	0000	0000	0000	0000	0001	0000	0001	0000
MEAN	0.000	0.300	1.430	0.000	0.000	0.000	0.250	13.570	57.14	0.250	0.180	0.000	1.320	0.000	0.550
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.000	0.300	1.430	0.000	0.000	0.000	0.250	13.570	57.14	0.250	0.180	0.000	1.320	0.000	0.550

SOLE, PETRALE				EOPSETTA JORDANI				059004 AREA- CALIFORNIA				SITE- F8 MUSCLE			
LENGTH WEIGHT	NUM NUM	10 MEAN	MEAN	0.382 S. D.	S. D.	0.034 LOW	LOW	0.320 HIGH	HIGH	0.450					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0010	0010	0010	0009	0009	0010	0010	0010	0010	0010	0009	0009	0010	0009	0009
N DET.	0000	0000	0001	0000	0000	0001	0000	0000	0000	0000	0006	0005	0000	0000	0000
MEAN	0.062	0.523	0.079	2.627	0.613	0.039	0.154	0.256	3.54	0.223	0.060	0.188	0.105	0.576	0.606
S. D.	0.029	0.386	0.030	0.552	0.152	0.006	0.098	0.144	0.47	0.073	0.000	0.113	0.023	0.224	0.265
LOW	0.025	0.160	0.040	1.933	0.370	0.030	0.040	0.070	2.81	0.140	0.060	0.060	0.080	0.130	0.220
HIGH	0.110	1.440	0.140	3.505	0.875	0.050	0.320	0.595	4.25	0.390	0.060	0.310	0.160	0.845	1.190

SOLE, PETRALE				EOPSETTA JORDANI				059004 AREA- CALIFORNIA				SITE- F8 LIVER			
LENGTH WEIGHT	NUM NUM	1 MEAN	MEAN	0.377 S. D.	S. D.	0.000 LOW	LOW	0.377 HIGH	HIGH	0.377					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000
MEAN	0.000	0.130	1.360	5.100	1.600	0.030	0.130	1.250	29.38	0.190	0.160	0.000	0.640	0.440	0.780
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.000	0.130	1.360	5.100	1.600	0.030	0.130	1.250	29.38	0.190	0.160	0.000	0.640	0.440	0.780

SOLE, PETRALE				EOPSETTA JORDANI				059004 AREA- PACIFIC NORTHWEST				SITE- H7 MUSCLE			
LENGTH WEIGHT	NUM NUM	11 MEAN	MEAN	0.383 S. D.	S. D.	0.032 LOW	LOW	0.360 HIGH	HIGH	0.445					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0011	0011	0011	0010	0010	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011
N DET.	0006	0000	0004	0000	0000	0008	0000	0000	0000	0001	0009	0009	0000	0001	0000
MEAN	0.347	0.433	0.056	7.277	0.663	0.037	0.165	0.213	4.62	0.335	0.608	0.135	0.163	0.829	0.339
S. D.	0.701	0.244	0.046	2.383	0.183	0.006	0.098	0.094	0.94	0.143	0.725	0.021	0.032	0.641	0.109
LOW	0.010	0.200	0.030	3.000	0.400	0.030	0.060	0.110	3.92	0.110	0.095	0.120	0.110	0.310	0.200
HIGH	1.600	1.000	0.160	10.650	0.925	0.040	0.390	0.360	6.43	0.570	1.120	0.150	0.210	2.460	0.500

SOLE, PETRALE				EOPSETTA JORDANI				059004 AREA- PACIFIC NORTHWEST				SITE- H7 LIVER			
LENGTH WEIGHT	NUM NUM	2 MEAN	MEAN	0.400 S. D.	S. D.	0.042 LOW	LOW	0.370 HIGH	HIGH	0.430					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0002	0000	0000	0000	0000	0002	0000	0000	0000	0000	0001	0001	0000	0001	0000
MEAN	0.000	0.470	0.360	5.995	1.650	0.000	0.223	4.515	35.27	0.350	0.120	0.200	0.655	0.190	0.155
S. D.	0.000	0.240	0.042	1.068	0.240	0.000	0.011	4.872	4.93	0.099	0.000	0.000	0.021	0.000	0.035
LOW	0.000	0.300	0.330	5.240	1.480	0.000	0.215	1.070	31.78	0.280	0.000	0.000	0.640	0.000	0.130
HIGH	0.000	0.640	0.390	6.750	1.820	0.000	0.230	7.960	38.75	0.420	0.120	0.200	0.670	0.190	0.180

SOLE, PETRALE				EOPSETTA JORDANI				059004 AREA- PACIFIC NORTHWEST				SITE- H8 MUSCLE			
LENGTH WEIGHT	NUM NUM	10 MEAN	MEAN	0.380 S. D.	S. D.	0.000 LOW	LOW	0.380 HIGH	HIGH	0.380					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010
N DET.	0002	0000	0002	0000	0000	0002	0002	0000	0000	0002	0004	0007	0001	0002	0000
MEAN	0.036	0.537	0.061	5.906	0.539	0.038	0.160	0.223	4.34	0.227	0.138	0.663	0.158	0.656	0.611
S. D.	0.023	0.237	0.035	4.754	0.157	0.014	0.056	0.089	0.75	0.118	0.120	0.525	0.031	0.447	0.175
LOW	0.010	0.280	0.030	0.450	0.355	0.020	0.090	0.070	3.40	0.135	0.035	0.060	0.110	0.090	0.350
HIGH	0.080	0.960	0.110	17.100	0.830	0.060	0.250	0.330	5.41	0.440	0.300	1.020	0.200	1.260	0.850

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5		HERRING, ROUND																
		ETRUMEUS TERES							078015 AREA- NORTH ATLANTIC			SITE- N2			H&G, TAILLESS			
LENGTH	NUM	7	MEAN	0.137	S. D.	0.000	LOW	0.137	HIGH	0.137								
WEIGHT	NUM	7	MEAN	0.028	S. D.	0.001	LOW	0.026	HIGH	0.329								
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN			
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	
NUMBER	0007	0006	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	
N DET.	0005	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000		
MEAN	0.025	0.913	0.132	1.689	0.919	0.086	0.325	1.587	15.18	0.345	0.178	0.441	0.934	1.357	1.314			
S. D.	0.007	0.203	0.029	0.906	0.272	0.010	0.249	0.374	1.46	0.109	0.066	0.133	0.236	0.323	0.413			
LOW	0.020	0.660	0.090	0.745	0.630	0.070	0.190	0.815	13.75	0.240	0.130	0.285	0.630	0.750	0.925			
HIGH	0.030	1.250	0.180	2.783	1.385	0.100	0.875	1.940	18.03	0.495	0.250	0.630	1.385	1.690	1.940			
		HERRING, ROUND																
		ETRUMEUS TERES							078015 AREA- NORTH ATLANTIC			SITE- N7			H&G, TAILLESS			
LENGTH	NUM	10	MEAN	0.145	S. D.	0.002	LOW	0.140	HIGH	0.145								
WEIGHT	NUM	10	MEAN	0.043	S. D.	0.002	LOW	0.040	HIGH	0.046								
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN			
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	
NUMBER	0010	0009	0010	0010	0010	0010	0009	0010	0010	0010	0010	0010	0010	0010	0010	0010		
N DET.	0006	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0000	0000	0008	0000		
MEAN	0.065	0.747	0.158	1.970	0.854	0.083	0.319	1.508	13.39	0.389	0.286	0.536	0.907	1.440	0.945			
S. D.	0.053	0.165	0.047	0.870	0.394	0.023	0.171	0.413	2.63	0.089	0.192	0.108	0.314	0.000	0.453			
LOW	0.020	0.500	0.110	0.890	0.130	0.050	0.185	0.800	8.25	0.240	0.130	0.410	0.470	1.440	0.140			
HIGH	0.140	0.940	0.270	4.000	1.380	0.130	0.620	2.340	16.92	0.510	0.700	0.700	1.630	1.440	1.970			

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS IN RESOURCE SURVEY SPECIES; BY TISSUE AND LOCATION

LOCATION LEVEL 5

Table with 17 columns: LENGTH WEIGHT, NUM NUM, MEAN, MERCURY PPM, LEAD PPM, CADMIUM PPM, ARSENIC PPM, SELENIUM PPM, SILVER PPM, CHROM PPM, COPPER PPM, ZINC PPM, NICKEL PPM, MOLYB PPM, VANADIUM PPM, MANG PPM, ANTIMONY PPM, TIN PPM. Rows include TUNA, BIGEYE and THUNNUS OBESUS, 091022 AREA- HAWAII, and SITE- J5 LIVER.

Table with 17 columns: LENGTH WEIGHT, NUM NUM, MEAN, MERCURY PPM, LEAD PPM, CADMIUM PPM, ARSENIC PPM, SELENIUM PPM, SILVER PPM, CHROM PPM, COPPER PPM, ZINC PPM, NICKEL PPM, MOLYB PPM, VANADIUM PPM, MANG PPM, ANTIMONY PPM, TIN PPM. Rows include TUNA, BIGEYE and THUNNUS OBESUS, 091022 AREA- HAWAII, and SITE- K1 MUSCLE.

Table with 17 columns: LENGTH WEIGHT, NUM NUM, MEAN, MERCURY PPM, LEAD PPM, CADMIUM PPM, ARSENIC PPM, SELENIUM PPM, SILVER PPM, CHROM PPM, COPPER PPM, ZINC PPM, NICKEL PPM, MOLYB PPM, VANADIUM PPM, MANG PPM, ANTIMONY PPM, TIN PPM. Rows include TUNA, BIGEYE and THUNNUS OBESUS, 091022 AREA- HAWAII, and SITE- K1 LIVER.

Table with 17 columns: LENGTH WEIGHT, NUM NUM, MEAN, MERCURY PPM, LEAD PPM, CADMIUM PPM, ARSENIC PPM, SELENIUM PPM, SILVER PPM, CHROM PPM, COPPER PPM, ZINC PPM, NICKEL PPM, MOLYB PPM, VANADIUM PPM, MANG PPM, ANTIMONY PPM, TIN PPM. Rows include TUNA, BLUEFIN and THUNNUS THYNNUS, 091023 AREA- NORTH ATLANTIC, and SITE- I7 MUSCLE.

Table with 17 columns: LENGTH WEIGHT, NUM NUM, MEAN, MERCURY PPM, LEAD PPM, CADMIUM PPM, ARSENIC PPM, SELENIUM PPM, SILVER PPM, CHROM PPM, COPPER PPM, ZINC PPM, NICKEL PPM, MOLYB PPM, VANADIUM PPM, MANG PPM, ANTIMONY PPM, TIN PPM. Rows include TUNA, BLUEFIN and THUNNUS THYNNUS, 091023 AREA- CALIFORNIA, and SITE- K6 MUSCLE.

Table with 17 columns: LENGTH WEIGHT, NUM NUM, MEAN, MERCURY PPM, LEAD PPM, CADMIUM PPM, ARSENIC PPM, SELENIUM PPM, SILVER PPM, CHROM PPM, COPPER PPM, ZINC PPM, NICKEL PPM, MOLYB PPM, VANADIUM PPM, MANG PPM, ANTIMONY PPM, TIN PPM. Rows include TUNA, BLUEFIN and THUNNUS THYNNUS, 091023 AREA- CALIFORNIA, and SITE- K6 LIVER.

Table with 17 columns: LENGTH WEIGHT, NUM NUM, MEAN, MERCURY PPM, LEAD PPM, CADMIUM PPM, ARSENIC PPM, SELENIUM PPM, SILVER PPM, CHROM PPM, COPPER PPM, ZINC PPM, NICKEL PPM, MOLYB PPM, VANADIUM PPM, MANG PPM, ANTIMONY PPM, TIN PPM. Rows include MOJARRA, YELLOWFIN and GERRES CINEREUS, 094010 AREA- SOUTH ATLANTIC, and SITE- J4 MUSCLE.

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS IN RESOURCE SURVEY SPECIES, BY TISSUE AND LOCATION

LOCATION LEVEL 5

MULLET, STRIPED MUGIL CEPHALUS 098002 AREA- SOUTH ATLANTIC SITE- M1 LIVER
LENGTH WEIGHT NUM NUM 0 MEAN 0.000 S. D. 0.000 LOW 0.000 HIGH 0.000
MERCURY PPM LEAD PPM CADMIUM PPM ARSENIC PPM SELENIUM PPM SILVER PPM CHROM PPM COPPER PPM ZINC PPM NICKEL PPM MOLYB PPM VANADIUM PPM MANG PPM ANTIMONY PPM TIN PPM
NUMBER 0001 0001 0001 0001 0001 0001 0001 0001 0001 0001 0001 0001 0001 0001 0001 0001 0001
N DET. 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
MEAN 0.130 0.130 0.380 4.750 0.850 0.090 0.250 4.380 34.38 0.350 1.050 0.530 0.460 0.000 0.000 0.530
S. D. 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
LOW 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
HIGH 0.130 0.130 0.380 4.750 0.850 0.090 0.250 4.380 34.38 0.350 1.050 0.530 0.460 0.000 0.000 0.530

MULLET, STRIPED MUGIL CEPHALUS 098002 AREA- GULF SITE- B8 MUSCLE
LENGTH WEIGHT NUM NUM 1 MEAN 0.250 S. D. 0.000 LOW 0.250 HIGH 0.250
MERCURY PPM LEAD PPM CADMIUM PPM ARSENIC PPM SELENIUM PPM SILVER PPM CHROM PPM COPPER PPM ZINC PPM NICKEL PPM MOLYB PPM VANADIUM PPM MANG PPM ANTIMONY PPM TIN PPM
NUMBER 0007 0009 0009 0009 0009 0009 0009 0009 0009 0009 0009 0009 0009 0009 0009 0009 0008
N DET. 0006 0000 0000 0003 0000 0000 0000 0000 0000 0000 0000 0004 0005 0000 0000 0000 0000
MEAN 0.010 0.491 0.065 2.127 0.377 0.073 0.231 0.347 6.08 0.311 0.240 0.155 0.572 0.988 0.532
S. D. 0.000 0.242 0.017 0.747 0.118 0.062 0.102 0.138 1.77 0.116 0.206 0.110 0.261 0.470 0.212
LOW 0.000 0.020 0.040 1.163 0.250 0.040 0.060 0.170 2.80 0.110 0.060 0.060 0.260 0.300 0.050
HIGH 0.010 0.880 0.080 3.400 0.600 0.160 0.420 0.610 9.13 0.500 0.570 0.250 0.940 2.060 0.750

MULLET, STRIPED MUGIL CEPHALUS 098002 AREA- GULF SITE- D5 MUSCLE
LENGTH WEIGHT NUM NUM 0 MEAN 0.000 S. D. 0.000 LOW 0.000 HIGH 0.000
MERCURY PPM LEAD PPM CADMIUM PPM ARSENIC PPM SELENIUM PPM SILVER PPM CHROM PPM COPPER PPM ZINC PPM NICKEL PPM MOLYB PPM VANADIUM PPM MANG PPM ANTIMONY PPM TIN PPM
NUMBER 0010 0010 0010 0010 0010 0010 0009 0010 0009 0010 0010 0010 0010 0010 0010 0010 0010
N DET. 0010 0000 0000 0000 0000 0002 0000 0000 0000 0000 0000 0000 0010 0009 0000 0000 0000
MEAN 0.000 0.401 0.067 2.629 0.498 0.028 0.174 0.486 5.48 0.197 0.000 0.480 0.448 0.699 0.467
S. D. 0.000 0.225 0.021 1.343 0.169 0.023 0.081 0.288 0.74 0.069 0.000 0.000 0.195 0.187 0.110
LOW 0.000 0.190 0.040 0.590 0.260 0.010 0.060 0.160 4.56 0.130 0.000 0.000 0.210 0.380 0.310
HIGH 0.000 0.810 0.110 5.000 0.700 0.080 0.310 0.890 6.69 0.340 0.000 0.480 0.780 0.940 0.640

MULLET, STRIPED MUGIL CEPHALUS 098002 AREA- GULF SITE- E5 MUSCLE
LENGTH WEIGHT NUM NUM 20 MEAN 0.376 S. D. 0.020 LOW 0.344 HIGH 0.420
MERCURY PPM LEAD PPM CADMIUM PPM ARSENIC PPM SELENIUM PPM SILVER PPM CHROM PPM COPPER PPM ZINC PPM NICKEL PPM MOLYB PPM VANADIUM PPM MANG PPM ANTIMONY PPM TIN PPM
NUMBER 0020 0020 0020 0020 0020 0020 0020 0020 0020 0020 0020 0020 0020 0020 0020 0020 0019
N DET. 0011 0001 0002 0000 0001 0005 0001 0000 0000 0003 0019 0015 0000 0002 0000
MEAN 0.043 0.522 0.105 3.288 0.378 0.043 0.173 0.390 5.07 0.208 0.440 0.323 0.266 0.836 0.652
S. D. 0.029 0.244 0.102 1.251 0.173 0.021 0.082 0.111 0.53 0.064 0.000 0.105 0.168 0.270 0.258
LOW 0.010 0.010 0.040 1.625 0.050 0.010 0.060 0.170 3.93 0.100 0.000 0.250 0.070 0.500 0.360
HIGH 0.100 1.030 0.480 5.900 0.690 0.110 0.340 0.610 5.93 0.340 0.440 0.500 0.870 1.600 1.450

MULLET, STRIPED MUGIL CEPHALUS 098002 AREA- GULF SITE- E5 LIVER
LENGTH WEIGHT NUM NUM 2 MEAN 0.382 S. D. 0.004 LOW 0.379 HIGH 0.385
MERCURY PPM LEAD PPM CADMIUM PPM ARSENIC PPM SELENIUM PPM SILVER PPM CHROM PPM COPPER PPM ZINC PPM NICKEL PPM MOLYB PPM VANADIUM PPM MANG PPM ANTIMONY PPM TIN PPM
NUMBER 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002
N DET. 0000 0000 0000 0000 0000 0000 0000 0000 0000 0003 0000 0001 0000 0000 0000 0000 0000
MEAN 0.078 0.768 0.303 17.613 3.158 0.225 0.110 87.513 73.27 0.320 1.845 1.448 0.440 0.720 0.420
S. D. 0.060 0.110 0.046 15.609 0.668 0.120 0.071 4.402 6.83 0.198 0.000 0.095 0.240 0.396 0.071
LOW 0.035 0.690 0.270 6.575 2.685 0.140 0.060 84.400 68.44 0.180 0.000 1.380 0.270 0.440 0.370
HIGH 0.120 0.845 0.335 28.650 3.630 0.310 0.160 90.625 78.10 0.360 1.845 1.515 0.610 1.000 0.470

MULLET, STRIPED MUGIL CEPHALUS 098002 AREA- GULF SITE- G3 MUSCLE
LENGTH WEIGHT NUM NUM 2 MEAN 0.250 S. D. 0.000 LOW 0.250 HIGH 0.250
MERCURY PPM LEAD PPM CADMIUM PPM ARSENIC PPM SELENIUM PPM SILVER PPM CHROM PPM COPPER PPM ZINC PPM NICKEL PPM MOLYB PPM VANADIUM PPM MANG PPM ANTIMONY PPM TIN PPM
NUMBER 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002 0002 0001
N DET. 0002 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0002 0001 0000 0000 0000
MEAN 0.000 0.350 0.060 3.205 0.373 0.085 0.160 0.305 5.04 0.273 0.000 0.090 0.193 0.970 0.490
S. D. 0.000 0.127 0.014 1.747 0.046 0.064 0.014 0.106 1.07 0.053 0.000 0.000 0.004 0.161 0.000
LOW 0.000 0.260 0.050 1.970 0.340 0.040 0.150 0.230 4.28 0.235 0.000 0.000 0.190 0.870 0.000
HIGH 0.000 0.440 0.070 4.440 0.405 0.130 0.170 0.380 5.80 0.310 0.000 0.090 0.195 1.070 0.490

MULLET, STRIPED MUGIL CEPHALUS 098002 AREA- GULF SITE- G5 MUSCLE
LENGTH WEIGHT NUM NUM 3 MEAN 0.418 S. D. 0.127 LOW 0.273 HIGH 0.510
MERCURY PPM LEAD PPM CADMIUM PPM ARSENIC PPM SELENIUM PPM SILVER PPM CHROM PPM COPPER PPM ZINC PPM NICKEL PPM MOLYB PPM VANADIUM PPM MANG PPM ANTIMONY PPM TIN PPM
NUMBER 0003 0003 0003 0003 0003 0003 0003 0003 0003 0003 0003 0003 0003 0003 0003 0003 0003
N DET. 0001 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0003 0002 0000 0000 0000
MEAN 0.020 0.448 0.095 1.133 0.605 0.033 0.170 0.537 4.02 0.282 0.000 0.310 0.202 0.940 0.470
S. D. 0.000 0.143 0.039 0.651 0.118 0.006 0.035 0.148 1.32 0.068 0.000 0.000 0.050 0.000 0.078
LOW 0.020 0.310 0.070 0.500 0.470 0.030 0.130 0.375 2.97 0.235 0.000 0.000 0.150 0.000 0.380
HIGH 0.020 0.595 0.140 1.800 0.690 0.040 0.190 0.665 5.50 0.360 0.000 0.310 0.250 0.940 0.515

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

REPORT MF17

LOCATION LEVEL 5

SABLEFISH		ANOPILOPOMA FIMBRIA						126001 AREA- PACIFIC NORTHWEST		SITE- G9		MUSCLE	
LENGTH WEIGHT	NUM NUM	0 MEAN	0.513 S. D.	0.034 S. D.	LOW	0.470 S. D.	HIGH	0.550 S. D.	0.300	VANADIUM	MANG	ANTIMONY	TIN
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	PPM	PPM
NUMBER	0005	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006
N DET.	0001	0000	0003	0000	0000	0003	0000	0000	0000	0000	0005	0006	0001
MEAN	0.079	0.298	0.047	2.257	0.451	0.027	0.118	0.252	3.08	0.358	0.100	0.000	0.076
S. D.	0.062	0.165	0.021	1.417	0.173	0.015	0.086	0.094	0.80	0.150	0.000	0.000	0.011
LOW	0.040	0.150	0.030	0.200	0.305	0.010	0.040	0.140	2.50	0.205	0.000	0.000	0.060
HIGH	0.170	0.610	0.070	4.100	0.770	0.040	0.245	0.390	4.62	0.540	0.100	0.000	0.090
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000
MEAN	0.035	0.496	0.780	2.580	1.570	0.070	0.265	2.280	18.94	0.785	0.195	0.000	1.130
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000
HIGH	0.035	0.496	0.780	2.580	1.570	0.070	0.265	2.280	18.94	0.785	0.195	0.000	1.130
NUMBER	0004	0004	0004	0003	0003	0004	0004	0004	0004	0004	0004	0004	0004
N DET.	0001	0000	0001	0000	0001	0001	0000	0000	0000	0000	0002	0003	0000
MEAN	0.017	0.358	0.092	3.072	0.483	0.030	0.250	0.290	3.53	0.121	0.240	0.700	0.076
S. D.	0.006	0.220	0.078	1.108	0.329	0.017	0.117	0.055	0.53	0.371	0.156	0.000	0.024
LOW	0.010	0.150	0.035	2.295	0.250	0.010	0.110	0.230	2.77	0.352	0.130	0.000	0.045
HIGH	0.020	0.555	0.180	4.340	0.715	0.040	0.370	0.360	4.00	0.220	0.350	0.700	0.100
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.120	0.210	0.050	3.560	0.655	0.026	0.403	0.190	2.43	0.183	0.360	0.130	0.440
S. D.	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.300	0.000	0.000	0.000
LOW	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000
HIGH	0.120	0.210	0.050	3.560	0.655	0.026	0.403	0.190	2.43	0.183	0.360	0.130	0.440
NUMBER	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008
N DET.	0000	0000	0003	0000	0000	0004	0000	0000	0000	0002	0006	0007	0000
MEAN	0.114	0.370	0.091	2.778	0.427	0.034	0.318	0.230	3.78	0.322	0.210	0.800	0.129
S. D.	0.086	0.200	0.038	1.530	0.130	0.007	0.299	0.054	0.71	0.112	0.226	0.000	0.087
LOW	0.030	0.145	0.050	0.550	0.326	0.025	0.050	0.165	2.73	0.195	0.050	0.000	0.040
HIGH	0.270	0.650	0.140	4.960	0.740	0.040	0.950	0.305	5.00	0.485	0.370	0.800	0.290
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0000	0001	0000
MEAN	0.140	0.300	1.750	2.240	2.330	0.300	0.050	5.110	21.43	0.300	0.200	0.000	1.210
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000
HIGH	0.140	0.300	1.750	2.240	2.330	0.300	0.050	5.110	21.43	0.300	0.200	0.000	1.210
NUMBER	0005	0005	0005	0004	0004	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0003	0004	0000
MEAN	0.206	0.379	0.087	2.405	0.825	0.054	0.302	0.302	4.39	0.313	0.265	0.630	0.160
S. D.	0.166	0.136	0.037	1.247	0.354	0.047	0.148	0.205	1.35	0.250	0.064	0.000	0.070
LOW	0.040	0.250	0.050	1.160	0.493	0.020	0.160	0.070	3.05	0.070	0.220	0.000	0.120
HIGH	0.440	0.570	0.140	3.880	1.260	0.130	0.520	0.620	6.57	0.660	0.310	0.630	0.285
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.140	0.300	1.750	2.240	2.330	0.300	0.050	5.110	21.43	0.300	0.200	0.000	1.210
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000
HIGH	0.140	0.300	1.750	2.240	2.330	0.300	0.050	5.110	21.43	0.300	0.200	0.000	1.210

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES:
BY TISSUE AND LOCATION

LOCATION LEVEL 5

ROCKFISH, YELLOWTAIL SEBASTES FLAVIDUS 131043 AREA- PACIFIC NORTHWEST SITE- M2 MUSCLE

LENGTH WEIGHT	NUM NUM	4 MEAN	MEAN	0.479	S. D.	0.021	LOW	0.465	HIGH	0.510	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
				MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM					
NUMBER	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004
N DET.	0000	0000	0001	0000	0000	0003	0000	0000	0000	0001	0004	0004	0000	0002	0000
MEAN	0.154	0.382	0.060	3.693	0.938	0.030	0.109	0.278	5.87	0.393	0.000	0.000	0.146	0.430	0.448
S. D.	0.051	0.050	0.026	2.368	0.224	0.000	0.051	0.052	2.68	0.251	0.000	0.000	0.084	0.212	0.100
LOW	0.100	0.320	0.040	1.310	0.780	0.000	0.040	0.210	2.88	0.215	0.000	0.000	0.075	0.280	0.300
HIGH	0.220	0.443	0.090	6.600	1.270	0.030	0.153	0.336	8.57	0.680	0.000	0.000	0.250	0.580	0.520

ROCKFISH, YELLOWTAIL SEBASTES FLAVIDUS 131043 AREA- PACIFIC NORTHWEST SITE- M5 MUSCLE

LENGTH WEIGHT	NUM NUM	16 MEAN	MEAN	0.477	S. D.	0.014	LOW	0.460	HIGH	0.500	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
				MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM					
NUMBER	0016	0016	0016	0016	0016	0016	0016	0016	0016	0016	0016	0016	0016	0016	0016
N DET.	0000	0001	0009	0001	0000	0012	0001	0000	0000	0003	0013	0014	0000	0003	0000
MEAN	0.209	0.386	0.056	2.478	0.944	0.046	0.245	0.271	3.77	0.278	0.253	0.775	0.089	0.694	0.523
S. D.	0.076	0.201	0.040	1.120	0.303	0.039	0.149	0.074	0.83	0.139	0.167	0.672	0.027	0.594	0.282
LOW	0.090	0.150	0.030	0.800	0.490	0.015	0.070	0.180	2.29	0.110	0.060	0.300	0.055	0.060	0.200
HIGH	0.400	0.750	0.140	5.240	1.600	0.100	0.700	0.420	5.01	0.580	0.350	1.250	0.140	2.100	1.100

PERCH, OCEAN (REDFISH) SEBASTES MARINUS 131052 AREA- NORTH ATLANTIC SITE- E9 MUSCLE

LENGTH WEIGHT	NUM NUM	22 MEAN	MEAN	0.348	S. D.	0.033	LOW	0.266	HIGH	0.400	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
				MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM					
NUMBER	0022	0022	0022	0022	0022	0022	0022	0022	0022	0022	0022	0022	0022	0022	0022
N DET.	0002	0000	0000	0001	0000	0003	0004	0000	0000	0000	0018	0020	0000	0000	0000
MEAN	0.097	0.380	0.054	2.558	0.909	0.027	0.182	0.224	3.20	0.188	0.239	0.125	0.089	0.510	0.448
S. D.	0.052	0.144	0.026	1.128	0.314	0.011	0.175	0.061	0.50	0.073	0.219	0.007	0.015	0.147	0.145
LOW	0.020	0.190	0.030	0.303	0.350	0.010	0.060	0.110	1.94	0.060	0.075	0.120	0.060	0.310	0.130
HIGH	0.210	0.660	0.155	4.600	1.370	0.040	0.810	0.345	3.94	0.400	0.560	0.130	0.115	0.860	0.755

PERCH, OCEAN (REDFISH) SEBASTES MARINUS 131052 AREA- NORTH ATLANTIC SITE- I6 MUSCLE

LENGTH WEIGHT	NUM NUM	5 MEAN	MEAN	0.298	S. D.	0.017	LOW	0.278	HIGH	0.317	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
				MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM					
NUMBER	0005	0004	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	0001	0001	0000	0000	0000
MEAN	0.069	0.389	0.065	2.815	1.126	0.050	0.271	0.236	4.12	0.217	0.120	0.400	0.237	0.919	0.581
S. D.	0.040	0.093	0.029	1.409	0.108	0.010	0.186	0.121	0.57	0.081	0.049	0.167	0.198	0.119	0.196
LOW	0.030	0.250	0.030	0.900	0.500	0.040	0.122	0.030	3.19	0.150	0.060	0.260	0.125	0.750	0.500
HIGH	0.130	0.440	0.110	4.700	2.890	0.060	0.530	0.340	4.56	0.350	0.180	0.620	0.590	1.060	1.000

PERCH, OCEAN (REDFISH) SEBASTES MARINUS 131052 AREA- NORTH ATLANTIC SITE- J4 MUSCLE

LENGTH WEIGHT	NUM NUM	14 MEAN	MEAN	0.315	S. D.	0.046	LOW	0.260	HIGH	0.385	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
				MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM					
NUMBER	0014	0014	0014	0014	0014	0014	0014	0014	0014	0014	0014	0014	0014	0014	0014
N DET.	0001	0000	0000	0000	0000	0006	0003	0000	0000	0000	0012	0014	0000	0001	0000
MEAN	0.161	0.400	0.057	3.084	0.742	0.033	0.105	0.213	3.38	0.183	0.095	0.000	0.106	0.514	0.465
S. D.	0.106	0.181	0.011	1.477	0.282	0.010	0.095	0.052	0.56	0.042	0.049	0.000	0.037	0.137	0.189
LOW	0.040	0.190	0.040	0.783	0.285	0.020	0.050	0.150	2.90	0.115	0.060	0.000	0.080	0.310	0.220
HIGH	0.360	0.880	0.075	5.600	1.370	0.050	0.380	0.310	5.00	0.240	0.130	0.000	0.220	0.750	0.940

PERCH, OCEAN (REDFISH) SEBASTES MARINUS 131052 AREA- NORTH ATLANTIC SITE- J5 MUSCLE

LENGTH WEIGHT	NUM NUM	13 MEAN	MEAN	0.335	S. D.	0.032	LOW	0.284	HIGH	0.388	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
				MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM					
NUMBER	0013	0013	0013	0013	0013	0013	0013	0012	0013	0013	0013	0013	0013	0013	0013
N DET.	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0011	0009	0000	0000	0000
MEAN	0.243	0.566	0.065	3.255	0.710	0.036	0.218	0.270	3.83	0.207	0.190	0.156	0.101	0.671	0.567
S. D.	0.088	0.329	0.036	1.327	0.244	0.014	0.185	0.196	1.02	0.084	0.000	0.092	0.046	0.119	0.165
LOW	0.140	0.250	0.035	1.000	0.400	0.020	0.060	0.120	2.75	0.110	0.190	0.060	0.060	0.530	0.380
HIGH	0.460	1.500	0.170	5.687	1.120	0.070	0.750	0.810	5.63	0.450	0.190	0.280	0.230	0.880	0.815

PERCH, OCEAN (REDFISH) SEBASTES MARINUS 131052 AREA- NORTH ATLANTIC SITE- J7 MUSCLE

LENGTH WEIGHT	NUM NUM	6 MEAN	MEAN	0.299	S. D.	0.020	LOW	0.276	HIGH	0.326	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
				MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM					
NUMBER	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0005	0004	0000	0000	0000
MEAN	0.058	0.495	0.056	2.995	0.693	0.047	0.141	0.213	3.87	0.187	0.060	0.140	0.115	0.796	0.516
S. D.	0.024	0.182	0.022	1.222	0.307	0.015	0.056	0.096	0.73	0.043	0.000	0.071	0.037	0.075	0.227
LOW	0.020	0.190	0.030	1.750	0.080	0.030	0.090	0.040	2.63	0.150	0.000	0.090	0.080	0.685	0.060
HIGH	0.090	0.690	0.080	4.500	0.890	0.060	0.250	0.280	4.87	0.270	0.060	0.190	0.170	0.910	0.645

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

PERCH, OCEAN (REDFISH)				SEBASTES MARINUS				131052 AREA- NORTH ATLANTIC				SITE- J9 MUSCLE			
LENGTH WEIGHT	NUM NUM	1 MEAN	MEAN	0.331 0.681	S. D. S. D.	0.000 0.000	LOW LOW	0.331 0.681	HIGH HIGH	0.331 0.681	VANADIUM MOLYB	MANG PPM	ANTIMONY PPM	TIN PPM	
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	PPM	PPM	PPM	PPM	
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	
N DET.	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0000	0000	0000	
MEAN	0.130	0.370	0.010	2.475	0.630	0.040	0.000	0.250	2.56	0.220	0.870	0.500	0.060	1.060	
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.300	0.300	0.000	0.000	0.000	
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.300	0.000	0.000	0.000	0.000	
HIGH	0.130	0.370	0.010	2.475	0.630	0.040	0.000	0.250	2.56	0.220	0.870	0.500	0.060	1.060	

PERCH, OCEAN (REDFISH)				SEBASTES MARINUS				131052 AREA- NORTH ATLANTIC				SITE- J9 LIVER			
LENGTH WEIGHT	NUM NUM	1 MEAN	MEAN	0.331 0.681	S. D. S. D.	0.000 0.000	LOW LOW	0.331 0.681	HIGH HIGH	0.331 0.681	VANADIUM MOLYB	MANG PPM	ANTIMONY PPM	TIN PPM	
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	PPM	PPM	PPM	PPM	
NUMBER	0001	0001	0001	0000	0000	0001	0001	0001	0001	0001	0001	0001	0001	0001	
N DET.	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0001	0000	0000	0000	
MEAN	0.360	0.690	0.560	0.000	0.000	0.000	0.310	3.250	23.13	0.900	0.300	0.220	0.360	0.880	
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.300	0.000	0.000	0.000	
HIGH	0.360	0.690	0.560	0.000	0.000	0.000	0.310	3.250	23.13	0.900	0.300	0.220	0.360	0.880	

PERCH, OCEAN (REDFISH)				SEBASTES MARINUS				131052 AREA- NORTH ATLANTIC				SITE- K5 MUSCLE			
LENGTH WEIGHT	NUM NUM	12 MEAN	MEAN	0.360 0.894	S. D. S. D.	0.044 0.268	LOW LOW	0.265 0.604	HIGH HIGH	0.430 1.419	VANADIUM MOLYB	MANG PPM	ANTIMONY PPM	TIN PPM	
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	PPM	PPM	PPM	PPM	
NUMBER	0012	0012	0012	0012	0012	0012	0012	0012	0012	0012	0012	0012	0012	0012	
N DET.	0000	0000	0000	0000	0000	0001	0001	0000	0000	0000	0009	0011	0000	0000	
MEAN	0.213	0.338	0.052	3.545	0.911	0.030	0.108	0.263	3.24	0.179	0.127	0.190	0.092	0.653	
S. D.	0.123	0.105	0.015	1.520	0.249	0.009	0.033	0.133	0.31	0.058	0.365	0.000	0.010	0.297	
LOW	0.065	0.190	0.030	1.140	0.380	0.010	0.060	0.060	2.81	0.090	0.060	0.000	0.080	0.370	
HIGH	0.490	0.500	0.080	6.450	1.200	0.040	0.135	0.630	3.80	0.265	0.190	0.190	0.110	1.250	

PERCH, OCEAN (REDFISH)				SEBASTES MARINUS				131052 AREA- NORTH ATLANTIC				SITE- K6 MUSCLE			
LENGTH WEIGHT	NUM NUM	3 MEAN	MEAN	0.366 0.000	S. D. S. D.	0.008 0.000	LOW LOW	0.358 0.000	HIGH HIGH	0.374 0.000	VANADIUM MOLYB	MANG PPM	ANTIMONY PPM	TIN PPM	
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	PPM	PPM	PPM	PPM	
NUMBER	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	
N DET.	0000	0000	0001	0000	0000	0001	0000	0000	0000	0000	0001	0002	0000	0000	
MEAN	0.330	0.390	0.078	3.472	0.763	0.045	0.673	0.824	2.37	0.533	0.145	0.200	0.120	0.747	
S. D.	0.059	0.143	0.004	3.194	0.021	0.007	0.805	1.192	0.24	0.441	0.021	0.000	0.082	0.398	
LOW	0.265	0.225	0.075	1.460	0.720	0.040	0.150	0.105	2.21	0.205	0.130	0.000	0.030	0.410	
HIGH	0.380	0.480	0.080	7.155	0.760	0.050	1.600	2.200	2.64	1.035	0.160	0.200	0.190	1.186	

PERCH, OCEAN (REDFISH)				SEBASTES MARINUS				131052 AREA- NORTH ATLANTIC				SITE- P2 MUSCLE			
LENGTH WEIGHT	NUM NUM	4 MEAN	MEAN	0.279 0.531	S. D. S. D.	0.030 0.000	LOW LOW	0.238 0.531	HIGH HIGH	0.307 0.531	VANADIUM MOLYB	MANG PPM	ANTIMONY PPM	TIN PPM	
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	PPM	PPM	PPM	PPM	
NUMBER	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	
N DET.	0000	0000	0001	0000	0000	0003	0000	0000	0000	0000	0003	0003	0000	0000	
MEAN	0.083	0.298	0.060	5.841	0.919	0.060	0.088	0.249	2.50	0.236	1.120	0.620	0.123	1.003	
S. D.	0.036	0.061	0.017	3.902	0.125	0.000	0.018	0.101	0.17	0.132	0.000	0.000	0.036	0.550	
LOW	0.055	0.210	0.040	2.566	0.765	0.000	0.070	0.160	2.30	0.085	0.000	0.000	0.100	0.440	
HIGH	0.135	0.347	0.070	11.186	1.065	0.060	0.110	0.355	2.72	0.380	1.120	0.620	0.175	1.370	

PERCH, OCEAN (REDFISH)				SEBASTES MARINUS				131052 AREA- NORTH ATLANTIC				SITE- P2 LIVER			
LENGTH WEIGHT	NUM NUM	1 MEAN	MEAN	0.279 0.531	S. D. S. D.	0.000 0.000	LOW LOW	0.279 0.531	HIGH HIGH	0.279 0.531	VANADIUM MOLYB	MANG PPM	ANTIMONY PPM	TIN PPM	
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	PPM	PPM	PPM	PPM	
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0000	
MEAN	0.060	0.150	0.055	5.500	0.865	0.285	0.150	3.700	17.32	0.360	0.465	0.000	0.695	1.015	
S. D.	0.000	0.000	0.000	0.000	0.000	0.300	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.300	0.000	0.000	0.000	
HIGH	0.060	0.150	0.055	5.500	0.865	0.285	0.150	3.700	17.32	0.360	0.465	0.000	0.695	1.015	

ROCKFISH, BOCCACCIO				SEBASTES PAUCISPINIS				131061 AREA- CALIFORNIA				SITE- B5 MUSCLE			
LENGTH WEIGHT	NUM NUM	10 MEAN	MEAN	0.600 2.650	S. D. S. D.	0.064 0.948	LOW LOW	0.525 1.901	HIGH HIGH	0.740 4.795	VANADIUM MOLYB	MANG PPM	ANTIMONY PPM	TIN PPM	
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	PPM	PPM	PPM	PPM	
NUMBER	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	
N DET.	0000	0000	0002	0000	0000	0003	0000	0001	0000	0001	0009	0010	0001	0003	
MEAN	0.270	0.506	0.076	2.012	0.665	0.040	0.267	0.264	3.67	0.237	0.870	0.000	0.123	0.985	
S. D.	0.189	0.272	0.038	1.598	0.265	0.015	0.248	0.047	0.81	0.145	0.000	0.000	0.059	0.504	
LOW	0.040	0.200	0.040	0.430	0.345	0.020	0.060	0.195	2.21	0.370	0.300	0.000	0.040	0.400	
HIGH	0.630	1.130	0.140	5.800	1.230	0.070	0.880	0.320	5.00	0.540	0.870	0.000	0.210	1.950	

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES:
BY TISSUE AND LOCATION

LOCATION LEVEL 5				PRIONOTUS CAROLINUS				135010	AREA- NORTH ATLANTIC			SITE- 02	MUSCLE			
LENGTH	NUM	14	MEAN	0.254	S. D.	0.019	LOW	0.217	HIGH	0.287						
WEIGHT	NUM	14	MEAN	0.188	S. D.	0.043	LOW	0.100	HIGH	0.254						
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN	
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
SEARCHBIN, NORTHERN	0014	0012	0014	0014	0014	0014	0013	0014	0013	0014	0014	0014	0014	0014	0014	0014
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.115	0.354	0.079	1.529	0.390	0.048	0.206	0.469	4.68	0.242	0.170	0.480	0.151	0.843	0.551	
S. D.	0.052	0.112	0.039	0.665	0.238	0.014	0.093	0.161	0.89	0.087	0.113	0.000	0.043	0.242	0.250	
LOW	0.040	0.190	0.040	0.840	0.080	0.020	0.060	0.250	2.69	0.080	0.090	0.000	0.090	0.380	0.380	
HIGH	0.220	0.565	0.190	3.350	1.100	0.080	0.345	0.750	5.75	0.380	0.250	0.480	0.220	1.130	1.220	
SEARCHBIN, NORTHERN	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0001	0000	0000	0000	
MEAN	0.110	0.518	0.060	1.763	0.443	0.033	0.128	0.310	4.97	0.255	0.000	0.040	0.160	0.625	0.515	
S. D.	0.028	0.159	0.028	1.290	0.173	0.004	0.046	0.269	1.20	0.092	0.000	0.000	0.057	0.262	0.064	
LOW	0.090	0.405	0.040	0.850	0.320	0.030	0.095	0.120	4.12	0.190	0.000	0.000	0.120	0.440	0.470	
HIGH	0.130	0.630	0.080	2.675	0.565	0.035	0.160	0.500	5.81	0.320	0.000	0.040	0.200	0.810	0.560	
SEARCHBIN, NORTHERN	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	0004	0002	0000	0000	0000	
MEAN	0.175	0.688	0.089	2.316	0.428	0.055	0.226	0.249	5.46	0.326	0.060	0.180	0.233	0.000	0.678	
S. D.	0.105	0.194	0.016	1.602	0.166	0.020	0.068	0.103	1.12	0.073	0.000	0.017	0.059	0.000	0.131	
LOW	0.060	0.470	0.070	0.890	0.245	0.030	0.155	0.080	4.37	0.215	0.000	0.160	0.170	0.000	0.530	
HIGH	0.290	0.910	0.110	4.725	0.670	0.080	0.310	0.360	7.00	0.390	0.060	0.190	0.330	0.000	0.860	
SEARCHBIN, NORTHERN	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0005	0005	0000	0004	0000	
MEAN	0.095	0.751	0.085	2.181	0.537	0.052	0.251	0.464	4.88	0.288	0.280	0.175	0.193	0.530	0.640	
S. D.	0.034	0.538	0.020	0.933	0.118	0.013	0.111	0.170	0.59	0.077	0.000	0.000	0.025	0.580	0.194	
LOW	0.050	0.410	0.060	1.150	0.350	0.030	0.140	0.285	3.97	0.190	0.000	0.000	0.170	0.120	0.470	
HIGH	0.130	1.810	0.110	3.866	0.685	0.065	0.440	0.740	5.50	0.420	0.280	0.175	0.230	0.940	1.000	
SEARCHBIN, NORTHERN	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0002	0000	0002	0000	
MEAN	0.138	1.095	0.130	1.804	0.398	0.040	0.315	0.555	4.77	0.273	0.000	0.000	0.170	0.000	0.570	
S. D.	0.025	1.011	0.057	0.525	0.145	0.014	0.134	0.000	0.42	0.060	0.000	0.000	0.014	0.000	0.307	
LOW	0.120	0.380	0.090	1.433	0.295	0.030	0.220	0.555	4.47	0.230	0.000	0.000	0.160	0.000	0.265	
HIGH	0.155	1.810	0.170	2.175	0.500	0.050	0.410	0.555	5.06	0.315	0.000	0.000	0.180	0.000	0.575	
SEARCHBIN, NORTHERN	0003	0003	0003	0003	0003	0003	0003	0003	0002	0003	0003	0003	0003	0003	0003	0003
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0003	0003	0000	0003	0000	
MEAN	0.255	0.352	0.078	1.617	0.622	0.048	0.197	0.333	4.57	0.305	0.000	0.000	0.203	0.000	0.440	
S. D.	0.172	0.036	0.008	0.785	0.155	0.026	0.080	0.059	0.09	0.065	0.000	0.000	0.051	0.000	0.079	
LOW	0.190	0.310	0.070	1.000	0.450	0.020	0.120	0.290	4.50	0.230	0.000	0.000	0.160	0.000	0.380	
HIGH	0.440	0.375	0.085	2.500	0.750	0.070	0.280	0.400	4.63	0.345	0.000	0.000	0.260	0.000	0.530	
SEARCHBIN, NORTHERN	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0001	0000	0000	0000	
MEAN	0.105	0.413	0.040	20.383	0.900	0.100	0.150	0.230	4.71	0.605	0.000	0.000	0.410	1.570	0.625	
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	
HIGH	0.105	0.413	0.040	20.383	0.900	0.100	0.150	0.230	4.71	0.605	0.000	0.000	0.410	1.570	0.625	

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

SHARK, SANDBAR				CARCHARHINUS MILBERTI				145009	AREA- NORTH ATLANTIC			SITE- N2		MUSCLE	
LENGTH WEIGHT	NUM NUM	10 MEAN MEAN		1.362	S. D.	0.224	LOW	0.997	HIGH		1.745				
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0010	0010	0010	0009	0009	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010
N DET.	0000	0000	0000	0000	0000	0001	0002	0000	0000	0000	0006	0010	0000	0000	0000
MEAN	1.490	1.221	0.085	7.975	0.678	0.029	0.158	0.474	6.71	0.214	0.173	0.000	0.097	0.646	0.533
S. D.	0.351	0.613	0.044	3.075	0.247	0.012	0.103	0.352	2.64	0.059	0.080	0.000	0.034	0.142	0.108
LOW	0.960	0.440	0.040	2.766	0.400	0.010	0.060	0.060	4.38	0.130	0.360	0.000	0.040	0.440	0.380
HIGH	2.330	2.380	0.160	13.865	1.120	0.050	0.380	1.180	11.75	0.290	0.250	0.000	0.160	0.970	0.700

SHARK, SANDBAR				CARCHARHINUS MILBERTI				145009	AREA- NORTH ATLANTIC			SITE- N2		LIVER	
LENGTH WEIGHT	NUM NUM	7 MEAN MEAN		1.387	S. D.	0.238	LOW	0.997	HIGH		1.745				
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0007	0007	0006	0007	0007	0007	0007	0007	0007	0007	0006	0006	0007	0007	0006
N DET.	0000	0001	0001	0000	0000	0003	0003	0000	0000	0001	0001	0003	0000	0002	0000
MEAN	6.566	0.620	0.366	28.321	2.134	0.035	0.141	1.944	9.69	0.242	0.228	0.293	0.596	0.336	0.367
S. D.	10.609	0.356	0.253	18.574	0.592	0.026	0.089	1.834	7.33	0.186	0.085	0.075	0.294	0.036	0.311
LOW	0.670	0.350	0.040	5.500	1.520	0.010	0.060	0.110	0.93	0.090	0.180	0.250	0.180	0.310	0.200
HIGH	30.200	1.300	0.690	53.300	3.280	0.070	0.235	5.500	23.93	0.500	0.380	0.380	0.930	0.380	1.000

SHARK, SANDBAR				CARCHARHINUS MILBERTI				145009	AREA- GJLF			SITE- D7		MUSCLE	
LENGTH WEIGHT	NUM NUM	0 MEAN MEAN		0.000	S. D.	0.000	LOW	0.000	HIGH		0.000				
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0003	0003	0003	0002	0002	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003
N DET.	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0002	0002	0000	0001	0000
MEAN	1.088	0.950	0.053	8.025	1.025	0.038	0.090	0.317	4.21	0.183	0.620	0.200	0.058	0.613	1.095
S. D.	0.865	0.764	0.015	0.177	0.247	0.004	0.106	0.051	0.48	0.127	0.000	0.000	0.028	0.018	0.903
LOW	0.100	0.500	0.040	7.900	0.850	0.035	0.010	0.260	3.70	0.070	0.000	0.000	0.030	0.600	0.380
HIGH	1.705	1.870	0.070	8.150	1.200	0.040	0.210	0.360	4.65	0.320	0.620	0.200	0.085	0.625	2.110

SHARK, DUSKY				CARCHARHINUS OBSCURUS				145010	AREA- NORTH ATLANTIC			SITE- N2		MUSCLE	
LENGTH WEIGHT	NUM NUM	1 MEAN MEAN		1.340	S. D.	0.000	LOW	1.340	HIGH		1.340				
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0001	0000	0000	0000
MEAN	1.780	1.250	0.100	7.550	1.050	0.080	0.190	0.310	3.94	0.270	0.000	0.000	0.880	0.340	0.220
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.300	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	1.780	1.250	0.100	7.550	1.050	0.080	0.190	0.310	3.94	0.270	0.000	0.000	0.880	0.340	0.220

SHARK, DUSKY				CARCHARHINUS OBSCURUS				145010	AREA- SOUTH ATLANTIC			SITE- M1		MUSCLE	
LENGTH WEIGHT	NUM NUM	1 MEAN MEAN		1.981	S. D.	0.000	LOW	1.981	HIGH		1.981				
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0001	0000	0000	0000
MEAN	1.570	0.440	0.090	7.900	1.300	0.050	0.190	0.710	8.50	0.190	0.000	0.000	0.110	0.440	0.630
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	1.570	0.440	0.090	7.900	1.300	0.050	0.190	0.710	8.50	0.190	0.000	0.000	0.110	0.440	0.630

SHARK, DUSKY				CARCHARHINUS OBSCURUS				145010	AREA- GULF			SITE- D7		MUSCLE	
LENGTH WEIGHT	NUM NUM	0 MEAN MEAN		0.000	S. D.	0.000	LOW	0.000	HIGH		0.000				
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0002	0002	0002	0001	0001	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0002	0002	0000	0001	0000
MEAN	1.383	0.620	0.083	21.805	0.800	0.065	0.083	0.258	4.01	0.268	0.000	0.000	0.090	0.690	0.293
S. D.	0.279	0.240	0.039	0.000	0.000	0.000	0.025	0.032	0.90	0.074	0.000	0.000	0.085	0.000	0.053
LOW	1.185	0.450	0.055	0.000	0.000	0.000	0.065	0.235	3.37	0.215	0.000	0.000	0.030	0.000	0.255
HIGH	1.580	0.790	0.110	21.805	0.800	0.065	0.100	0.280	4.64	0.320	0.000	0.000	0.150	0.690	0.330

DOG FISH, SMOOTH				MUSTELUS CANIS				145018	AREA- NORTH ATLANTIC			SITE- H8		MUSCLE	
LENGTH WEIGHT	NUM NUM	17 MEAN MEAN		0.861	S. D.	0.117	LOW	0.686	HIGH		1.194				
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0021	0021	0021	0021	0020	0021	0021	0020	0020	0021	0021	0021	0021	0021	0021
N DET.	0000	0000	0001	0000	0000	0004	0000	0000	0000	0001	0015	0016	0000	0002	0000
MEAN	0.400	0.881	0.287	9.476	0.788	0.032	0.251	0.288	4.23	0.223	0.202	0.362	0.191	0.797	0.521
S. D.	0.288	0.480	0.757	3.971	0.284	0.013	0.141	0.128	0.96	0.394	0.156	0.436	0.103	0.329	0.183
LOW	0.060	0.310	0.040	4.820	0.303	0.010	0.050	0.040	2.94	0.080	0.060	0.060	0.085	0.380	0.285
HIGH	1.050	2.060	3.475	20.330	1.342	0.070	0.560	0.640	6.72	0.440	0.440	1.090	0.450	1.590	0.940

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES:
BY TISSUE AND LOCATION

LOCATION LEVEL 5

DOG FISH, SMOOTH MUSTELUS CANIS 145018 AREA- NORTH ATLANTIC SITE- R6 MUSCLE. Data table with columns: LENGTH, WEIGHT, MERCURY, LEAD, CADMIUM, ARSENIC, SELENIUM, SILVER, CHROM, COPPER, ZINC, NICKEL, MOLYB, VANADIUM, MANG, ANTIMONY, TIN. Rows: NUMBER, N DET., MEAN, S. D., LOW, HIGH.

DOG FISH, SMOOTH MUSTELUS CANIS 145018 AREA- NORTH ATLANTIC SITE- S4 MUSCLE. Data table with columns: LENGTH, WEIGHT, MERCURY, LEAD, CADMIUM, ARSENIC, SELENIUM, SILVER, CHROM, COPPER, ZINC, NICKEL, MOLYB, VANADIUM, MANG, ANTIMONY, TIN. Rows: NUMBER, N DET., MEAN, S. D., LOW, HIGH.

SHARK, BLUE PRIONACE GLAUCA 145023 AREA- NORTH ATLANTIC SITE- N2 MUSCLE. Data table with columns: LENGTH, WEIGHT, MERCURY, LEAD, CADMIUM, ARSENIC, SELENIUM, SILVER, CHROM, COPPER, ZINC, NICKEL, MOLYB, VANADIUM, MANG, ANTIMONY, TIN. Rows: NUMBER, N DET., MEAN, S. D., LOW, HIGH.

SHARK, BLUE PRIONACE GLAUCA 145023 AREA- NORTH ATLANTIC SITE- N2 LIVER. Data table with columns: LENGTH, WEIGHT, MERCURY, LEAD, CADMIUM, ARSENIC, SELENIUM, SILVER, CHROM, COPPER, ZINC, NICKEL, MOLYB, VANADIUM, MANG, ANTIMONY, TIN. Rows: NUMBER, N DET., MEAN, S. D., LOW, HIGH.

SHARK, ATL. SHARPNOSE RHIZOPRIONODON TERRAENOVAE 145025 AREA- SOUTH ATLANTIC SITE- M1 MUSCLE. Data table with columns: LENGTH, WEIGHT, MERCURY, LEAD, CADMIUM, ARSENIC, SELENIUM, SILVER, CHROM, COPPER, ZINC, NICKEL, MOLYB, VANADIUM, MANG, ANTIMONY, TIN. Rows: NUMBER, N DET., MEAN, S. D., LOW, HIGH.

JACKSMELT ATERINOPSIS CALIFORNIENSIS 149004 AREA- CALIFORNIA SITE- F4 WHOLE. Data table with columns: LENGTH, WEIGHT, MERCURY, LEAD, CADMIUM, ARSENIC, SELENIUM, SILVER, CHROM, COPPER, ZINC, NICKEL, MOLYB, VANADIUM, MANG, ANTIMONY, TIN. Rows: NUMBER, N DET., MEAN, S. D., LOW, HIGH.

SKATE, LITTLE RAJA ERINACEA 150005 AREA- NJRTH ATLANTIC SITE- I7 MUSCLE. Data table with columns: LENGTH, WEIGHT, MERCURY, LEAD, CADMIUM, ARSENIC, SELENIUM, SILVER, CHROM, COPPER, ZINC, NICKEL, MOLYB, VANADIUM, MANG, ANTIMONY, TIN. Rows: NUMBER, N DET., MEAN, S. D., LOW, HIGH.

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES:
BY TISSUE AND LOCATION

LOCATION LEVEL 5

SKATE, LITTLE		RAJA ERINACEA							150005	AREA- NORTH ATLANTIC			SITE- I7	LIVER	
LENGTH WEIGHT	NUM NUM	1 MEAN	0.490	S. D.	0.000	LOW	0.490	HIGH	0.490						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.120	1.060	0.510	5.650	0.880	0.010	0.310	3.310	13.13	0.220	0.130	0.310	0.020	0.500	0.380
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.120	1.060	0.510	5.650	0.880	0.010	0.310	3.310	13.13	0.220	0.130	0.310	0.020	0.500	0.380

SKATE, LITTLE		RAJA ERINACEA							150005	AREA- NORTH ATLANTIC			SITE- J6	MUSCLE	
LENGTH WEIGHT	NUM NUM	3 MEAN	0.465	S. D.	0.011	LOW	0.454	HIGH	0.475						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0003	0003	0003	0003
MEAN	0.097	0.468	0.068	12.205	0.427	0.042	0.442	0.512	6.62	0.393	0.160	0.000	0.337	0.000	0.735
S. D.	0.035	0.030	0.014	1.611	0.327	0.008	0.272	0.105	1.14	0.042	0.042	0.000	0.064	0.000	0.105
LOW	0.060	0.440	0.060	10.350	0.050	0.035	0.130	0.395	5.31	0.360	0.130	0.000	0.300	0.000	0.630
HIGH	0.130	0.500	0.085	13.250	0.630	0.050	0.630	0.600	7.38	0.440	0.190	0.000	0.410	0.000	0.840

SKATE, LITTLE		RAJA ERINACEA							150005	AREA- NORTH ATLANTIC			SITE- J7	MUSCLE	
LENGTH WEIGHT	NUM NUM	14 MEAN	0.443	S. D.	0.028	LOW	0.357	HIGH	0.472						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0014	0014	0014	0014	0012	0014	0013	0014	0014	0014	0014	0014	0014	0014	0014
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0005	0009	0000	0013	0000
MEAN	0.121	0.584	0.094	18.631	0.649	0.076	0.343	0.426	8.54	0.392	0.166	0.196	0.839	0.250	0.928
S. D.	0.041	0.218	0.017	11.336	0.253	0.033	0.227	0.088	1.20	0.097	0.044	0.091	0.442	0.000	0.342
LOW	0.060	0.300	0.070	0.460	0.050	0.030	0.130	0.310	6.63	0.240	0.090	0.130	0.130	0.000	0.560
HIGH	0.200	1.130	0.130	47.400	0.970	0.150	0.970	0.640	10.25	0.540	0.250	0.310	1.740	0.250	1.630

SKATE, LITTLE		RAJA ERINACEA							150005	AREA- NORTH ATLANTIC			SITE- M9	MUSCLE	
LENGTH WEIGHT	NUM NUM	5 MEAN	0.461	S. D.	0.029	LOW	0.423	HIGH	0.490						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000
MEAN	0.206	0.987	0.100	19.620	0.745	0.078	0.238	0.305	7.82	0.323	0.208	0.305	1.251	1.332	1.124
S. D.	0.072	0.285	0.014	8.961	0.070	0.008	0.016	0.070	1.27	0.142	0.033	0.097	0.275	0.154	0.352
LOW	0.130	0.530	0.080	11.725	0.650	0.070	0.220	0.200	6.13	0.150	0.175	0.190	1.010	1.130	1.080
HIGH	0.325	1.230	0.115	33.750	0.800	0.090	0.250	0.370	9.30	0.460	0.250	0.435	1.600	1.500	1.190

SKATE, LITTLE		RAJA ERINACEA							150005	AREA- NORTH ATLANTIC			SITE- N2	MUSCLE	
LENGTH WEIGHT	NUM NUM	1 MEAN	0.371	S. D.	0.000	LOW	0.371	HIGH	0.371						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.115	1.265	0.140	13.816	0.550	0.075	0.190	0.265	5.97	0.340	0.280	0.310	2.085	1.155	1.025
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.115	1.265	0.140	13.816	0.550	0.075	0.190	0.265	5.97	0.340	0.280	0.310	2.085	1.155	1.025

SKATE, LITTLE		RAJA ERINACEA							150005	AREA- NORTH ATLANTIC			SITE- N3	MUSCLE	
LENGTH WEIGHT	NUM NUM	1 MEAN	0.455	S. D.	0.000	LOW	0.455	HIGH	0.455						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.220	0.940	0.120	45.450	0.390	0.130	0.410	2.250	7.13	0.510	0.060	0.310	1.130	1.880	0.000
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.220	0.940	0.120	45.450	0.390	0.130	0.410	2.250	7.13	0.510	0.060	0.310	1.130	1.880	0.000

SKATE, LITTLE		RAJA ERINACEA							150005	AREA- NORTH ATLANTIC			SITE- N3	LIVER	
LENGTH WEIGHT	NUM NUM	1 MEAN	0.455	S. D.	0.000	LOW	0.455	HIGH	0.455						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.040	0.750	0.890	13.975	1.230	0.030	0.000	0.750	16.25	0.430	0.880	0.380	1.190	0.440	0.560
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.040	0.750	0.890	13.975	1.230	0.030	0.000	0.750	16.25	0.430	0.880	0.380	1.190	0.440	0.560

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

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LOCATION LEVEL 5																
SKATE, WINTER				RAJA OCELLATA					150012	AREA- NORTH ATLANTIC			SITE- M2		MUSCLE	
LENGTH WEIGHT	NUM NUM	1 0	MEAN MEAN	0.397 0.832	S. D. S. D.	0.000 0.000	LOW LOW	0.397 0.832	HIGH HIGH	0.397 0.832	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM					
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.180	1.500	0.130	13.875	0.730	0.080	0.250	0.360	6.60	0.390	0.120	0.440	2.000	1.310	1.120	
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
HIGH	0.180	1.500	0.130	13.875	0.730	0.080	0.250	0.360	6.60	0.390	0.120	0.440	2.000	1.310	1.120	
EULACHON																
				THALEICHTHYS PACIFICUS					153009	AREA- PACIFIC NORTHWEST			SITE- G9		WHOLE	
LENGTH WEIGHT	NUM NUM	10 0	MEAN MEAN	0.159 0.000	S. D. S. D.	0.035 0.000	LOW LOW	0.100 0.000	HIGH HIGH	0.190 0.000	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM					
NUMBER	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010
N DET.	0009	0000	0000	0000	0000	0000	0001	0000	0000	0000	0002	0004	0000	0003	0000	0000
MEAN	0.010	0.621	0.109	2.686	0.445	0.054	0.216	1.022	11.73	0.370	0.176	0.340	0.545	0.944	1.372	
S. D.	0.000	0.236	0.061	0.861	0.128	0.018	0.075	0.315	1.95	0.164	0.090	0.230	0.094	0.527	0.491	
LOW	0.000	0.360	0.030	1.286	0.300	0.030	0.123	0.670	7.81	0.190	0.060	0.050	0.020	0.250	0.800	
HIGH	0.010	1.060	0.210	4.100	0.670	0.080	0.330	1.710	14.46	0.720	0.310	0.620	0.710	1.650	2.590	
EULACHON																
				THALEICHTHYS PACIFICUS					153009	AREA- PACIFIC NORTHWEST			SITE- M2		WHOLE	
LENGTH WEIGHT	NUM NUM	7 0	MEAN MEAN	0.155 0.000	S. D. S. D.	0.013 0.000	LOW LOW	0.125 0.000	HIGH HIGH	0.160 0.000	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM					
NUMBER	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007
N DET.	0006	0000	0002	0000	0000	0004	0000	0000	0000	0001	0002	0004	0000	0002	0000	0000
MEAN	0.020	0.782	0.094	2.730	0.337	0.128	0.182	0.803	13.48	0.391	0.148	0.267	0.659	1.606	1.011	
S. D.	0.000	0.389	0.044	1.302	0.150	0.110	0.096	0.169	4.01	0.151	0.063	0.076	0.446	0.471	0.423	
LOW	0.000	0.350	0.042	0.500	0.180	0.060	0.070	0.530	8.93	0.220	0.050	0.200	0.250	1.050	0.550	
HIGH	0.020	1.500	0.145	3.700	0.590	0.255	0.296	1.075	20.20	0.640	0.220	0.350	1.580	2.250	1.775	
EULACHON																
				THALEICHTHYS PACIFICUS					153009	AREA- PACIFIC NORTHWEST			SITE- M5		WHOLE	
LENGTH WEIGHT	NUM NUM	0 0	MEAN MEAN	0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH	0.000 0.000	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM					
NUMBER	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003
N DET.	0001	0000	0000	0000	0000	0001	0000	0000	0000	0001	0002	0003	0000	0000	0000	0000
MEAN	0.060	0.806	0.215	2.745	0.410	0.040	0.383	0.843	9.68	0.430	0.150	0.000	0.503	1.223	0.830	
S. D.	0.071	0.654	0.234	0.261	0.170	0.000	0.271	0.251	2.76	0.300	0.000	0.000	0.172	0.240	0.199	
LOW	0.010	0.350	0.070	2.475	0.240	0.000	0.150	0.605	6.55	0.430	0.000	0.000	0.320	1.070	0.600	
HIGH	0.110	1.555	0.485	2.995	0.580	0.040	0.680	1.105	11.78	0.430	0.150	0.000	0.660	1.500	0.950	
EULACHON																
				THALEICHTHYS PACIFICUS					153009	AREA- PACIFIC NORTHWEST			SITE- M8		WHOLE	
LENGTH WEIGHT	NUM NUM	0 0	MEAN MEAN	0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH	0.000 0.000	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM					
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0001	0000	0000	0000	0000	0001	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000
MEAN	0.100	0.677	0.100	2.309	0.254	0.200	0.186	0.935	13.72	0.371	0.168	0.410	0.450	0.875	0.975	
S. D.	0.000	0.112	0.042	0.313	0.182	0.000	0.056	0.233	0.21	0.162	0.067	0.297	0.170	0.000	0.403	
LOW	0.000	0.597	0.070	2.388	0.125	0.000	0.146	0.770	13.57	0.256	0.120	0.200	0.330	0.000	0.690	
HIGH	0.100	0.755	0.130	2.530	0.383	0.200	0.225	1.100	13.87	0.485	0.215	0.620	0.570	0.875	1.260	
EULACHON																
				THALEICHTHYS PACIFICUS					153009	AREA- PACIFIC NORTHWEST			SITE- N4		WHOLE	
LENGTH WEIGHT	NUM NUM	5 0	MEAN MEAN	0.152 0.000	S. D. S. D.	0.017 0.000	LOW LOW	0.140 0.000	HIGH HIGH	0.175 0.000	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM					
NUMBER	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0005	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0000	0000	0000	0000
MEAN	0.000	0.908	0.079	2.295	0.586	0.045	0.234	0.700	12.25	0.210	0.146	0.525	0.513	0.874	1.324	
S. D.	0.000	0.257	0.024	0.788	0.516	0.019	0.061	0.125	2.98	0.358	0.062	0.632	0.120	0.335	0.207	
LOW	0.000	0.535	0.060	1.737	0.170	0.030	0.160	0.520	9.63	0.130	0.060	0.090	0.360	0.380	1.000	
HIGH	0.000	1.250	0.120	3.540	1.475	0.075	0.310	0.840	16.97	0.285	0.220	1.250	0.655	1.220	1.560	
EULACHON																
				THALEICHTHYS PACIFICUS					153009	AREA- PACIFIC NORTHWEST			SITE- R2		WHOLE	
LENGTH WEIGHT	NUM NUM	0 0	MEAN MEAN	0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH	0.000 0.000	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM					
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0002	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000
MEAN	0.000	0.625	0.060	1.525	0.420	0.080	0.430	1.010	11.19	0.265	0.185	0.130	0.425	1.330	1.260	
S. D.	0.000	0.092	0.000	0.177	0.099	0.000	0.297	0.113	1.85	0.307	0.177	0.000	0.021	0.750	0.028	
LOW	0.000	0.560	0.060	1.400	0.350	0.080	0.190	0.930	9.88	0.260	0.360	0.000	0.410	0.500	1.240	
HIGH	0.000	0.690	0.060	1.650	0.490	0.080	0.610	1.090	12.50	0.270	0.310	0.130	0.440	1.560	1.280	

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

WOLFFISH, ATL.		ANARHICHAS LUPUS							183002 AREA- NORTH ATLANTIC			SITE- I5 LIVER				
LENGTH WEIGHT	NUM NUM	4 MEAN MEAN	0.916 S. D.	0.085 S. D.	LOW LOW	0.842 HIGH HIGH	1.020 HIGH HIGH	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM		
NUMBER	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	
MEAN	0.073	0.359	0.998	4.752	2.144	0.051	0.110	7.764	22.58	0.200	0.220	0.438	0.524	0.370	0.474	
S. D.	0.040	0.128	0.528	2.070	1.071	0.037	0.063	3.089	4.57	0.064	0.042	0.322	0.094	0.115	0.147	
LOW	0.030	0.190	0.570	1.912	0.980	0.010	0.060	5.000	18.75	0.140	0.190	0.090	0.440	0.220	0.310	
HIGH	0.110	0.500	1.690	6.883	3.576	0.100	0.190	12.185	27.81	0.290	0.250	0.780	0.640	0.500	0.530	

WOLFFISH, ATL.		ANARHICHAS LUPUS							183002 AREA- NORTH ATLANTIC			SITE- I9 MJSCL			
LENGTH WEIGHT	NUM NUM	1 MEAN MEAN	1.000 S. D.	0.000 S. D.	LOW LOW	1.000 HIGH HIGH	1.000 HIGH HIGH	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	
MEAN	0.225	0.380	0.065	5.550	0.700	0.030	0.155	0.320	10.09	0.145	0.000	0.095	0.395	0.310	
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
HIGH	0.225	0.380	0.065	5.550	0.700	0.030	0.155	0.320	10.09	0.145	0.000	0.095	0.395	0.310	

WOLFFISH, ATL.		ANARHICHAS LUPUS							183002 AREA- NORTH ATLANTIC			SITE- I9 LIVER			
LENGTH WEIGHT	NUM NUM	1 MEAN MEAN	1.000 S. D.	0.000 S. D.	LOW LOW	1.000 HIGH HIGH	1.000 HIGH HIGH	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	
MEAN	0.110	0.500	2.030	4.350	1.370	0.330	0.060	18.750	27.50	0.260	0.310	0.660	0.380	0.060	
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
HIGH	0.110	0.500	2.030	4.350	1.370	0.330	0.060	18.750	27.50	0.260	0.310	0.660	0.380	0.060	

WOLFFISH, ATL.		ANARHICHAS LUPUS							183002 AREA- NORTH ATLANTIC			SITE- J3 MUSCLE			
LENGTH WEIGHT	NUM NUM	2 MEAN MEAN	0.688 S. D.	2.182 S. D.	0.145 LOW	0.585 HIGH	2.182 HIGH	0.790 HIGH	2.182 HIGH	0.790 HIGH	0.790 HIGH	0.000	0.000	0.000	0.000
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
NUMBER	0002	0001	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	
N DET.	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0002	0001	0000	0000	
MEAN	0.190	0.310	0.175	27.058	0.890	0.020	0.095	0.048	7.35	0.155	0.000	0.470	0.178	0.440	
S. D.	0.184	0.000	0.021	35.981	0.113	0.000	0.049	0.018	0.22	0.049	0.000	0.000	0.088	0.085	
LOW	0.060	0.000	0.160	1.615	0.810	0.000	0.060	0.035	0.19	0.120	0.000	0.000	0.115	0.380	
HIGH	0.320	0.310	0.190	52.500	0.970	0.020	0.130	0.060	7.50	0.190	0.000	0.470	0.240	0.560	

WOLFFISH, ATL.		ANARHICHAS LUPUS							183002 AREA- NORTH ATLANTIC			SITE- J3 LIVER			
LENGTH WEIGHT	NUM NUM	1 MEAN MEAN	0.790 S. D.	0.000 S. D.	LOW LOW	0.790 HIGH	0.000 HIGH	0.790 HIGH	0.000 HIGH	0.790 HIGH	0.000	0.000	0.000	0.000	
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	
MEAN	0.000	0.250	0.720	4.500	2.520	0.120	0.060	17.500	34.38	0.280	0.000	1.500	0.960	0.500	
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
HIGH	0.000	0.250	0.720	4.500	2.520	0.120	0.060	17.500	34.38	0.280	0.000	1.500	0.960	0.500	

WOLFFISH, ATL.		ANARHICHAS LUPUS							183002 AREA- NORTH ATLANTIC			SITE- J5 MJSCL			
LENGTH WEIGHT	NUM NUM	2 MEAN MEAN	0.810 S. D.	5.425 S. D.	0.000 LOW	0.810 HIGH	5.425 HIGH	0.810 HIGH	5.425 HIGH	0.810 HIGH	0.810 HIGH	0.000	0.000	0.000	0.000
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0001	
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0002	0000	0000	
MEAN	0.220	0.435	0.075	5.803	1.320	0.015	0.060	0.325	8.00	0.305	0.000	0.000	0.075	0.560	
S. D.	0.127	0.262	0.021	3.539	0.099	0.007	0.000	0.078	1.15	0.120	0.000	0.000	0.021	0.354	
LOW	0.130	0.250	0.060	3.300	1.250	0.010	0.060	0.270	7.19	0.220	0.000	0.000	0.060	0.310	
HIGH	0.310	0.620	0.090	8.305	1.390	0.020	0.060	0.380	8.81	0.390	0.000	0.000	0.090	0.630	

WOLFFISH, ATL.		ANARHICHAS LUPUS							183002 AREA- NORTH ATLANTIC			SITE- J5 LIVER			
LENGTH WEIGHT	NUM NUM	1 MEAN MEAN	0.810 S. D.	0.000 S. D.	LOW LOW	0.810 HIGH	0.000 HIGH	0.810 HIGH	0.000 HIGH	0.810 HIGH	0.000	0.000	0.000	0.000	
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	
MEAN	0.050	0.250	2.540	8.600	3.400	0.110	0.190	0.000	33.12	0.360	0.810	0.560	0.000	0.310	
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
HIGH	0.050	0.250	2.540	8.600	3.400	0.110	0.190	0.000	33.12	0.360	0.810	0.560	0.000	0.310	

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

RFPJRT MF17

LOCATION LEVEL 5

WOLFFISH, ATL.			ANARHICHAS LUPUS						183002	AREA- NORTH ATLANTIC			SITE- K4		LIVER
LENGTH WEIGHT	NUM NUM	2 MEAN	0.910	S. D.	0.014	LOW	0.900	HIGH	0.920						
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.195	0.895	4.105	26.698	4.608	0.105	0.140	21.140	43.50	0.365	0.205	2.720	1.150	0.420	0.360
S. D.	0.092	0.290	3.811	34.121	0.555	0.021	0.014	2.461	4.95	0.035	0.021	1.372	0.170	0.113	0.198
LOW	0.130	0.690	1.410	2.570	4.215	0.090	0.130	19.400	40.00	0.340	0.190	1.750	1.030	0.340	0.220
HIGH	0.260	1.100	6.800	50.825	5.000	0.120	0.150	22.880	47.00	0.390	0.220	3.690	1.270	0.500	0.503

WOLFFISH, ATL.			ANARHICHAS LUPUS						183002	AREA- NORTH ATLANTIC			SITE- K5		MUSCLE
LENGTH WEIGHT	NUM NUM	2 MEAN	0.820	S. D.	0.000	LOW	0.820	HIGH	0.820						
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000	0002	0000	0000	0000
MEAN	0.090	0.405	0.045	5.503	0.840	0.030	0.310	0.285	8.02	0.250	0.095	0.000	0.330	0.660	0.720
S. D.	0.057	0.219	0.007	3.285	0.552	0.014	0.000	0.134	0.74	0.028	0.049	0.000	0.212	0.042	0.127
LOW	0.050	0.250	0.040	3.180	0.450	0.020	0.000	0.090	7.50	0.230	0.060	0.000	0.180	0.630	0.630
HIGH	0.130	0.560	0.050	7.825	1.230	0.040	0.310	0.380	8.54	0.270	0.130	0.000	0.480	0.690	0.810

WOLFFISH, ATL.			ANARHICHAS LUPUS						183002	AREA- NORTH ATLANTIC			SITE- K5		LIVER
LENGTH WEIGHT	NUM NUM	1 MEAN	0.795	S. D.	0.000	LOW	0.795	HIGH	0.795						
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.075	0.560	2.845	3.125	2.470	0.070	0.155	12.970	37.81	0.300	0.470	2.360	1.300	0.655	0.545
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.000	8.56	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.075	0.560	2.845	3.125	2.470	0.070	0.155	12.970	37.81	0.300	0.470	2.360	1.300	0.655	0.545

WOLFFISH, ATL.			ANARHICHAS LUPUS						183002	AREA- NORTH ATLANTIC			SITE- K6		MUSCLE
LENGTH WEIGHT	NUM NUM	3 MEAN	0.630	S. D.	0.075	LOW	0.560	HIGH	0.710						
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0003	0003	0000	0002	0000
MEAN	0.230	0.397	0.092	7.160	0.392	0.028	0.158	0.227	5.32	0.213	0.000	0.000	0.112	0.500	0.512
S. D.	0.078	0.131	0.010	3.665	0.193	0.003	0.053	0.130	1.56	0.025	0.000	0.000	0.045	0.000	0.094
LOW	0.175	0.250	0.080	2.930	0.170	0.025	0.125	0.100	3.87	0.190	0.000	0.000	0.070	0.000	0.410
HIGH	0.285	0.500	0.100	9.400	0.525	0.030	0.220	0.360	6.97	0.240	0.000	0.000	0.160	0.500	0.595

TAUTOG			TAUTOGA ONITIS						185022	AREA- NORTH ATLANTIC			SITE- I7		MUSCLE
LENGTH WEIGHT	NUM NUM	9 MEAN	0.441	S. D.	0.059	LOW	0.354	HIGH	0.554						
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0009	0009	0009	0009	0009	0009	0009	0008	0008	0007	0009	0009	0009	0009	0009
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0004	0006	0000	0000	0000
MEAN	0.253	0.526	0.076	2.458	0.444	0.041	0.167	0.370	4.07	0.176	0.206	0.470	0.244	0.706	0.620
S. D.	0.092	0.261	0.042	0.708	0.257	0.036	0.076	0.253	1.06	0.034	0.138	0.255	0.179	0.279	0.191
LOW	0.130	0.250	0.035	1.725	0.140	0.020	0.040	0.130	2.75	0.135	0.060	0.250	0.070	0.380	0.380
HIGH	0.375	1.000	0.180	3.775	0.970	0.130	0.290	0.940	6.06	0.230	0.380	0.750	0.560	1.310	1.000

TAUTOG			TAUTOGA ONITIS						185022	AREA- NORTH ATLANTIC			SITE- N7		MUSCLE
LENGTH WEIGHT	NUM NUM	5 MEAN	0.371	S. D.	0.037	LOW	0.330	HIGH	0.430						
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0005	0005	0000	0000	0000
MEAN	0.330	0.488	0.049	1.678	0.626	0.030	0.092	0.141	4.49	0.180	0.000	0.000	0.208	0.555	0.460
S. D.	0.076	0.082	0.011	1.011	0.106	0.007	0.036	0.079	0.44	0.041	0.000	0.000	0.067	0.131	0.080
LOW	0.210	0.440	0.030	0.737	0.455	0.020	0.060	0.090	4.00	0.140	0.000	0.000	0.105	0.440	0.332
HIGH	0.420	0.630	0.060	3.340	0.725	0.040	0.130	0.230	5.09	0.240	0.000	0.000	0.280	0.750	0.550

ABALONE, GREEN			HALIOTIS FULGENS						187005	AREA- CALIFORNIA			SITE- K3		SHUCKED
LENGTH WEIGHT	NUM NUM	8 MEAN	0.175	S. D.	0.005	LOW	0.168	HIGH	0.180						
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0010	0010	0010	0010	0010	0010	0010	0010	0009	0010	0010	0010	0010	0010	0010
N DET.	0006	0000	0000	0000	0001	0000	0000	0000	0000	0000	0001	0002	0000	0001	0000
MEAN	0.029	0.838	2.434	14.259	0.167	0.640	0.431	2.845	18.04	2.930	0.789	0.236	0.556	0.963	1.053
S. D.	0.012	0.209	0.693	9.300	0.113	0.323	0.124	1.086	4.53	1.531	0.204	0.134	0.223	0.365	0.319
LOW	0.020	0.560	1.360	3.000	0.020	0.130	0.250	1.190	10.00	0.320	0.575	0.060	0.300	0.250	0.750
HIGH	0.045	1.190	3.500	27.000	0.340	1.140	0.630	4.940	26.07	6.175	1.190	0.470	0.880	1.560	1.735

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES:
BY TISSUE AND LOCATION

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LOCATION LEVEL 5

SQUID, SHORTFINNED				ILLEX ILLECEBROSUS				188014 AREA- NORTH ATLANTIC			SITE- P2		MANTLE, SKINLESS		
LENGTH WEIGHT	NUM NUM	14 MEAN	MEAN	0.186 S. D.	S. D.	0.006 S. D.	LOW	0.173 HIGH	0.196 HIGH	0.166 HIGH	VANADIUM	MANG	ANTIMONY	TIN	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	PPM	PPM	PPM	PPM
NUMBER	0014	0013	0014	0014	0014	0014	0013	0014	0014	0014	0014	0014	0014	0014	0014
N DET.	0308	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.060	0.487	0.093	2.790	0.491	0.054	0.122	4.895	13.57	0.287	0.140	0.243	0.283	0.731	0.725
S. D.	0.040	0.219	0.026	1.632	0.229	0.010	0.042	1.623	2.15	0.084	0.000	0.196	0.144	0.206	0.244
LOW	0.020	0.150	0.040	1.080	0.190	0.040	0.060	1.880	8.63	0.120	0.000	0.130	0.160	0.530	0.440
HIGH	0.130	0.970	0.135	6.810	1.085	0.070	0.190	7.780	17.81	0.390	0.140	0.470	0.740	1.140	1.310

SQUID, SHORTFINNED				ILLEX ILLECEBROSUS				188014 AREA- NORTH ATLANTIC			SITE- S1		MANTLE, SKINLESS		
LENGTH WEIGHT	NUM NUM	11 MEAN	MEAN	0.197 S. D.	S. D.	0.050 S. D.	LOW	0.127 HIGH	0.240 HIGH	0.383 HIGH	VANADIUM	MANG	ANTIMONY	TIN	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	PPM	PPM	PPM	PPM
NUMBER	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011
N DET.	0006	0000	0000	0000	0000	0000	0000	0000	0000	0000	0006	0004	0000	0001	0000
MEAN	0.105	0.977	0.291	4.200	0.868	0.122	0.415	8.315	14.76	0.297	0.157	0.403	0.619	1.148	1.473
S. D.	0.134	0.516	0.086	2.207	0.295	0.084	0.634	5.138	2.57	0.084	0.033	0.211	0.360	0.451	2.118
LOW	0.025	0.140	0.160	1.362	0.480	0.030	0.110	3.190	11.44	0.130	0.115	0.150	0.195	0.500	0.440
HIGH	0.340	1.950	0.420	8.900	1.600	0.250	2.310	18.060	20.00	0.405	0.190	0.630	1.230	1.750	7.810

SQUID, SHORTFINNED				ILLEX ILLECEBROSUS				188014 AREA- NORTH ATLANTIC			SITE- S4		MANTLE, SKINLESS		
LENGTH WEIGHT	NUM NUM	2 MEAN	MEAN	0.178 S. D.	S. D.	0.029 S. D.	LOW	0.157 HIGH	0.198 HIGH	0.163 HIGH	VANADIUM	MANG	ANTIMONY	TIN	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	PPM	PPM	PPM	PPM
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0002	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0002	0000	0000	0000
MEAN	0.000	0.500	0.095	6.788	0.690	0.050	0.095	4.445	13.44	0.230	0.310	0.000	0.225	1.115	0.535
S. D.	0.000	0.085	0.007	6.311	0.580	0.014	0.049	0.615	3.10	0.371	0.000	0.000	0.021	0.007	0.134
LOW	0.000	0.440	0.090	2.325	0.280	0.040	0.060	4.010	11.25	0.180	0.000	0.000	0.210	1.110	0.440
HIGH	0.000	0.560	0.100	11.250	1.100	0.060	0.130	4.880	15.63	0.280	0.310	0.000	0.240	1.120	0.630

SQUID, SHORTFINNED				ILLEX ILLECEBROSUS				188014 AREA- NORTH ATLANTIC			SITE- S7		MANTLE, SKINLESS		
LENGTH WEIGHT	NUM NUM	5 MEAN	MEAN	0.185 S. D.	S. D.	0.015 S. D.	LOW	0.163 HIGH	0.200 HIGH	0.163 HIGH	VANADIUM	MANG	ANTIMONY	TIN	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	PPM	PPM	PPM	PPM
NUMBER	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0004	0000	0000	0000	0000	0000	0000	0000	0000	0000	0005	0004	0000	0001	0000
MEAN	0.060	0.683	0.289	6.200	0.592	0.062	0.160	4.896	14.19	0.304	0.000	0.190	0.231	0.973	0.643
S. D.	0.000	0.184	0.352	2.325	0.120	0.034	0.052	6.644	6.02	0.077	0.000	0.000	0.069	0.236	0.121
LOW	0.000	0.405	0.080	3.250	0.300	0.030	0.130	0.440	5.63	0.230	0.000	0.000	0.150	0.630	0.440
HIGH	0.060	0.880	0.915	9.450	0.730	0.120	0.250	16.410	22.53	0.410	0.000	0.190	0.310	1.130	0.750

OYSTER, EASTERN				CRASSOSTREA VIRGINICA				189001 AREA- NORTH ATLANTIC			SITE- H8		SHUCKED		
LENGTH WEIGHT	NUM NUM	0 MEAN	MEAN	0.000 S. D.	S. D.	0.000 S. D.	LOW	0.000 HIGH	0.000 HIGH	0.000 HIGH	VANADIUM	MANG	ANTIMONY	TIN	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	PPM	PPM	PPM	PPM
NUMBER	0020	0019	0018	0019	0019	0019	0018	0018	0018	0018	0019	0019	0017	0019	0019
N DET.	0009	0000	0000	0001	0001	0000	0000	0000	0000	0000	0010	0008	0000	0001	0000
MEAN	0.048	1.348	3.195	2.927	0.251	0.743	0.756	160.552	833.83	0.843	0.333	0.621	5.486	1.157	0.720
S. D.	0.035	1.059	1.475	1.665	0.131	0.672	0.584	120.409	305.76	0.775	0.147	0.435	4.602	0.977	0.438
LOW	0.020	0.230	1.440	0.855	0.120	0.030	0.120	22.190	452.86	0.160	0.180	0.250	0.800	0.250	0.285
HIGH	0.120	3.635	5.680	6.920	0.570	1.805	2.173	336.935	1574.10	2.530	0.580	1.595	14.640	2.970	1.765

OYSTER, EASTERN				CRASSOSTREA VIRGINICA				189001 AREA- NORTH ATLANTIC			SITE- H8		SHUCKED, SELECT		
LENGTH WEIGHT	NUM NUM	0 MEAN	MEAN	0.000 S. D.	S. D.	0.000 S. D.	LOW	0.000 HIGH	0.000 HIGH	0.000 HIGH	VANADIUM	MANG	ANTIMONY	TIN	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	PPM	PPM	PPM	PPM
NUMBER	0010	0010	0010	0010	0008	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010
N DET.	0008	0000	0000	0001	0000	0001	0000	0000	0000	0000	0006	0004	0000	0001	0000
MEAN	0.040	0.266	0.500	2.153	0.413	0.389	0.139	9.660	312.34	0.307	0.140	0.438	1.199	0.470	0.579
S. D.	0.000	0.140	0.149	1.008	0.203	0.069	0.110	3.880	149.58	0.068	0.063	0.428	0.454	0.465	0.343
LOW	0.040	0.130	0.270	1.025	0.155	0.010	0.040	0.470	4.69	0.190	0.063	0.060	0.190	0.060	0.200
HIGH	0.040	0.560	0.680	3.766	0.675	0.245	0.375	14.060	437.50	0.430	0.190	1.220	1.780	1.560	1.170

OYSTER, EASTERN				CRASSOSTREA VIRGINICA				189001 AREA- NORTH ATLANTIC			SITE- H8		SHUCKED, STANDARD		
LENGTH WEIGHT	NUM NUM	0 MEAN	MEAN	0.000 S. D.	S. D.	0.000 S. D.	LOW	0.000 HIGH	0.000 HIGH	0.000 HIGH	VANADIUM	MANG	ANTIMONY	TIN	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	PPM	PPM	PPM	PPM
NUMBER	0010	0010	0010	0009	0009	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010
N DET.	0007	0000	0000	0000	0000	0000	0001	0000	0000	0000	0006	0006	1.004	0.340	0.366
MEAN	0.057	0.300	0.964	2.238	0.716	0.219	0.169	18.599	408.66	0.259	0.125	0.185	1.104	0.221	0.192
S. D.	0.038	0.109	0.169	0.839	0.295	0.168	0.158	5.778	250.55	0.357	0.123	0.087	0.230	0.060	0.130
LOW	0.030	0.190	0.795	0.650	0.140	0.030	0.050	14.500	146.56	0.170	0.060	0.090	0.840	0.060	0.130
HIGH	0.100	0.500	1.370	3.250	0.980	0.610	0.560	33.750	828.13	0.320	0.310	0.300	1.480	0.690	0.750

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

OYSTER, EASTERN		CRASSOSTREA VIRGINICA							189001	AREA- NORTH ATLANTIC			SITE- R3		SHUCKED, SELECT	
LENGTH WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	MANG PPM	ANTIMONY PPM	TIN PPM			
	NUM	1	MEAN	0.015	S. D.	0.000	LOW	0.015	HIGH	0.015						
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM					
NUMBER	0016	0016	0016	0016	0016	0016	0016	0016	0016	0016	0016	0016	0016			
N DET.	0009	0000	0000	0000	0000	0000	0001	0000	0000	0000	0008	0008	0000			
MEAN	0.029	0.362	0.640	2.042	0.552	0.160	0.118	14.030	424.17	0.283	0.211	0.230	0.852			
S. D.	0.019	0.157	0.155	0.841	0.327	0.122	0.093	5.300	205.98	0.043	0.135	0.138	0.211			
LOW	0.020	0.130	0.330	0.700	0.270	0.010	0.010	0.985	42.19	0.190	0.060	0.060	0.575			
HIGH	0.070	0.560	0.890	3.441	1.655	0.430	0.380	20.810	729.69	0.350	0.500	0.500	1.220			

OYSTER, EASTERN		CRASSOSTREA VIRGINICA							189001	AREA- NORTH ATLANTIC			SITE- R3		SHUCKED, STANDARD	
LENGTH WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	MANG PPM	ANTIMONY PPM	TIN PPM			
	NUM	7	MEAN	0.010	S. D.	0.000	LOW	0.010	HIGH	0.010						
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM					
NUMBER	0016	0015	0016	0016	0015	0016	0016	0016	0016	0016	0016	0016	0016			
N DET.	0016	0001	0000	0000	0000	0000	0004	0000	0000	0000	0009	0009	0000			
MEAN	0.000	0.404	0.790	1.915	0.615	0.283	0.160	19.666	580.63	0.331	0.172	0.313	1.011			
S. D.	0.000	0.139	0.103	0.749	0.303	0.215	0.198	4.245	120.76	0.052	0.089	0.157	0.218			
LOW	0.000	0.190	0.600	0.950	0.280	0.020	0.060	12.200	314.08	0.250	0.060	0.090	0.490			
HIGH	0.000	0.690	0.980	3.625	1.330	0.690	0.750	27.190	781.25	0.425	0.310	0.620	1.330			

OYSTER, EASTERN		CRASSOSTREA VIRGINICA							189001	AREA- SOUTH ATLANTIC			SITE- B5		SHUCKED	
LENGTH WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	MANG PPM	ANTIMONY PPM	TIN PPM			
	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000						
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM					
NUMBER	0010	0010	0010	0010	0009	0010	0010	0010	0010	0010	0010	0010	0010			
N DET.	0003	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0001	0000			
MEAN	0.133	0.689	0.504	11.709	0.625	0.378	0.437	8.365	179.38	0.837	2.571	1.734	3.735			
S. D.	0.054	0.290	0.151	8.275	0.219	0.088	0.201	2.421	48.45	0.374	1.230	1.123	1.448			
LOW	0.020	0.363	0.315	4.740	0.240	0.255	0.120	4.895	98.13	0.385	1.500	0.820	2.145			
HIGH	0.450	1.180	0.820	31.500	0.840	0.540	0.880	12.000	285.00	1.500	5.500	4.380	6.680			

OYSTER, EASTERN		CRASSOSTREA VIRGINICA							189001	AREA- SOUTH ATLANTIC			SITE- C2		SHUCKED	
LENGTH WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	MANG PPM	ANTIMONY PPM	TIN PPM			
	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000						
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM					
NUMBER	0010	0010	0010	0009	0009	0010	0010	0010	0010	0010	0010	0010	0010			
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000			
MEAN	0.063	1.006	0.983	3.649	0.618	0.592	0.490	24.227	439.65	0.813	0.482	0.950	6.713			
S. D.	0.042	0.175	0.150	1.108	0.161	0.188	0.113	5.316	77.93	0.307	0.132	0.514	2.028			
LOW	0.020	0.655	0.710	2.400	0.445	0.250	0.325	19.315	302.00	0.180	0.225	0.165	3.570			
HIGH	0.130	1.203	1.210	5.770	0.890	0.895	0.625	36.900	571.43	1.280	0.600	1.800	9.500			

OYSTER, EASTERN		CRASSOSTREA VIRGINICA							189001	AREA- SOUTH ATLANTIC			SITE- F3		SHUCKED	
LENGTH WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	MANG PPM	ANTIMONY PPM	TIN PPM			
	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000						
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM					
NUMBER	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010			
N DET.	0005	0000	0000	0000	0000	0000	0000	0000	0000	0001	0002	0003	0000			
MEAN	0.030	0.404	0.404	3.579	0.663	0.242	0.205	11.533	266.39	0.282	0.355	0.536	2.868			
S. D.	0.029	0.263	0.094	2.259	0.403	0.194	0.142	3.847	59.45	0.142	0.285	0.261	0.789			
LOW	0.010	0.060	0.260	1.443	0.270	0.020	0.050	6.690	142.50	0.190	0.130	0.235	1.990			
HIGH	0.080	0.950	0.570	9.250	1.725	0.695	0.515	17.145	388.44	0.640	0.870	0.965	4.285			

OYSTER, EASTERN		CRASSOSTREA VIRGINICA							189001	AREA- GULF			SITE- B8		SHUCKED	
LENGTH WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	MANG PPM	ANTIMONY PPM	TIN PPM			
	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000						
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM					
NUMBER	0010	0010	0010	0009	0009	0009	0010	0010	0010	0010	0010	0010	0010			
N DET.	0003	0001	0000	0000	0000	0000	0001	0000	0000	0000	0000	0000	0000			
MEAN	0.039	1.383	1.026	4.170	0.684	0.319	0.471	18.964	521.17	1.273	0.259	0.844	18.421			
S. D.	0.021	0.540	0.365	2.568	0.217	0.174	0.181	6.077	265.32	0.636	0.127	0.699	10.370			
LOW	0.010	0.557	0.376	0.500	0.250	0.165	0.282	10.330	212.86	0.610	0.070	0.335	9.320			
HIGH	0.060	2.125	1.630	9.360	0.965	0.710	0.845	29.645	985.07	2.565	0.485	2.750	42.920			

OYSTER, EASTERN		CRASSOSTREA VIRGINICA							189001	AREA- GULF			SITE- D6		SHUCKED	
LENGTH WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	MANG PPM	ANTIMONY PPM	TIN PPM			
	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000						
MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM					
NUMBER	0011	0011	0011	0010	0011	0011	0011	0011	0011	0011	0011	0011	0011			
N DET.	0005	0000	0000	0000	0000	0000	0000	0000	0000	0001	0001	0000	0000			
MEAN	0.038	0.485	0.436	4.809	1.038	0.240	0.189	13.137	304.02	0.362	0.332	1.587	2.642			
S. D.	0.015	0.225	0.166	2.318	0.728	0.257	0.124	4.810	138.33	0.129	0.286	0.590	0.801			
LOW	0.020	0.300	0.180	1.933	0.180	0.040	0.010	5.370	132.50	0.090	0.150	0.925	1.570			
HIGH	0.055	1.130	0.730	8.483	2.155	0.960	0.470	22.100	645.63	0.540	1.120	2.795	3.945			

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES:
BY TISSUE AND LOCATION

REPORT MF17

LOCATION LEVEL 5

OYSTER, EASTERN				CRASSOSTREA VIRGINICA				189001 AREA- GULF			SITE- E5 SHUCKED			
LENGTH WEIGHT	NUM NUM	0 0	MEAN MEAN	0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH	0.000 0.000	COPPER ZINC NICKEL	MOLYB VANADIUM MANG	ANTIMONY TIN	
MERCURY	PPM	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	PPM	PPM	PPM	PPM	PPM	PPM	
NUMBER	0020	0020	0020	0020	0020	0020	0019	0020	0020	0020	0020	0020	0020	
N DET.	0012	0000	0000	0000	0000	0000	0001	0000	0000	0001	0006	0003	0000	
MEAN	0.028	0.706	0.362	3.183	0.398	0.275	0.278	5.808	205.59	0.592	0.259	0.438	1.771	
S. D.	0.013	0.357	0.147	1.800	0.184	0.161	0.189	3.962	106.43	0.213	0.154	0.127	0.743	
LOW	0.010	0.250	0.180	0.400	0.140	0.080	0.060	0.420	11.64	0.260	0.090	0.190	0.730	
HIGH	0.055	1.590	0.800	7.750	1.000	0.560	0.810	19.070	455.00	1.015	0.625	0.750	3.090	

OYSTER, EASTERN				CRASSOSTREA VIRGINICA				189001 AREA- GULF			SITE- E8 SHUCKED			
LENGTH WEIGHT	NUM NUM	0 0	MEAN MEAN	0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH	0.000 0.000	COPPER ZINC NICKEL	MOLYB VANADIUM MANG	ANTIMONY TIN	
MERCURY	PPM	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	PPM	PPM	PPM	PPM	PPM	PPM	
NUMBER	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0009	
N DET.	0003	0000	0000	0001	0000	0000	0000	0000	0000	0000	0003	0000	0000	
MEAN	0.036	0.436	0.511	2.899	0.653	0.375	0.245	6.559	61.69	0.451	0.115	0.515	4.531	
S. D.	0.013	0.205	0.172	1.487	0.741	0.106	0.080	2.418	30.93	0.120	0.064	0.311	1.283	
LOW	0.020	0.030	0.190	1.000	0.150	0.200	0.140	2.430	3.90	0.230	0.060	0.060	2.690	
HIGH	0.050	0.750	0.860	4.750	2.650	0.500	0.360	9.410	107.14	0.613	0.226	0.910	6.175	

OYSTER, PAC. (GIANT)				CRASSOSTREA GIGAS				189002 AREA- CALIFORNIA			SITE- B5 SHUCKED			
LENGTH WEIGHT	NUM NUM	10 10	MEAN MEAN	0.150 0.262	S. D. S. D.	0.000 0.000	LOW LOW	0.150 0.262	HIGH HIGH	0.150 0.262	COPPER ZINC NICKEL	MOLYB VANADIUM MANG	ANTIMONY TIN	
MERCURY	PPM	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	PPM	PPM	PPM	PPM	PPM	PPM	
NUMBER	0020	0020	0020	0020	0020	0020	0020	0020	0019	0020	0020	0020	0020	
N DET.	0012	0001	0001	0000	0000	0000	0001	0000	0000	0001	0008	0003	0000	
MEAN	0.111	0.702	0.719	4.458	0.798	0.297	0.414	18.559	119.71	0.501	0.253	0.393	10.150	
S. D.	0.101	0.308	0.091	2.267	0.660	0.272	0.306	5.278	31.97	0.242	0.179	0.252	3.698	
LOW	0.010	0.190	0.545	1.325	0.280	0.020	0.110	3.060	48.12	0.260	0.360	0.060	4.380	
HIGH	0.260	1.370	0.910	8.750	3.390	0.895	1.380	25.630	175.00	1.430	0.720	1.130	17.040	

OYSTER, PAC. (GIANT)				CRASSOSTREA GIGAS				189002 AREA- CALIFORNIA			SITE- F1 SHUCKED			
LENGTH WEIGHT	NUM NUM	10 10	MEAN MEAN	0.106 0.138	S. D. S. D.	0.000 0.000	LOW LOW	0.106 0.138	HIGH HIGH	0.106 0.138	COPPER ZINC NICKEL	MOLYB VANADIUM MANG	ANTIMONY TIN	
MERCURY	PPM	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	PPM	PPM	PPM	PPM	PPM	PPM	
NUMBER	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	
N DET.	0008	0002	0000	0000	0000	0001	0001	0000	0000	0002	0006	0004	0000	
MEAN	0.090	0.613	0.640	4.071	1.006	0.101	0.333	2.580	105.04	0.423	0.293	0.438	6.212	
S. D.	0.014	0.274	0.116	1.995	0.612	0.125	0.152	0.598	64.36	0.340	0.301	0.341	2.354	
LOW	0.080	0.250	0.460	0.875	0.440	0.030	0.140	1.790	50.48	0.110	0.350	0.180	2.810	
HIGH	0.100	1.130	0.860	6.535	2.610	0.430	0.650	3.750	274.38	1.110	0.720	1.090	10.000	

OYSTER, PAC. (GIANT)				CRASSOSTREA GIGAS				189002 AREA- PACIFIC NORTHWEST			SITE- H4 SHUCKED, SMALL			
LENGTH WEIGHT	NUM NUM	0 0	MEAN MEAN	0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH	0.000 0.000	COPPER ZINC NICKEL	MOLYB VANADIUM MANG	ANTIMONY TIN	
MERCURY	PPM	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	PPM	PPM	PPM	PPM	PPM	PPM	
NUMBER	0010	0010	0010	0009	0009	0010	0010	0010	0009	0010	0010	0010	0010	
N DET.	0005	0000	0000	0000	0000	0001	0000	0000	0000	0001	0002	0004	0000	
MEAN	0.050	0.701	1.584	3.379	0.816	0.435	0.252	14.372	461.30	0.398	0.261	0.304	7.233	
S. D.	0.053	0.216	0.446	1.715	0.368	0.156	0.129	2.554	302.47	0.188	0.184	0.160	0.951	
LOW	0.010	0.355	0.735	1.200	0.340	0.180	0.070	10.250	11.82	0.190	0.100	0.120	5.640	
HIGH	0.140	1.070	2.290	5.940	1.575	0.745	0.440	18.610	893.75	0.710	0.655	0.535	8.395	

OYSTER, PAC. (GIANT)				CRASSOSTREA GIGAS				189002 AREA- PACIFIC NORTHWEST			SITE- M6 SHUCKED, MEDIUM			
LENGTH WEIGHT	NUM NUM	0 0	MEAN MEAN	0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH	0.000 0.000	COPPER ZINC NICKEL	MOLYB VANADIUM MANG	ANTIMONY TIN	
MERCURY	PPM	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	PPM	PPM	PPM	PPM	PPM	PPM	
NUMBER	0009	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	
N DET.	0004	0001	0000	0000	0000	0000	0000	0000	0000	0000	0004	0002	0000	
MEAN	0.060	0.516	1.065	2.762	0.678	0.155	0.152	13.516	112.95	0.269	0.210	0.354	4.943	
S. D.	0.085	0.292	0.135	1.107	0.824	0.144	0.087	3.234	48.21	0.189	0.269	0.190	1.143	
LOW	0.010	0.250	0.765	0.400	0.110	0.060	0.065	6.755	54.10	0.130	0.060	0.160	2.815	
HIGH	0.210	1.060	1.235	4.025	2.960	0.430	0.360	17.810	175.00	0.710	0.750	0.750	6.430	

OYSTER, PAC. (GIANT)				CRASSOSTREA GIGAS				189002 AREA- PACIFIC NORTHWEST			SITE- M9 SHUCKED, MEDIUM			
LENGTH WEIGHT	NUM NUM	0 0	MEAN MEAN	0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH	0.000 0.000	COPPER ZINC NICKEL	MOLYB VANADIUM MANG	ANTIMONY TIN	
MERCURY	PPM	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	PPM	PPM	PPM	PPM	PPM	PPM	
NUMBER	0010	0010	0010	0010	0010	0010	0010	0010	0010	0009	0010	0010	0010	
N DET.	0006	0001	0000	0001	0000	0000	0001	0000	0000	0000	0006	0003	0000	
MEAN	0.028	0.444	0.703	3.412	0.800	0.177	0.254	12.206	77.44	0.294	0.325	0.389	9.235	
S. D.	0.021	0.223	0.161	2.796	0.274	0.160	0.144	2.251	22.46	0.114	0.350	0.148	3.817	
LOW	0.010	0.230	0.360	1.125	0.270	0.010	0.080	8.130	43.30	0.150	0.050	0.235	0.200	
HIGH	0.050	0.880	0.970	10.150	1.170	0.460	0.500	15.870	112.41	0.455	1.120	0.665	13.210	

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

SCALLOP, CALICO				AQUIPECTEN GIBBUS				190016 AREA- SOUTH ATLANTIC			SITE- J1		ADDUCTOR MUSCLE		
LENGTH WEIGHT	NUM NUM	0 0 MEAN MEAN	0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH	0.000 0.000						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROMIUM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0010	0009	0010	0009	0010	0010	0009	0010	0010	0010	0010	0010	0010	0010	0010
N DET.	0005	0001	0000	0000	0000	0003	0001	0000	0000	0001	0007	0005	0000	0003	0000
MEAN	0.076	0.452	3.278	7.368	0.488	0.091	0.303	0.230	11.85	0.257	0.333	0.506	0.141	0.837	0.588
S. D.	0.081	0.256	0.304	2.002	0.170	0.084	0.185	0.153	1.42	0.148	0.092	0.336	0.078	0.187	0.163
LOW	0.030	0.190	2.975	3.950	0.240	0.020	0.080	0.070	9.63	0.100	0.280	0.090	0.030	0.500	0.400
HIGH	0.220	0.880	3.860	10.600	0.750	0.260	0.630	0.620	14.63	0.570	0.440	1.000	0.290	1.040	0.810

SCALLOP, PINK				CHLAMYS HERICIUS				190028 AREA- ALASKA			SITE- L4		ADDUCTOR MUSCLE		
LENGTH WEIGHT	NUM NUM	0 0 MEAN MEAN	0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH	0.000 0.000						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROMIUM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0004	0000	0000	0000	0000	0000	0000	0000	0000	0000	0005	0005	0000	0005	0000
MEAN	0.020	0.286	0.094	2.350	0.299	0.038	0.314	0.218	8.27	0.250	0.000	0.000	0.114	0.000	0.390
S. D.	0.000	0.036	0.011	1.999	0.057	0.004	0.132	0.008	0.05	0.325	0.000	0.000	0.017	0.000	0.054
LOW	0.000	0.240	0.080	0.250	0.215	0.030	0.190	0.210	8.19	0.210	0.000	0.000	0.090	0.000	0.310
HIGH	0.020	0.330	0.110	5.000	0.355	0.040	0.500	0.230	8.31	0.270	0.000	0.000	0.130	0.000	0.440

CLAM, HARD (QUAHOG)				MERCENARIA MERCENARIA				191001 AREA- NORTH ATLANTIC			SITE- H8		SHUCKED, MIXED		
LENGTH WEIGHT	NUM NUM	0 0 MEAN MEAN	0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH	0.000 0.000						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROMIUM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0020	0019	0020	0020	0020	0019	0020	0020	0020	0020	0019	0019	0020	0020	0018
N DET.	0005	0001	0000	0000	0000	0000	0000	0000	0000	0000	0003	0001	0000	0004	0000
MEAN	0.065	1.236	0.458	6.645	0.451	0.237	0.825	5.168	27.41	1.049	3.275	0.517	17.111	1.099	0.751
S. D.	0.065	0.354	0.126	2.132	0.157	0.091	0.306	1.467	9.03	0.306	0.117	0.247	7.475	0.323	0.193
LOW	0.020	0.555	0.190	3.325	0.200	0.070	0.080	3.220	18.15	0.580	0.150	0.150	0.180	0.250	0.490
HIGH	0.260	1.940	0.680	11.250	0.800	0.430	1.655	8.460	53.21	1.695	0.630	1.130	30.000	1.440	1.090

CLAM, HARD (QUAHOG)				MERCENARIA MERCENARIA				191001 AREA- NORTH ATLANTIC			SITE- N1		SHUCKED, MIXED		
LENGTH WEIGHT	NUM NUM	0 0 MEAN MEAN	0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH	0.000 0.000						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROMIUM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0006	0006	0006	0006	0006	0006	0006	0005	0005	0006	0006	0006	0006	0006	0006
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0000	0001	0000
MEAN	0.052	1.275	0.567	5.884	1.286	0.559	0.543	5.537	48.60	1.507	0.434	0.213	50.043	1.113	0.563
S. D.	0.021	0.509	0.133	1.571	0.339	0.261	0.318	0.559	10.84	0.545	0.464	0.109	20.696	0.282	0.219
LOW	0.040	0.680	0.375	4.030	0.775	0.280	0.312	4.610	33.20	0.785	0.140	0.120	28.240	0.710	0.450
HIGH	0.095	2.148	0.715	8.125	1.685	0.860	1.120	6.090	58.93	2.213	1.310	0.350	79.105	1.440	1.060

CLAM, HARD (QUAHOG)				MERCENARIA MERCENARIA				191001 AREA- NORTH ATLANTIC			SITE- R3		SHUCKED, LITTLENEC		
LENGTH WEIGHT	NUM NUM	0 0 MEAN MEAN	0.000 0.052	S. D. S. D.	0.000 0.016	LOW LOW	0.000 0.034	HIGH HIGH	0.000 0.084						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROMIUM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0016	0016	0016	0016	0015	0016	0016	0016	0016	0016	0016	0016	0016	0016	0016
N DET.	0007	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0003	0000	0000	0000
MEAN	0.038	0.562	0.175	2.097	0.494	0.128	0.188	1.446	10.65	0.930	0.384	0.352	1.629	0.979	0.692
S. D.	0.036	0.214	0.034	0.584	0.203	0.037	0.104	0.340	4.11	0.151	0.124	0.165	0.422	0.310	0.166
LOW	0.020	0.210	0.110	1.300	0.120	0.080	0.060	0.870	0.19	0.570	0.160	0.090	1.060	0.410	0.440
HIGH	0.130	0.940	0.240	3.325	0.870	0.220	0.500	2.000	16.31	1.220	0.620	0.620	2.560	1.500	1.095

CLAM, HARD (QUAHOG)				MERCENARIA MERCENARIA				191001 AREA- NORTH ATLANTIC			SITE- R3		SHUCKED, CHERRYSTO		
LENGTH WEIGHT	NUM NUM	0 30 MEAN MEAN	0.000 0.160	S. D. S. D.	0.000 0.021	LOW LOW	0.000 0.126	HIGH HIGH	0.000 0.206						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROMIUM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0030	0030	0030	0030	0029	0030	0030	0030	0030	0029	0029	0030	0030	0030	0030
N DET.	0013	0000	0000	0000	0000	0000	0001	0000	0000	0000	0001	0013	0000	0003	0000
MEAN	0.037	0.455	0.181	2.497	0.350	0.148	0.181	1.552	12.15	1.039	0.326	0.356	1.109	0.816	0.562
S. D.	0.024	0.151	0.074	1.013	0.200	0.062	0.114	0.784	2.95	0.265	0.155	0.196	0.515	0.265	0.232
LOW	0.020	0.190	0.040	0.800	0.020	0.030	0.060	0.330	5.25	0.270	0.060	0.075	0.400	0.160	0.220
HIGH	0.100	0.830	0.410	5.300	0.920	0.300	0.500	4.040	18.69	1.390	0.765	0.765	2.380	1.440	1.310

CLAM, HARD (QUAHOG)				MERCENARIA MERCENARIA				191001 AREA- NORTH ATLANTIC			SITE- R3		SHUCKED, POWDER		
LENGTH WEIGHT	NUM NUM	0 27 MEAN MEAN	0.000 0.254	S. D. S. D.	0.000 0.041	LOW LOW	0.000 0.202	HIGH HIGH	0.000 0.378						
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROMIUM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0049	0049	0049	0049	0047	0049	0049	0049	0048	0049	0048	0049	0048	0049	0049
N DET.	0014	0000	0000	0000	0000	0000	0002	0000	0000	0000	0009	0009	0000	0017	0000
MEAN	0.050	0.638	0.239	3.340	0.476	0.254	0.245	1.429	10.72	1.062	0.266	0.387	1.682	0.726	0.541
S. D.	0.040	0.248	0.120	1.499	0.245	0.119	0.142	0.555	3.42	0.337	0.128	0.180	1.219	0.251	0.167
LOW	0.020	0.190	0.090	0.900	0.060	0.085	0.060	0.475	3.50	0.190	0.060	0.060	0.100	0.130	0.120
HIGH	0.200	1.285	0.745	7.633	1.030	0.540	0.810	3.440	26.56	1.780	0.530	0.940	5.300	1.310	0.880

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

SHRIMP, PINK (NORTHERN)				PANDALUS BOREALIS				192011		AREA- NORTH ATLANTIC			SITE- I6		TAIL, PEELED	
LENGTH WEIGHT	NUM NUM	0 LEAD	MEAN MEAN	0.000 0.006	S. D. S. D.	0.000 0.001	LOW LOW	0.000 0.005	HIGH HIGH	0.000 0.007	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	NUMBER	N DET.
0.002	0001	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
0.020	0.410	0.115	11.688	0.415	0.150	0.190	2.065	8.22	0.385	0.000	0.000	0.495	0.130	0.735		
0.000	0.042	0.035	5.745	0.219	0.014	0.000	0.262	1.02	0.007	0.000	0.000	0.092	0.000	0.502		
0.000	0.380	0.090	7.625	0.260	0.140	0.190	1.880	7.50	0.380	0.000	0.000	0.430	0.000	0.380		
0.020	0.440	0.140	15.750	0.570	0.160	0.190	2.250	8.94	0.390	0.000	0.000	0.560	0.130	1.390		

SHRIMP, PINK (NORTHERN)				PANDALUS BOREALIS				192011		AREA- NORTH ATLANTIC			SITE- J1		TAIL, PEELED	
LENGTH WEIGHT	NUM NUM	0 LEAD	MEAN MEAN	0.000 0.004	S. D. S. D.	0.000 0.001	LOW LOW	0.000 0.003	HIGH HIGH	0.000 0.006	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	NUMBER	N DET.
0.011	0007	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011
0.048	0.590	0.117	9.785	0.475	0.135	0.312	2.816	11.16	0.402	0.160	0.285	0.395	0.407	0.876		
0.026	0.296	0.028	3.144	0.128	0.036	0.218	1.562	3.61	0.106	0.000	0.134	0.116	0.541	0.112		
0.020	0.250	0.090	6.350	0.300	0.090	0.060	1.440	8.50	0.210	0.160	0.190	0.225	0.060	0.690		
0.070	1.250	0.180	15.225	0.730	0.190	0.750	5.630	21.25	0.560	0.160	0.380	0.620	1.030	1.060		

SHRIMP, PINK (NORTHERN)				PANDALUS BOREALIS				192011		AREA- NORTH ATLANTIC			SITE- J2		TAIL, PEELED	
LENGTH WEIGHT	NUM NUM	0 LEAD	MEAN MEAN	0.000 0.007	S. D. S. D.	0.000 0.001	LOW LOW	0.000 0.006	HIGH HIGH	0.000 0.008	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	NUMBER	N DET.
0.003	0001	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003
0.055	0.500	0.097	17.911	0.547	0.087	0.158	2.025	9.07	0.258	0.000	0.190	0.298	0.000	0.617		
0.049	0.167	0.010	2.816	0.185	0.034	0.081	0.459	0.42	0.035	0.000	0.000	0.014	0.000	0.048		
0.020	0.310	0.085	14.666	0.425	0.060	0.095	1.505	8.69	0.225	0.000	0.000	0.290	0.000	0.565		
0.090	0.625	0.105	19.716	0.760	0.125	0.250	2.375	9.53	0.295	0.000	0.190	0.315	0.000	0.660		

SHRIMP, PINK (NORTHERN)				PANDALUS BOREALIS				192011		AREA- NORTH ATLANTIC			SITE- J7		TAIL, PEELED	
LENGTH WEIGHT	NUM NUM	0 LEAD	MEAN MEAN	0.000 0.007	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.007	HIGH HIGH	0.000 0.007	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	NUMBER	N DET.
0.000	0000	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
0.020	0.456	0.116	19.300	0.546	0.106	0.140	2.650	10.89	0.296	0.000	0.175	0.430	0.000	0.710		
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
0.020	0.456	0.116	19.300	0.546	0.106	0.140	2.650	10.89	0.296	0.000	0.175	0.430	0.000	0.710		

SHRIMP, PINK (NORTHERN)				PANDALUS BOREALIS				192011		AREA- NORTH ATLANTIC			SITE- K1		TAIL, PEELED	
LENGTH WEIGHT	NUM NUM	0 LEAD	MEAN MEAN	0.000 0.007	S. D. S. D.	0.000 0.001	LOW LOW	0.000 0.007	HIGH HIGH	0.000 0.008	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	NUMBER	N DET.
0.003	0000	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003
0.027	0.420	0.123	13.467	0.490	0.063	0.130	1.940	11.73	0.317	0.000	0.000	0.267	0.000	0.717		
0.012	0.193	0.012	4.767	0.052	0.015	0.000	0.947	1.49	0.170	0.000	0.000	0.038	0.000	0.143		
0.020	0.250	0.110	8.950	0.460	0.050	0.000	0.860	10.50	0.140	0.000	0.000	0.240	0.000	0.560		
0.040	0.630	0.130	18.450	0.550	0.080	0.130	2.630	13.38	0.480	0.000	0.000	0.310	0.000	0.840		

SHRIMP, PINK (NORTHERN)				PANDALUS BOREALIS				192011		AREA- ALASKA			SITE- K3		TAIL, PEELED	
LENGTH WEIGHT	NUM NUM	0 LEAD	MEAN MEAN	0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH	0.000 0.000	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	NUMBER	N DET.
0.010	0009	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010
0.050	0.550	0.100	3.233	0.256	0.084	0.128	2.431	10.71	0.283	0.085	0.240	0.313	0.790	0.695		
0.000	0.193	0.019	1.395	0.131	0.017	0.059	0.741	2.27	0.089	0.350	0.087	0.074	0.199	0.156		
0.000	0.310	0.080	1.000	0.080	0.060	0.060	1.630	9.13	0.140	0.060	0.190	0.170	0.410	0.500		
0.050	0.880	0.130	5.650	0.570	0.115	0.210	4.310	16.88	0.410	0.160	0.340	0.430	1.075	0.880		

SHRIMP, PINK (NORTHERN)				PANDALUS BOREALIS				192011		AREA- ALASKA			SITE- O7		TAIL, PEELED	
LENGTH WEIGHT	NUM NUM	0 LEAD	MEAN MEAN	0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH	0.000 0.000	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM	NUMBER	N DET.
0.009	0005	0010	0010	0010	0010	0010	0009	0010	0010	0010	0010	0010	0010	0009	0009	0009
0.063	0.892	0.197	8.887	0.464	0.148	0.142	4.294	12.40	0.376	0.160	0.250	0.462	1.060	0.667		
0.033	0.421	0.047	4.559	0.153	0.039	0.042	0.960	1.18	0.146	0.030	0.131	0.068	0.299	0.105		
0.040	0.500	0.110	4.500	0.260	0.060	0.060	3.630	11.00	0.220	0.130	0.090	0.350	0.720	0.500		
0.110	1.630	0.265	17.600	0.750	0.200	0.190	6.880	15.00	0.580	0.190	0.410	0.590	1.630	0.810		

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
 IN RESOURCE SURVEY SPECIES;
 BY TISSUE AND LOCATION

LOCATION LEVEL 5

SHRIMP, ALASKA (SIDESTRIPE)				PANDALOPSIS DISPAR				192012 AREA- ALASKA			SITE- L4			TAIL, PEELED	
LENGTH WEIGHT	NUM NUM	0 MEAN	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007
N DET.	0004	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0005	0004	0000	0000
MEAN	0.168	0.734	0.146	4.197	0.261	0.066	0.185	4.403	13.68	0.309	0.155	0.252	0.381	0.942	0.729
S. D.	0.123	0.386	0.061	2.085	0.134	0.018	0.083	1.962	3.75	0.162	0.035	0.082	0.042	0.253	0.240
LOW	0.050	0.440	0.080	2.350	0.155	0.045	0.095	2.360	9.69	0.130	0.130	0.190	0.330	0.705	0.380
HIGH	0.295	1.560	0.230	8.375	0.550	0.100	0.310	8.250	20.87	0.580	0.180	0.345	0.440	1.380	1.130

SHRIMP, ALASKA (SIDESTRIPE)				PANDALOPSIS DISPAR				192012 AREA- ALASKA			SITE- N6			TAIL, PEELED	
LENGTH WEIGHT	NUM NUM	0 MEAN	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0010	0010	0010	0010	0010	0010	0010	0010	0009	0010	0010	0010	0010	0010	0010
N DET.	0007	0000	0000	0000	0000	0000	0001	0000	0000	0000	0009	0005	0000	0000	0000
MEAN	0.040	0.651	0.085	4.711	0.340	0.079	0.158	5.627	13.48	0.227	0.220	0.524	0.326	0.822	1.054
S. D.	0.020	0.224	0.042	1.366	0.152	0.035	0.036	1.681	2.13	0.054	0.000	0.584	0.061	0.291	0.301
LOW	0.020	0.440	0.035	2.778	0.150	0.040	0.110	4.250	8.75	0.140	0.000	0.130	0.230	0.380	0.500
HIGH	0.060	1.130	0.190	6.500	0.580	0.160	0.220	9.130	15.94	0.305	0.220	1.560	0.430	1.310	1.500

LOBSTER, SPINY (ATL.)				PANULIRUS ARGUS				194002 AREA- SJUTH ATLANTIC			SITE- M4			TAIL MEAT	
LENGTH WEIGHT	NUM NUM	0 MEAN	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0010	0010	0010	0009	0009	0010	0010	0010	0010	0010	0010	0010	0010	0009	0010
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0010	0008	0000	0000	0000
MEAN	0.190	0.599	0.093	13.991	0.235	0.034	0.170	3.854	22.02	0.253	0.000	0.375	0.132	0.863	0.516
S. D.	0.067	0.203	0.022	5.487	0.125	0.010	0.103	1.732	3.34	0.088	0.000	0.262	0.026	0.275	0.151
LOW	0.120	0.380	0.060	5.550	0.050	0.010	0.060	0.030	17.00	0.110	0.000	0.190	0.095	0.500	0.345
HIGH	0.340	0.940	0.135	22.250	0.420	0.045	0.380	6.810	27.50	0.440	0.000	0.560	0.180	1.220	0.880

LOBSTER, SPINY (ATL.)				PANULIRUS ARGUS				194002 AREA- SOUTH ATLANTIC			SITE- N1			TAIL MEAT	
LENGTH WEIGHT	NUM NUM	0 MEAN	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0010	0010	0010	0010	0009	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010
N DET.	0001	0000	0001	0000	0000	0003	0001	0000	0000	0000	0003	0004	0000	0001	0000
MEAN	0.061	0.597	0.058	17.188	0.294	0.054	0.195	3.919	26.30	0.328	0.446	0.314	0.154	1.050	0.697
S. D.	0.052	0.300	0.022	7.489	0.157	0.018	0.119	2.257	22.34	0.151	0.336	0.305	0.076	0.366	0.290
LOW	0.020	0.300	0.035	4.190	0.140	0.030	0.080	0.520	4.69	0.140	0.060	0.060	0.040	0.300	0.450
HIGH	0.170	1.310	0.090	31.200	0.515	0.080	0.410	7.570	81.25	0.540	0.870	0.870	0.275	1.685	1.390

LOBSTER, SPINY (ATL.)				PANULIRUS ARGUS				194002 AREA- GJLF			SITE- L9			TAIL MEAT	
LENGTH WEIGHT	NUM NUM	0 MEAN	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0008	0008	0007	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0007
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0005	0000	0000	0000
MEAN	0.084	0.782	0.139	19.170	0.354	0.069	0.141	3.727	14.61	0.298	0.198	0.455	0.176	1.031	0.726
S. D.	0.036	0.369	0.065	7.130	0.291	0.015	0.063	1.225	2.28	0.051	0.118	0.183	0.030	0.381	0.211
LOW	0.030	0.440	0.095	7.750	0.150	0.060	0.080	1.880	11.19	0.220	0.060	0.265	0.130	0.630	0.380
HIGH	0.150	1.500	0.280	26.575	1.020	0.100	0.250	5.620	17.25	0.380	0.370	0.630	0.220	1.750	1.050

LOBSTER, SPINY (ATL.)				PANULIRUS ARGUS				194002 AREA- GJLF			SITE- R6			TAIL MEAT	
LENGTH WEIGHT	NUM NUM	0 MEAN	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0012	0012	0012	0012	0012	0012	0012	0012	0010	0012	0012	0012	0012	0012	0012
N DET.	0003	0000	0001	0000	0001	0005	0001	0000	0000	0001	0008	0007	0000	0001	0000
MEAN	0.055	0.598	0.057	17.520	0.230	0.069	0.200	3.753	20.08	0.353	0.455	0.552	0.205	1.085	0.797
S. D.	0.052	0.426	0.032	12.985	0.174	0.031	0.133	1.576	3.69	0.232	0.575	0.377	0.123	0.354	0.316
LOW	0.025	0.120	0.011	7.130	0.030	0.030	0.085	0.180	12.50	0.140	0.100	0.120	0.040	0.500	0.380
HIGH	0.190	1.500	0.130	55.070	0.590	0.130	0.500	5.500	24.53	0.590	1.310	0.940	0.460	1.630	1.500

LOBSTER, SPINY (PAC.)				PANULIRUS INTERRUPTUS				194003 AREA- CALIFORNIA			SITE- K3			TAIL MEAT	
LENGTH WEIGHT	NUM NUM	5 MEAN	5 MEAN	0.085	S. D.	0.001	LOW	0.084	HIGH	0.086					
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0005	0005	0005	0004	0004	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0003	0000	0000	0000
MEAN	0.064	0.547	0.245	25.356	0.336	0.091	0.129	9.819	16.54	0.335	0.194	0.365	0.234	0.974	1.163
S. D.	0.017	0.072	0.135	7.155	0.146	0.021	0.056	2.215	7.58	0.069	0.182	0.361	0.039	0.430	0.339
LOW	0.050	0.480	0.150	19.390	0.215	0.060	0.070	6.535	3.75	0.270	0.060	0.110	0.180	0.310	0.655
HIGH	0.090	0.630	0.480	35.700	0.540	0.120	0.215	11.880	23.28	0.440	0.440	0.620	0.290	1.370	1.500

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES:
BY TISSUE AND LOCATION

LOCATION LEVEL 5

LOBSTER, NORTHERN (AMERICAN)				HOMARUS AMERICANUS				194012 AREA- NORTH ATLANTIC			SITE- E9			CLAW & TAIL MEAT		
LENGTH WEIGHT	NUM NUM	1 2	MEAN	0.415 1.575	S. D. S. D.	0.000 1.104	LOW LOW	0.415 0.794	HIGH HIGH	0.415 2.355	VANADIUM		MANG	ANTIMONY	TIN	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB					
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0002	0000	0000	0000
MEAN	0.115	0.495	0.200	31.650	0.765	0.495	0.185	16.560	34.53	0.305	0.120	0.000	0.870	0.690	0.640	0.640
S. D.	0.035	0.007	0.127	7.460	0.092	0.007	0.177	0.438	2.43	0.078	0.000	0.000	0.198	0.354	0.198	0.198
LOW	0.090	0.490	0.110	26.375	0.700	0.490	0.060	16.250	32.81	0.250	0.000	0.000	0.730	0.440	0.500	0.500
HIGH	0.140	0.500	0.290	36.925	0.830	0.500	0.310	16.870	36.25	0.360	0.120	0.000	1.010	0.940	0.780	0.780

LOBSTER, NORTHERN (AMERICAN)				HOMARUS AMERICANUS				194012 AREA- NORTH ATLANTIC			SITE- I9			CLAW & TAIL MEAT		
LENGTH WEIGHT	NUM NUM	2 2	MEAN	0.273 0.745	S. D. S. D.	0.081 0.552	LOW LOW	0.215 0.354	HIGH HIGH	0.330 1.135	VANADIUM		MANG	ANTIMONY	TIN	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB					
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0002	0000	0000	0000	0000
MEAN	0.175	0.560	0.245	15.019	0.838	0.318	0.108	13.220	42.03	0.385	0.180	0.000	0.295	1.010	0.880	0.880
S. D.	0.148	0.059	0.134	8.052	0.074	0.046	0.018	1.018	1.10	0.335	0.000	0.000	0.148	0.099	0.255	0.255
LOW	0.070	0.490	0.150	9.325	0.786	0.285	0.095	12.500	41.25	0.360	0.000	0.000	0.190	0.940	0.700	0.700
HIGH	0.280	0.630	0.340	20.712	0.890	0.350	0.120	13.940	42.81	0.410	0.180	0.000	0.400	1.080	1.060	1.060

LOBSTER, NORTHERN (AMERICAN)				HOMARUS AMERICANUS				194012 AREA- NORTH ATLANTIC			SITE- J3			CLAW & TAIL MEAT		
LENGTH WEIGHT	NUM NUM	8 7	MEAN	0.260 1.107	S. D. S. D.	0.025 0.338	LOW LOW	0.225 0.880	HIGH HIGH	0.310 1.844	VANADIUM		MANG	ANTIMONY	TIN	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB					
NUMBER	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0004	0000	0001	0000	0000
MEAN	0.205	0.531	0.297	19.422	0.878	0.432	0.235	13.426	24.95	0.414	0.132	0.313	0.783	0.884	0.566	0.566
S. D.	0.142	0.190	0.143	11.567	0.229	0.160	0.195	2.976	7.50	0.125	0.061	0.279	0.477	0.167	0.260	0.260
LOW	0.075	0.330	0.160	8.800	0.630	0.250	0.076	9.715	11.31	0.265	0.000	0.060	0.440	0.560	0.390	0.390
HIGH	0.440	0.880	0.570	43.050	1.315	0.680	0.690	18.630	35.65	0.680	0.250	0.690	1.860	1.120	1.120	1.120

LOBSTER, NORTHERN (AMERICAN)				HOMARUS AMERICANUS				194012 AREA- NORTH ATLANTIC			SITE- J5			CLAW & TAIL MEAT		
LENGTH WEIGHT	NUM NUM	7 7	MEAN	0.323 1.072	S. D. S. D.	0.023 0.239	LOW LOW	0.305 0.823	HIGH HIGH	0.350 1.476	VANADIUM		MANG	ANTIMONY	TIN	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB					
NUMBER	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0003	0002	0000	0000	0000	0000
MEAN	0.219	0.571	0.229	14.331	1.253	0.406	0.144	18.649	31.28	0.386	0.075	0.376	1.007	0.798	0.674	0.674
S. D.	0.128	0.129	0.208	24.246	0.241	0.164	0.031	5.062	3.82	0.078	0.030	0.190	0.383	0.188	0.089	0.089
LOW	0.100	0.380	0.105	17.790	0.976	0.230	0.120	12.625	28.12	0.300	0.060	0.220	0.620	0.560	0.590	0.590
HIGH	0.460	0.750	0.695	82.783	1.650	0.630	0.190	25.630	38.44	0.515	0.120	0.630	1.810	1.130	0.815	0.815

LOBSTER, NORTHERN (AMERICAN)				HOMARUS AMERICANUS				194012 AREA- NORTH ATLANTIC			SITE- J6			CLAW & TAIL MEAT		
LENGTH WEIGHT	NUM NUM	19 18	MEAN	0.303 1.302	S. D. S. D.	0.059 0.599	LOW LOW	0.197 0.262	HIGH HIGH	0.402 2.951	VANADIUM		MANG	ANTIMONY	TIN	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB					
NUMBER	0019	0019	0019	0019	0015	0019	0018	0019	0018	0019	0019	0019	0018	0019	0018	0018
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0009	0005	0000	0002	0000	0000
MEAN	0.185	0.560	0.196	24.431	1.014	0.523	0.227	17.868	31.52	0.362	0.153	0.322	0.682	1.019	0.756	0.756
S. D.	0.089	0.164	0.091	12.335	0.388	0.181	0.134	6.297	38.91	0.096	0.103	0.228	0.356	0.364	0.206	0.206
LOW	0.050	0.190	0.070	4.000	0.570	0.240	0.060	10.620	12.50	0.235	0.060	0.060	0.140	0.440	0.425	0.425
HIGH	0.400	0.875	0.350	48.000	1.895	0.890	0.630	29.560	180.49	0.640	0.410	0.880	1.485	1.810	1.130	1.130

LOBSTER, NORTHERN (AMERICAN)				HOMARUS AMERICANUS				194012 AREA- NORTH ATLANTIC			SITE- J9			CLAW & TAIL MEAT		
LENGTH WEIGHT	NUM NUM	7 7	MEAN	0.404 2.506	S. D. S. D.	0.113 1.694	LOW LOW	0.301 0.891	HIGH HIGH	0.575 5.022	VANADIUM		MANG	ANTIMONY	TIN	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB					
NUMBER	0008	0008	0007	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0004	0007	0000	0000	0000	0000
MEAN	0.263	0.509	0.143	27.096	0.563	0.479	0.148	15.500	20.68	0.348	0.110	0.110	0.426	0.891	0.612	0.612
S. D.	0.187	0.314	0.079	14.997	0.213	0.268	0.046	7.424	6.38	0.100	0.093	0.000	0.206	0.300	0.172	0.172
LOW	0.085	0.190	0.040	10.650	0.060	0.130	0.085	5.750	13.75	0.260	0.060	0.000	0.250	0.410	0.380	0.380
HIGH	0.590	1.180	0.280	51.247	0.840	0.925	0.220	24.375	31.56	0.530	0.250	0.110	0.850	1.405	0.905	0.905

LOBSTER, NORTHERN (AMERICAN)				HOMARUS AMERICANUS				194012 AREA- NORTH ATLANTIC			SITE- K3			CLAW & TAIL MEAT		
LENGTH WEIGHT	NUM NUM	1 1	MEAN	0.445 2.923	S. D. S. D.	0.000 0.000	LOW LOW	0.445 2.923	HIGH HIGH	0.445 2.923	VANADIUM		MANG	ANTIMONY	TIN	
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB					
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0001	0000	0000	0000
MEAN	0.445	0.560	0.180	41.633	1.000	0.620	0.125	16.690	30.62	0.320	0.130	0.000	1.425	0.740	0.580	0.580
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.445	0.560	0.180	41.633	1.000	0.620	0.125	16.690	30.62	0.320	0.130	0.000	1.425	0.740	0.580	0.580

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

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LOCATION LEVEL 5

LOBSTER, NORTHERN (AMERICAN)			HOMARUS AMERICANUS				194012 AREA- NJRTH ATLANTIC			SITE- K5			CLAW & TAIL MEAT	
LENGTH WEIGHT	NUM NUM	7 6	MEAN MEAN	0.365 1.426	S. D. S. D.	0.023 0.350	LOW LOW	0.302 0.794	HIGH HIGH	0.370 1.731	VANADIUM MOLYB	MANG PPM	ANTIMONY PPM	TIN PPM
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM				
NUMBER	0007	0007	0007	0007	0007	0007	0007	0006	0006	0007	0007	0007	0007	0007
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0004	0006	0000	0000
MEAN	0.240	0.629	0.203	31.101	0.631	0.493	0.201	15.275	70.63	0.379	0.207	0.940	0.519	0.854
S. D.	0.129	0.318	0.110	13.905	0.239	0.179	0.236	6.101	64.38	0.124	0.177	0.000	0.166	0.424
LOW	0.130	0.300	0.090	15.930	0.300	0.240	0.060	9.065	28.12	0.290	0.090	0.000	0.260	0.370
HIGH	0.470	1.250	0.430	57.600	1.000	0.780	0.720	26.965	183.45	0.640	0.410	0.940	0.670	0.780

LOBSTER, NORTHERN (AMERICAN)			HOMARUS AMERICANUS				194012 AREA- NJRTH ATLANTIC			SITE- O1			CLAW & TAIL MEAT	
LENGTH WEIGHT	NUM NUM	1 1	MEAN MEAN	0.232 0.577	S. D. S. D.	0.000 0.000	LOW LOW	0.232 0.577	HIGH HIGH	0.232 0.577	VANADIUM MOLYB	MANG PPM	ANTIMONY PPM	TIN PPM
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM				
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000
MEAN	0.325	0.655	0.230	4.400	0.863	0.190	0.135	14.655	17.50	0.300	0.000	0.605	0.505	1.000
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.325	0.655	0.230	4.400	0.863	0.190	0.135	14.655	17.50	0.300	0.000	0.605	0.505	1.000

LOBSTER, NORTHERN (AMERICAN)			HOMARUS AMERICANUS				194012 AREA- NJRTH ATLANTIC			SITE- O3			CLAW & TAIL MEAT	
LENGTH WEIGHT	NUM NUM	5 2	MEAN MEAN	0.220 0.702	S. D. S. D.	0.046 0.652	LOW LOW	0.166 0.241	HIGH HIGH	0.290 1.163	VANADIUM MOLYB	MANG PPM	ANTIMONY PPM	TIN PPM
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM				
NUMBER	0005	0005	0004	0004	0004	0005	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0002	0000	0000
MEAN	0.115	0.522	0.164	9.684	1.288	0.423	0.208	16.320	19.27	0.357	0.293	0.250	0.569	0.697
S. D.	0.031	0.184	0.050	5.063	0.384	0.074	0.157	7.801	7.11	0.084	0.261	0.060	0.169	0.339
LOW	0.070	0.310	0.090	3.800	0.820	0.360	0.060	7.310	10.00	0.250	0.100	0.190	0.385	0.310
HIGH	0.150	0.750	0.195	16.050	1.750	0.510	0.416	28.130	28.31	0.460	0.590	0.310	0.810	0.750

LOBSTER, NORTHERN (AMERICAN)			HOMARUS AMERICANUS				194012 AREA- NJRTH ATLANTIC			SITE- P1			CLAW & TAIL MEAT	
LENGTH WEIGHT	NUM NUM	4 3	MEAN MEAN	0.274 1.343	S. D. S. D.	0.054 0.399	LOW LOW	0.199 0.964	HIGH HIGH	0.320 1.759	VANADIUM MOLYB	MANG PPM	ANTIMONY PPM	TIN PPM
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM				
NUMBER	0006	0006	0006	0006	0005	0006	0006	0006	0006	0006	0006	0006	0006	0006
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0003	0000	0000
MEAN	0.193	0.553	0.230	11.435	0.702	0.427	0.219	20.319	22.09	0.267	0.215	0.325	0.373	0.900
S. D.	0.064	0.154	0.108	3.222	0.209	0.152	0.110	5.653	2.31	0.083	0.118	0.110	0.131	0.186
LOW	0.120	0.440	0.105	7.575	0.390	0.195	0.070	11.065	19.32	0.150	0.100	0.220	0.145	0.625
HIGH	0.275	0.845	0.365	16.250	0.895	0.615	0.380	28.190	25.94	0.360	0.380	0.440	0.540	0.925

LOBSTER, NORTHERN (AMERICAN)			HOMARUS AMERICANUS				194012 AREA- NJRTH ATLANTIC			SITE- P2			CLAW & TAIL MEAT	
LENGTH WEIGHT	NUM NUM	3 3	MEAN MEAN	0.357 2.202	S. D. S. D.	0.091 1.635	LOW LOW	0.290 1.158	HIGH HIGH	0.460 4.086	VANADIUM MOLYB	MANG PPM	ANTIMONY PPM	TIN PPM
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM				
NUMBER	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0002	0000	0000
MEAN	0.243	0.367	0.200	14.888	0.723	0.468	0.237	19.252	21.33	0.292	0.090	0.220	0.457	0.972
S. D.	0.055	0.154	0.187	9.246	0.216	0.338	0.081	3.293	6.05	0.099	0.000	0.000	0.265	0.222
LOW	0.190	0.190	0.050	5.300	0.570	0.120	0.190	15.690	17.50	0.180	0.000	0.000	0.200	0.810
HIGH	0.300	0.470	0.410	23.750	0.970	0.795	0.330	22.185	28.31	0.370	0.090	0.220	0.730	0.690

LOBSTER, NORTHERN (AMERICAN)			HOMARUS AMERICANUS				194012 AREA- NORTH ATLANTIC			SITE- P3			CLAW & TAIL MEAT	
LENGTH WEIGHT	NUM NUM	3 3	MEAN MEAN	0.337 1.447	S. D. S. D.	0.054 0.344	LOW LOW	0.275 1.050	HIGH HIGH	0.373 1.646	VANADIUM MOLYB	MANG PPM	ANTIMONY PPM	TIN PPM
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM				
NUMBER	0003	0003	0003	0003	0002	0003	0003	0003	0003	0003	0003	0003	0003	0003
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0000	0000	0000
MEAN	0.167	0.690	0.143	13.789	0.765	0.483	0.250	24.240	28.65	0.325	0.440	0.430	0.420	0.877
S. D.	0.035	0.190	0.031	4.355	0.304	0.338	0.060	8.472	8.02	0.079	0.000	0.180	0.040	0.085
LOW	0.130	0.500	0.110	10.600	0.550	0.440	0.190	17.500	21.98	0.255	0.000	0.280	0.380	0.780
HIGH	0.200	0.880	0.170	18.750	0.980	0.510	0.310	33.750	37.50	0.410	0.440	0.630	0.460	0.940

LOBSTER, NORTHERN (AMERICAN)			HOMARUS AMERICANUS				194012 AREA- NJRTH ATLANTIC			SITE- P6			LFG MEAT	
LENGTH WEIGHT	NUM NUM	2 2	MEAN MEAN	0.773 6.719	S. D. S. D.	0.039 1.284	LOW LOW	0.745 5.811	HIGH HIGH	0.830 7.627	VANADIUM MOLYB	MANG PPM	ANTIMONY PPM	TIN PPM
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM				
NUMBER	0002	0002	0002	0001	0001	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0001	0000	0000
MEAN	0.548	0.908	0.120	20.545	0.615	0.898	0.155	19.328	47.43	0.505	0.160	0.190	0.435	0.815
S. D.	0.159	0.039	0.029	0.000	0.000	0.173	0.049	11.558	0.77	0.378	0.000	0.000	0.064	0.000
LOW	0.435	0.880	0.100	0.000	0.000	0.775	0.120	11.155	46.88	0.450	0.000	0.000	0.390	0.630
HIGH	0.660	0.935	0.140	20.545	0.615	1.020	0.190	27.500	47.97	0.560	0.160	0.190	0.480	1.000

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

CRAB, BLUE				CALLINECTES SAPIDUS				196001 AREA- SOUTH ATLANTIC				SITE- F3		BODY MEAT	
LENGTH WEIGHT	NUM NUM	0 MEAN 0 MEAN		0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH		0.000 0.000				
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0036	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000
MEAN	0.413	0.793	0.135	3.581	0.617	0.253	0.123	11.834	30.81	0.369	0.261	0.458	2.008	1.318	0.529
S. D.	0.122	0.260	0.017	1.178	0.164	0.106	0.035	3.748	8.28	0.054	0.069	0.203	0.517	0.228	0.310
LOW	0.280	0.470	0.115	2.200	0.385	0.145	0.063	8.565	21.12	0.275	0.190	0.190	1.375	1.125	0.390
HIGH	0.610	1.095	0.155	5.750	0.800	0.435	0.160	19.155	42.97	0.415	0.345	0.750	2.890	1.625	1.315

CRAB, BLUE				CALLINECTES SAPIDUS				196001 AREA- SOUTH ATLANTIC				SITE- F3		CLAW MEAT	
LENGTH WEIGHT	NUM NUM	0 MEAN 0 MEAN		0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH		0.000 0.000				
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0000	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000
MEAN	0.500	0.880	0.080	3.625	0.890	0.080	0.730	13.130	0.00	0.570	0.000	0.170	1.430	0.810	0.630
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.500	0.880	0.080	3.625	0.890	0.080	0.730	13.130	0.00	0.570	0.000	0.170	1.430	0.810	0.630

CRAB, BLUE				CALLINECTES SAPIDUS				196001 AREA- SOUTH ATLANTIC				SITE- F3		CLAW & BODY MEAT	
LENGTH WEIGHT	NUM NUM	0 MEAN 0 MEAN		0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH		0.000 0.000				
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0002	0002	0002	0002	0001	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0002	0000	0000	0000
MEAN	0.210	1.095	0.115	4.194	0.290	0.215	0.345	8.905	28.41	0.360	0.060	0.000	1.140	1.250	0.780
S. D.	0.141	0.304	0.021	1.193	0.000	0.106	0.403	2.425	2.16	0.028	0.000	0.000	1.032	0.269	0.042
LOW	0.110	0.880	0.010	3.350	0.000	0.140	0.060	7.190	26.88	0.340	0.000	0.000	0.410	1.060	0.750
HIGH	0.310	1.310	0.130	5.037	0.290	0.290	0.630	10.620	29.94	0.380	0.060	0.000	1.870	1.440	0.810

CRAB, BLUE				CALLINECTES SAPIDUS				196001 AREA- GULF				SITE- B7		BODY MEAT	
LENGTH WEIGHT	NUM NUM	0 MEAN 0 MEAN		0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH		0.000 0.000				
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0002
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0003	0002	0000	0000	0000
MEAN	0.053	0.877	0.103	1.795	0.477	0.120	0.347	4.143	54.06	0.397	0.000	0.220	1.173	0.990	0.905
S. D.	0.025	0.329	0.012	0.474	0.133	0.036	0.345	1.956	54.16	0.156	0.000	0.000	0.391	0.180	0.219
LOW	0.030	0.630	0.090	1.450	0.400	0.090	0.060	2.060	13.75	0.230	0.000	0.000	0.750	0.840	0.750
HIGH	0.080	1.250	0.110	2.335	0.630	0.160	0.730	5.940	115.62	0.540	0.000	0.220	1.520	1.190	1.060

CRAB, BLUE				CALLINECTES SAPIDUS				196001 AREA- GULF				SITE- B8		BODY MEAT	
LENGTH WEIGHT	NUM NUM	0 MEAN 0 MEAN		0.000 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.000 0.000	HIGH HIGH		0.000 0.000				
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0006	0007	0006	0007	0006	0007	0007	0007	0007	0007	0007	0007	0007	0007	0007
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0004	0000	0001	0000
MEAN	0.040	0.649	0.098	1.478	0.554	0.116	0.470	4.680	68.79	0.339	0.288	0.217	1.823	0.943	0.897
S. D.	0.028	0.287	0.022	0.632	0.341	0.054	0.440	1.025	49.20	0.067	0.255	0.085	0.602	0.283	0.242
LOW	0.020	0.370	0.070	0.700	0.040	0.020	0.120	3.010	30.62	0.240	0.090	0.120	0.930	0.720	0.620
HIGH	0.090	1.250	0.130	2.625	0.920	0.180	1.250	5.940	160.62	0.440	0.720	0.280	2.810	1.500	1.310

CRAB, BLUE				CALLINECTES SAPIDUS				196001 AREA- GULF				SITE- B8		CLAW MEAT	
LENGTH WEIGHT	NUM NUM	1 MEAN 0 MEAN		0.148 0.000	S. D. S. D.	0.000 0.000	LOW LOW	0.148 0.000	HIGH HIGH		0.148 0.000				
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0001	0000	0001	0000
MEAN	0.135	0.565	0.085	2.856	0.475	0.305	0.163	6.035	51.25	0.450	0.000	0.000	2.335	0.000	0.520
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.135	0.565	0.085	2.856	0.475	0.305	0.160	6.035	51.25	0.450	0.000	0.000	2.335	0.000	0.520

CRAB, BLUE				CALLINECTES SAPIDUS				196001 AREA- GULF				SITE- B8		CLAW & BODY MEAT	
LENGTH WEIGHT	NUM NUM	6 MEAN 0 MEAN		0.154 0.000	S. D. S. D.	0.007 0.000	LOW LOW	0.148 0.000	HIGH HIGH		0.166 0.000				
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006	0006
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0005	0005	0000	0006	0000
MEAN	0.078	0.555	0.096	2.578	0.539	0.167	0.223	3.690	35.92	0.401	0.000	0.130	3.369	0.000	0.709
S. D.	0.046	0.148	0.023	1.708	0.079	0.072	0.085	1.943	8.91	0.044	0.000	0.000	1.256	0.000	0.142
LOW	0.040	0.380	0.070	1.083	0.410	0.090	0.090	0.380	21.88	0.320	0.000	0.000	1.590	0.000	0.470
HIGH	0.150	0.750	0.125	5.537	0.620	0.290	0.315	5.880	46.88	0.440	0.130	0.130	5.000	0.000	0.845

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

REPORT MF17

LOCATION LEVEL 5

CRAB, BLUE				CALLINECTES SAPIDUS					196001 AREA- GULF			SITE- E5				BODY MEAT		
LENGTH WEIGHT	NUM	10	MEAN	0.150	S. D.	0.005	LOW	0.143	HIGH	0.157	MOLYB	VANADIUM	MANG	ANTIMONY	TIN			
	NUM	10	MEAN	0.174	S. D.	0.016	LOW	0.146	HIGH	0.190								
MERCURY	LEAD			CADMIUM			ARSENIC			SELENIUM			SILVER			CHROM		
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	
NUMBER	0010	0010	0009	0010	0008	0010	0010	0010	0010	0010	0010	0010	0010	0010	0009			
N DET.	0300	0000	0000	0000	0000	0000	0000	0000	0000	0000	0305	0006	0000	0001	0000			
MEAN	0.201	0.557	0.083	5.311	0.943	0.134	0.195	4.521	22.74	0.372	0.168	0.343	0.300	0.867	0.704			
S. D.	0.053	0.166	0.017	2.815	0.578	0.041	0.053	1.877	5.04	0.219	0.108	0.081	0.068	0.275	0.169			
LOW	0.150	0.250	0.050	3.000	0.370	0.070	0.120	1.425	12.50	0.040	0.060	0.250	0.220	0.560	0.470			
HIGH	0.330	0.810	0.105	12.140	1.900	0.200	0.260	7.440	29.25	0.740	0.310	0.440	0.440	1.440	1.000			

CRAB, BLUE				CALLINECTES SAPIDUS					196001 AREA- GULF			SITE- E5				CLAW & BODY MEAT		
LENGTH WEIGHT	NUM	10	MEAN	0.138	S. D.	0.005	LOW	0.133	HIGH	0.149	MOLYB	VANADIUM	MANG	ANTIMONY	TIN			
	NUM	10	MEAN	0.151	S. D.	0.017	LOW	0.134	HIGH	0.190								
MERCURY	LEAD			CADMIUM			ARSENIC			SELENIUM			SILVER			CHROM		
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM		
NUMBER	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010			
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0005	0002	0000	0008	0000			
MEAN	0.266	0.709	0.105	6.893	0.780	0.158	0.235	4.624	30.08	0.452	0.166	0.249	0.863	0.345	0.729			
S. D.	0.075	0.210	0.022	1.950	0.195	0.050	0.113	2.538	7.71	0.183	0.050	0.127	0.398	0.049	0.148			
LOW	0.130	0.380	0.060	3.933	0.410	0.100	0.130	1.290	13.94	0.260	0.090	0.130	0.260	0.310	0.470			
HIGH	0.330	1.000	0.130	9.100	1.060	0.250	0.500	9.440	38.13	0.870	0.220	0.540	1.590	0.380	1.060			

CRAB, BLUE				CALLINECTES SAPIDUS					196001 AREA- GULF			SITE- G3				CLAW & BODY MEAT		
LENGTH WEIGHT	NUM	2	MEAN	0.151	S. D.	0.008	LOW	0.145	HIGH	0.156	MOLYB	VANADIUM	MANG	ANTIMONY	TIN			
	NUM	1	MEAN	0.185	S. D.	0.000	LOW	0.185	HIGH	0.185								
MERCURY	LEAD			CADMIUM			ARSENIC			SELENIUM			SILVER			CHROM		
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM		
NUMBER	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002			
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0001	0000			
MEAN	0.193	0.845	0.100	3.375	0.460	0.238	0.200	3.718	39.53	0.285	0.138	0.280	1.599	0.630	0.628			
S. D.	0.011	0.354	0.028	0.884	0.127	0.216	0.028	0.795	0.23	0.049	0.011	0.000	0.233	0.000	0.110			
LOW	0.195	0.595	0.080	2.750	0.370	0.085	0.180	3.155	39.37	0.250	0.130	0.000	1.430	0.000	0.550			
HIGH	0.200	1.095	0.120	4.000	0.550	0.390	0.220	4.280	39.69	0.320	0.145	0.280	1.760	0.630	0.705			

CRAB, BLUE				CALLINECTES SAPIDUS					196001 AREA- GULF			SITE- L5				CLAW & BODY MEAT		
LENGTH WEIGHT	NUM	3	MEAN	0.139	S. D.	0.008	LOW	0.132	HIGH	0.148	MOLYB	VANADIUM	MANG	ANTIMONY	TIN			
	NUM	1	MEAN	0.154	S. D.	0.000	LOW	0.154	HIGH	0.154								
MERCURY	LEAD			CADMIUM			ARSENIC			SELENIUM			SILVER			CHROM		
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM		
NUMBER	0003	0003	0003	0002	0002	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003			
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0001	0000			
MEAN	0.100	0.782	0.128	9.230	1.022	0.608	0.203	10.168	33.67	0.489	0.212	0.450	0.632	0.845	0.873			
S. D.	0.044	0.157	0.014	4.011	0.257	0.266	0.071	1.949	11.22	0.313	0.121	0.240	0.257	0.488	0.223			
LOW	0.070	0.626	0.113	6.393	0.840	0.330	0.155	8.243	24.22	0.140	0.100	0.280	0.376	0.500	0.700			
HIGH	0.150	0.940	0.140	12.066	1.203	0.860	0.285	12.140	46.07	0.745	0.340	0.620	0.890	1.190	1.125			

CRAB, BLUE				CALLINECTES SAPIDUS					196001 AREA- GULF			SITE- L8				BODY MEAT		
LENGTH WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	MOLYB	VANADIUM	MANG	ANTIMONY	TIN			
	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000								
MERCURY	LEAD			CADMIUM			ARSENIC			SELENIUM			SILVER			CHROM		
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM		
NUMBER	0009	0009	0008	0008	0007	0009	0009	0009	0009	0008	0009	0009	0008	0009	0009			
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0003	0000	0000	0000			
MEAN	0.125	0.924	0.151	2.993	0.675	0.206	0.338	8.641	26.69	0.415	0.228	0.247	0.438	1.348	0.866			
S. D.	0.049	0.444	0.044	0.885	0.299	0.032	0.160	1.836	11.86	0.041	0.134	0.133	0.167	0.269	0.213			
LOW	0.020	0.360	0.090	2.225	0.250	0.140	0.140	6.380	9.56	0.355	0.060	0.060	0.300	0.970	0.620			
HIGH	0.180	1.630	0.230	4.287	1.250	0.250	0.630	11.110	46.25	0.460	0.500	0.440	0.820	1.780	1.250			

CRAB, BLUE				CALLINECTES SAPIDUS					196001 AREA- GULF			SITE- L8				CLAW MEAT		
LENGTH WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	MOLYB	VANADIUM	MANG	ANTIMONY	TIN			
	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000								
MERCURY	LEAD			CADMIUM			ARSENIC			SELENIUM			SILVER			CHROM		
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM		
NUMBER	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0002			
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0000	0000	0000	0000			
MEAN	0.125	0.978	0.152	3.776	0.770	0.185	0.250	8.157	28.26	0.403	0.220	0.537	0.368	1.282	0.938			
S. D.	0.048	0.400	0.073	1.795	0.448	0.031	0.295	3.762	9.84	0.087	0.000	0.502	0.156	0.294	0.442			
LOW	0.080	0.745	0.085	2.012	0.260	0.150	0.010	5.940	20.63	0.330	0.000	0.090	0.250	1.095	0.625			
HIGH	0.175	1.440	0.230	5.600	1.100	0.210	0.580	12.500	39.37	0.500	0.220	1.080	0.545	1.620	1.250			

CRAB, BLUE				CALLINECTES SAPIDUS					196001 AREA- GULF			SITE- L8				CLAW & BODY MEAT		
LENGTH WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	MOLYB	VANADIUM	MANG	ANTIMONY	TIN			
	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000								
MERCURY	LEAD			CADMIUM			ARSENIC			SELENIUM			SILVER			CHROM		
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM		
NUMBER	0010	0011	0011	0011	0010	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011			
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0003	0005	0000	0001	0000			
MEAN	0.147	0.676	0.122	4.902	0.515	0.282	0.235	7.877	31.07	0.329	0.203	0.387	0.371	1.148	0.921			
S. D.	0.026	0.291	0.051	2.181	0.519	0.120	0.131	4.491	5.65	0.083	0.185	0.170	0.102	0.300	0.167			
LOW	0.120	0.300	0.070	1.516	0.130	0.090	0.090	3.305	21.94	0.230	0.060	0.190	0.270	0.810	0.590			
HIGH	0.210	1.440	0.260	9.750	1.960	0.500	0.470	20.000	42.19	0.450	0.630	0.690	0.630	1.690	1.205			

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS IN RESOURCE SURVEY SPECIES: BY TISSUE AND LOCATION

LOCATION LEVEL 5

CRAB, ROCK				CANCER ERPRORATUS				196003 AREA- NRJTH ATLANTIC			SITE- I4 MEAT				
LENGTH WEIGHT	NUM NUM MERCURY PPM	0 MEAN		0.000 0.114 ARSENIC PPM	S. D. S. D. SELENIUM PPM	0.000 0.000 SILVER PPM	LOW LOW CHROM PPM	0.000 0.114 COPPER PPM	HIGH HIGH ZINC PPM	0.000 0.114 NICKEL PPM	0.000 0.114 MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
		LEAD PPM	CADMIUM PPM												
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0000	0000	0000
MEAN	0.000	1.000	0.190	7.125	1.900	0.360	0.310	9.840	43.75	0.750	0.300	0.190	1.500	0.130	0.880
S. D.	0.000	0.000	0.000	0.000	0.000	0.300	0.000	0.000	0.00	0.300	0.300	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.000	1.000	0.190	7.125	1.900	0.360	0.310	9.840	43.75	0.750	0.300	0.190	1.500	0.130	0.880

CRAB, ROCK				CANCER ERPRORATUS				196003 AREA- NRJTH ATLANTIC			SITE- N2 MEAT				
LENGTH WEIGHT	NUM NUM MERCURY PPM	1 MEAN		0.084 0.066 ARSENIC PPM	S. D. S. D. SELENIUM PPM	0.000 0.000 SILVER PPM	LOW LOW CHROM PPM	0.084 0.066 COPPER PPM	HIGH HIGH ZINC PPM	0.084 0.066 NICKEL PPM	0.000 0.000 MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
		LEAD PPM	CADMIUM PPM												
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0001	0000	0001	0000
MEAN	0.330	0.380	0.140	3.980	0.700	0.130	0.130	4.060	13.75	0.380	0.300	0.300	0.560	0.000	0.410
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.300	0.300	0.000	0.000	0.000	0.000
HIGH	0.330	0.380	0.140	3.980	0.700	0.130	0.130	4.060	13.75	0.380	0.300	0.300	0.560	0.000	0.410

CRAB, ROCK				CANCER ERPRORATUS				196003 AREA- NRJTH ATLANTIC			SITE- N4 MEAT				
LENGTH WEIGHT	NUM NUM MERCURY PPM	0 MEAN		0.000 0.096 ARSENIC PPM	S. D. S. D. SELENIUM PPM	0.000 0.000 SILVER PPM	LOW LOW CHROM PPM	0.000 0.096 COPPER PPM	HIGH HIGH ZINC PPM	0.000 0.096 NICKEL PPM	0.000 0.000 MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
		LEAD PPM	CADMIUM PPM												
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000
MEAN	0.240	0.630	0.210	10.583	1.600	0.255	0.275	4.660	39.38	0.890	0.160	0.250	1.345	0.000	0.640
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.300	0.300	0.000	0.000	0.000	0.300
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.300	0.300	0.000	0.000	0.000	0.000
HIGH	0.240	0.630	0.210	10.583	1.600	0.255	0.275	4.660	39.38	0.890	0.160	0.250	1.345	0.000	0.640

CRAB, ROCK				CANCER ERPRORATUS				196003 AREA- NRJTH ATLANTIC			SITE- N6 MEAT				
LENGTH WEIGHT	NUM NUM MERCURY PPM	0 MEAN		0.000 0.165 ARSENIC PPM	S. D. S. D. SELENIUM PPM	0.000 0.000 SILVER PPM	LOW LOW CHROM PPM	0.000 0.165 COPPER PPM	HIGH HIGH ZINC PPM	0.000 0.165 NICKEL PPM	0.000 0.000 MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
		LEAD PPM	CADMIUM PPM												
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.140	1.060	0.550	17.525	2.220	0.460	0.310	13.130	51.56	0.690	0.130	0.440	2.940	0.250	0.880
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.300	0.000	0.000	0.000	0.000	0.300
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.300	0.000	0.000	0.000	0.000	0.300
HIGH	0.140	1.060	0.550	17.525	2.220	0.460	0.310	13.130	51.56	0.690	0.130	0.440	2.940	0.250	0.880

CRAB, ROCK				CANCER ERPRORATUS				196003 AREA- NRJTH ATLANTIC			SITE- N7 MEAT				
LENGTH WEIGHT	NUM NUM MERCURY PPM	1 MEAN		0.080 0.087 ARSENIC PPM	S. D. S. D. SELENIUM PPM	0.000 0.013 SILVER PPM	LOW LOW CHROM PPM	0.080 0.072 COPPER PPM	HIGH HIGH ZINC PPM	0.080 0.097 NICKEL PPM	0.000 0.000 MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
		LEAD PPM	CADMIUM PPM												
NUMBER	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003	0003
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0002	0000	0000	0000
MEAN	0.215	0.690	0.277	7.539	1.260	0.458	0.253	7.285	33.75	1.145	0.160	0.280	1.323	0.000	0.787
S. D.	0.052	0.226	0.067	1.627	0.481	0.225	0.125	1.253	11.11	0.145	0.000	0.000	0.371	0.000	0.064
LOW	0.155	0.500	0.240	6.550	0.710	0.240	0.130	5.845	21.25	0.980	0.160	0.000	1.030	0.000	0.100
HIGH	0.250	0.940	0.330	9.416	1.600	0.690	0.380	8.130	42.50	1.250	0.160	0.280	1.740	0.000	0.860

CRAB, ROCK				CANCER ERPRORATUS				196003 AREA- NRJTH ATLANTIC			SITE- O1 MEAT				
LENGTH WEIGHT	NUM NUM MERCURY PPM	2 MEAN		0.097 0.155 ARSENIC PPM	S. D. S. D. SELENIUM PPM	0.006 0.077 SILVER PPM	LOW LOW CHROM PPM	0.092 0.086 COPPER PPM	HIGH HIGH ZINC PPM	0.101 0.285 NICKEL PPM	0.000 0.000 MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
		LEAD PPM	CADMIUM PPM												
NUMBER	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000	0004	0000
MEAN	0.169	0.914	0.300	12.058	1.930	0.265	0.286	7.170	40.43	0.708	0.245	0.351	1.067	0.380	0.888
S. D.	0.081	0.111	0.149	4.352	0.293	0.143	0.058	4.059	10.06	0.145	0.076	0.141	0.447	0.000	0.106
LOW	0.050	0.750	0.130	7.625	1.515	0.105	0.190	1.160	29.25	0.500	0.160	0.250	0.550	0.000	0.750
HIGH	0.230	1.060	0.523	19.150	2.250	0.433	0.345	10.463	54.69	0.855	0.355	0.560	1.773	0.380	0.986

CRAB, ROCK				CANCER ERPRORATUS				196003 AREA- NRJTH ATLANTIC			SITE- O3 MEAT				
LENGTH WEIGHT	NUM NUM MERCURY PPM	0 MEAN		0.000 0.112 ARSENIC PPM	S. D. S. D. SELENIUM PPM	0.000 0.000 SILVER PPM	LOW LOW CHROM PPM	0.000 0.112 COPPER PPM	HIGH HIGH ZINC PPM	0.000 0.112 NICKEL PPM	0.000 0.000 MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
		LEAD PPM	CADMIUM PPM												
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000
MEAN	0.100	1.000	0.360	14.650	2.550	1.000	0.380	5.380	68.75	0.970	0.190	0.150	0.710	0.300	1.060
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.300	0.300	0.000	0.000	0.000	0.300
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.300	0.300	0.000	0.000	0.000	0.300
HIGH	0.100	1.000	0.360	14.650	2.550	1.000	0.380	5.380	68.75	0.970	0.190	0.150	0.710	0.300	1.060

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS IN RESOURCE SURVEY SPECIES; BY TISSUE AND LOCATION

LOCATION LEVEL 5

CRAB, ROCK		CANCER ERRORTATUS						196003 AREA- NORTH ATLANTIC			SITE- P1			MEAT		
LENGTH WEIGHT	NUM NUM	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	0.111	ZINC	NICKEL	0.000	0.111	0.000	0.000
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN	
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.055	0.785	0.335	8.300	1.130	0.325	0.205	5.500	54.06	0.875	0.205	0.410	1.320	0.000	0.000	0.660
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.055	0.785	0.335	8.300	1.130	0.325	0.205	5.500	54.06	0.875	0.205	0.410	1.320	0.000	0.000	0.660

CRAB, ROCK		CANCER ERRORTATUS						196003 AREA- NORTH ATLANTIC			SITE- S1			MEAT		
LENGTH WEIGHT	NUM NUM	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	0.107	ZINC	NICKEL	0.000	0.107	0.000	0.000
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN	
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.100	0.750	0.430	8.850	0.890	0.560	0.190	7.750	30.63	1.180	0.160	0.410	1.780	0.000	0.000	0.630
S. D.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LOW	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
HIGH	0.100	0.750	0.430	8.850	0.890	0.560	0.190	7.750	30.63	1.180	0.160	0.410	1.780	0.000	0.000	0.630

CRAB, RED, DEEP SEA		GERYON QUINQUEDENS						196006 AREA- NORTH ATLANTIC			SITE- 02			MEAT		
LENGTH WEIGHT	NUM NUM	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	0.238	ZINC	NICKEL	0.000	0.344	0.000	0.000
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN	
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005	0005
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.151	0.479	0.114	11.857	2.268	0.194	0.252	6.028	32.40	0.451	0.190	0.005	0.454	0.300	0.000	0.778
S. D.	0.032	0.113	0.023	3.148	0.353	0.054	0.155	2.763	4.48	0.065	0.000	0.000	0.106	0.000	0.000	0.228
LOW	0.100	0.380	0.080	9.175	1.710	0.100	0.130	1.910	27.50	0.380	0.000	0.000	0.360	0.000	0.000	0.470
HIGH	0.180	0.630	0.135	16.550	2.650	0.230	0.500	9.380	39.06	0.540	0.190	0.000	0.600	0.000	0.000	1.090

CRAB, RED, DEEP SEA		GERYON QUINQUEDENS						196006 AREA- NORTH ATLANTIC			SITE- 04			MEAT		
LENGTH WEIGHT	NUM NUM	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	0.000	ZINC	NICKEL	0.000	0.000	0.000	0.000
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN	
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0020	0019	0020	0020	0020	0019	0019	0020	0020	0019	0020	0020	0020	0020	0020	0020
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0010	0006	0000	0017	0000	0000
MEAN	0.187	0.595	0.146	9.635	1.615	0.171	0.191	6.502	27.50	0.523	0.204	0.276	0.392	0.260	0.000	0.702
S. D.	0.088	0.154	0.039	5.070	0.731	0.092	0.086	5.331	7.64	0.227	0.062	0.126	0.223	0.046	0.000	0.153
LOW	0.040	0.315	0.100	2.650	0.750	0.050	0.060	1.060	11.44	0.280	0.130	0.100	0.180	0.220	0.000	0.410
HIGH	0.300	0.880	0.260	21.750	3.800	0.470	0.425	25.000	40.63	1.130	0.340	0.600	1.185	0.310	0.000	0.940

CRAB, DUNGNESS		CANCER MAGISTER						196011 AREA- CALIFORNIA			SITE- B2			MEAT		
LENGTH WEIGHT	NUM NUM	0 MEAN	0.190	S. D.	0.000	LOW	0.190	HIGH	0.980	ZINC	NICKEL	0.190	0.980	0.000	0.000	0.000
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN	
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010	0009	0000
N DET.	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0004	0005	0000	0000	0000	0000
MEAN	0.094	0.588	0.098	3.123	0.460	0.126	0.172	8.391	39.31	0.273	0.199	0.730	1.030	0.878	1.089	0.000
S. D.	0.036	0.236	0.022	1.715	0.228	0.025	0.060	2.730	14.92	0.039	0.095	0.561	0.327	0.253	0.280	0.000
LOW	0.040	0.190	0.070	1.387	0.050	0.070	0.060	4.620	17.88	0.190	0.120	0.090	0.530	0.360	0.560	0.000
HIGH	0.160	0.940	0.130	6.775	0.745	0.155	0.250	14.380	71.88	0.320	0.380	1.380	1.510	1.220	1.500	0.000

CRAB, DUNGNESS		CANCER MAGISTER						196011 AREA- PACIFIC NORTHWEST			SITE- I7			CLAW & BODY MEAT		
LENGTH WEIGHT	NUM NUM	0 MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	0.000	ZINC	NICKEL	0.000	0.000	0.000	0.000
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN	
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0008	0008	0008	0006	0007	0007	0008	0008	0008	0007	0008	0008	0008	0008	0008	0007
N DET.	0000	0000	0002	0000	0000	0000	0000	0000	0000	0001	0003	0004	0000	0003	0000	0000
MEAN	0.111	0.750	0.114	6.514	0.931	0.421	0.231	12.852	33.88	0.394	0.126	0.276	1.125	0.902	0.723	0.000
S. D.	0.017	0.398	0.068	2.561	0.170	0.076	0.127	2.402	8.47	0.089	0.060	0.150	0.252	0.325	0.363	0.000
LOW	0.080	0.100	0.040	4.560	0.590	0.345	0.050	8.680	25.36	0.280	0.070	0.130	0.710	0.480	0.100	0.000
HIGH	0.140	1.500	0.210	11.500	1.090	0.540	0.393	15.710	51.73	0.535	0.220	0.475	1.390	1.296	1.150	0.000

CRAB, DUNGNESS		CANCER MAGISTER						196011 AREA- PACIFIC NORTHWEST			SITE- M5			MEAT		
LENGTH WEIGHT	NUM NUM	3 MEAN	0.133	S. D.	0.000	LOW	0.133	HIGH	0.000	0.000	ZINC	NICKEL	0.133	0.000	0.000	0.000
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN	
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0020	0020	0020	0017	0016	0020	0020	0020	0018	0020	0020	0020	0020	0020	0020	0020
N DET.	0000	0000	0000	0000	0000	0002	0002	0000	0000	0001	0011	0012	0000	0004	0000	0000
MEAN	0.282	0.745	0.137	6.776	0.571	0.125	0.230	5.576	52.03	0.710	0.294	0.471	0.688	1.070	0.797	0.000
S. D.	0.076	0.282	0.052	4.724	0.201	0.055	0.105	1.549	9.16	0.409	0.257	0.202	0.675	0.597	0.387	0.000
LOW	0.170	0.355	0.065	1.847	0.290	0.040	0.100	2.480	33.28	0.150	0.060	0.150	0.110	0.300	0.350	0.000
HIGH	0.475	1.375	0.245	21.140	0.960	0.270	0.440	9.110	66.60	1.780	0.370	0.870	2.450	2.530	1.500	0.000

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS IN RESOURCE SURVEY SPECIES; BY TISSUE AND LOCATION

LOCATION LEVEL 5

Table with columns: CRAB, DUNGENESS; CANCER MAGISTER; 196011; AREA- PACIFIC NORTHWEST; SITE- N1; MEAT. Sub-headers: LENGTH WEIGHT, NUM NUM, 0 MEAN 0, MEAN MEAN, 0.000 0.000 S. D. S. D., 0.000 LOW 0.000 LOW, 0.000 HIGH 0.000 HIGH, 0.000 0.000. Data rows: MERCURY PPM, LEAD PPM, CADMIUM PPM, ARSENIC PPM, SELENIUM PPM, SILVER PPM, CHROM PPM, COPPER PPM, ZINC PPM, NICKEL PPM, MOLYB PPM, VANADIUM PPM, MANG PPM, ANTIMONY PPM, TIN PPM. Data points include values like 0002, 0002, 0002, 0002, 0002, 0002, 0002, 0002, 0002, 0002, 0002, 0002, 0002, 0002, 0002.

Table with columns: CRAB, DUNGENESS; CANCER MAGISTER; 196011; AREA- ALASKA; SITE- 08; MEAT. Sub-headers: LENGTH WEIGHT, NUM NUM, 0 MEAN 0, MEAN MEAN, 0.000 0.000 S. D. S. D., 0.000 LOW 0.000 LOW, 0.000 HIGH 0.000 HIGH, 0.000 0.000. Data rows: MERCURY PPM, LEAD PPM, CADMIUM PPM, ARSENIC PPM, SELENIUM PPM, SILVER PPM, CHROM PPM, COPPER PPM, ZINC PPM, NICKEL PPM, MOLYB PPM, VANADIUM PPM, MANG PPM, ANTIMONY PPM, TIN PPM. Data points include values like 0010, 0009, 0010, 0010, 0010, 0010, 0009, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010.

Table with columns: CRAB, KING; PARALITHODES CAMSCHATICA; 196012; AREA- ALASKA; SITE- L4; MEAT. Sub-headers: LENGTH WEIGHT, NUM NUM, 0 MEAN 0, MEAN MEAN, 0.000 0.000 S. D. S. D., 0.000 LOW 0.000 LOW, 0.000 HIGH 0.000 HIGH, 0.000 0.000. Data rows: MERCURY PPM, LEAD PPM, CADMIUM PPM, ARSENIC PPM, SELENIUM PPM, SILVER PPM, CHROM PPM, COPPER PPM, ZINC PPM, NICKEL PPM, MOLYB PPM, VANADIUM PPM, MANG PPM, ANTIMONY PPM, TIN PPM. Data points include values like 0009, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010.

Table with columns: CRAB, KING; PARALITHODES CAMSCHATICA; 196012; AREA- ALASKA; SITE- N6; CLAW & BODY MEAT. Sub-headers: LENGTH WEIGHT, NUM NUM, 0 MEAN 0, MEAN MEAN, 0.000 0.000 S. D. S. D., 0.000 LOW 0.000 LOW, 0.000 HIGH 0.000 HIGH, 0.000 0.000. Data rows: MERCURY PPM, LEAD PPM, CADMIUM PPM, ARSENIC PPM, SELENIUM PPM, SILVER PPM, CHROM PPM, COPPER PPM, ZINC PPM, NICKEL PPM, MOLYB PPM, VANADIUM PPM, MANG PPM, ANTIMONY PPM, TIN PPM. Data points include values like 0009, 0008, 0009, 0009, 0009, 0009, 0009, 0009, 0009, 0009, 0009, 0009, 0009, 0009, 0009.

Table with columns: CRAB, KING; PARALITHODES CAMSCHATICA; 196012; AREA- ALASKA; SITE- P3; MEAT. Sub-headers: LENGTH WEIGHT, NUM NUM, 0 MEAN 0, MEAN MEAN, 0.000 0.000 S. D. S. D., 0.000 LOW 0.000 LOW, 0.000 HIGH 0.000 HIGH, 0.000 0.000. Data rows: MERCURY PPM, LEAD PPM, CADMIUM PPM, ARSENIC PPM, SELENIUM PPM, SILVER PPM, CHROM PPM, COPPER PPM, ZINC PPM, NICKEL PPM, MOLYB PPM, VANADIUM PPM, MANG PPM, ANTIMONY PPM, TIN PPM. Data points include values like 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0009, 0010, 0010, 0010, 0010, 0010, 0010, 0010.

Table with columns: CRAB, TANNER (BAIRDI); CHIONECETES BAIRDI; 196035; AREA- ALASKA; SITE- H7; MEAT. Sub-headers: LENGTH WEIGHT, NUM NUM, 0 MEAN 0, MEAN MEAN, 0.000 0.000 S. D. S. D., 0.000 LOW 0.000 LOW, 0.000 HIGH 0.000 HIGH, 0.000 0.000. Data rows: MERCURY PPM, LEAD PPM, CADMIUM PPM, ARSENIC PPM, SELENIUM PPM, SILVER PPM, CHROM PPM, COPPER PPM, ZINC PPM, NICKEL PPM, MOLYB PPM, VANADIUM PPM, MANG PPM, ANTIMONY PPM, TIN PPM. Data points include values like 0010, 0008, 0009, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010.

Table with columns: CRAB, TANNER (BAIRDI); CHIONECETES BAIRDI; 196035; AREA- ALASKA; SITE- K3; MEAT. Sub-headers: LENGTH WEIGHT, NUM NUM, 0 MEAN 0, MEAN MEAN, 0.000 0.000 S. D. S. D., 0.000 LOW 0.000 LOW, 0.000 HIGH 0.000 HIGH, 0.000 0.000. Data rows: MERCURY PPM, LEAD PPM, CADMIUM PPM, ARSENIC PPM, SELENIUM PPM, SILVER PPM, CHROM PPM, COPPER PPM, ZINC PPM, NICKEL PPM, MOLYB PPM, VANADIUM PPM, MANG PPM, ANTIMONY PPM, TIN PPM. Data points include values like 0009, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010, 0010.

TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES:
BY TISSUE AND LOCATION

LOCATION LEVEL 5

OCTOPUS (MARMURATUS)				POLYPUS MARMURATUS				205001 AREA- HAWAII			SITE- D6 WHOLE				
LENGTH WEIGHT	NUM NUM	0 MEAN	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	0.000	0.000	0.000	0.000	0.000
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0003
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0001	0000
MEAN	0.023	0.645	0.688	16.563	0.716	0.381	0.119	15.903	14.53	0.463	0.226	0.135	0.444	1.010	0.888
S. D.	0.036	0.072	0.392	9.721	0.330	0.249	0.013	3.307	3.26	0.124	0.083	0.070	0.131	0.153	0.173
LOW	0.020	0.595	0.250	3.276	0.350	0.210	0.105	11.000	11.62	0.365	0.145	0.060	0.365	0.905	0.720
HIGH	0.030	0.750	1.200	26.500	1.075	0.750	0.130	18.210	18.93	0.640	0.340	0.200	0.640	1.185	1.065

OCTOPUS (MARMURATUS)				POLYPUS MARMURATUS				205001 AREA- HAWAII			SITE- D6 MANTLE, SKINLESS				
LENGTH WEIGHT	NUM NUM	0 MEAN	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	0.000	0.000	0.000	0.000	0.000
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0036	0035	0035	0034	0036	0036	0036	0036	0035	0036	0036	0036	0035	0036	0034
N DET.	0017	0000	0000	0000	0000	0000	0001	0000	0000	0000	0039	0031	0000	0004	0000
MEAN	0.058	0.604	0.308	17.195	0.403	0.154	0.166	9.051	14.01	0.340	0.564	0.592	0.282	0.898	0.851
S. D.	0.056	0.418	0.504	10.270	0.242	0.235	0.093	14.335	4.54	0.205	0.347	0.204	0.142	0.295	0.373
LOW	0.020	0.130	0.030	1.540	0.030	0.030	0.030	0.210	5.60	0.130	0.130	0.330	0.140	0.250	0.440
HIGH	0.250	2.100	1.810	38.250	1.000	0.980	0.380	78.130	34.38	1.170	1.060	0.810	0.690	1.630	2.000

MILKFISH				CHANOS CHANOS				206001 AREA- HAWAII			SITE- D6 MUSCLE				
LENGTH WEIGHT	NUM NUM	0 MEAN	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	0.000	0.000	0.000	0.000	0.000
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0040	0040	0040	0040	0040	0040	0040	0040	0039	0040	0040	0040	0040	0039	0038
N DET.	0014	0001	0003	0000	0000	0016	0001	0000	0000	0001	0036	0033	0000	0004	0000
MEAN	0.071	0.487	0.069	2.942	0.564	0.029	0.197	0.334	8.17	0.172	0.424	0.226	0.153	0.615	0.737
S. D.	0.050	0.307	0.024	1.522	0.271	0.009	0.161	0.145	2.55	0.360	0.467	0.096	0.035	0.256	1.390
LOW	0.020	0.120	0.030	0.350	0.060	0.010	0.060	0.070	0.44	0.070	0.139	0.120	0.090	0.050	0.160
HIGH	0.200	1.630	0.140	6.635	1.190	0.040	0.565	0.750	14.28	0.375	1.120	0.370	0.250	1.370	9.000

CLAM, SOFT				MYA ARENARIA				242001 AREA- NORTH ATLANTIC			SITE- M8 SHUCKED				
LENGTH WEIGHT	NUM NUM	0 MEAN	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	0.000	0.000	0.000	0.000	0.000
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0019	0019	0019	0019	0019	0019	0018	0019	0019	0019	0019	0019	0019	0019	0019
N DET.	0011	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
MEAN	0.086	0.590	0.226	2.015	0.895	0.053	0.265	4.227	15.36	0.560	0.280	0.454	6.448	0.000	0.519
S. D.	0.116	0.158	0.033	1.245	0.322	0.032	0.074	1.071	1.60	0.128	0.083	0.131	1.520	0.000	0.118
LOW	0.020	0.370	0.180	0.430	0.130	0.020	0.130	2.393	10.92	0.410	0.120	0.250	4.190	0.000	0.280
HIGH	0.360	0.940	0.290	5.000	1.800	0.140	0.405	5.875	17.50	0.880	0.410	0.750	9.250	0.000	0.705

CLAM, RAZOR				SILIQUA PATULA				243002 AREA- PACIFIC NORTHWEST			SITE- M2 SHUCKED				
LENGTH WEIGHT	NUM NUM	0 MEAN	MEAN	0.076	S. D.	0.000	LOW	0.076	HIGH	0.076	0.000	0.000	0.000	0.000	0.000
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0010	0010	0010	0010	0010	0010	0010	0010	0009	0010	0010	0010	0010	0010	0010
N DET.	0005	0000	0000	0000	0000	0004	0000	0000	0000	0001	0006	0002	0000	0002	0000
MEAN	0.042	0.530	0.094	2.027	0.536	0.050	0.240	0.552	20.07	0.511	0.298	0.343	2.533	0.876	1.486
S. D.	0.033	0.314	0.041	1.052	0.279	0.015	0.085	0.111	4.85	0.174	0.382	0.125	0.988	0.333	0.703
LOW	0.020	0.190	0.040	0.383	0.235	0.030	0.140	0.410	13.75	0.300	0.080	0.120	0.990	0.360	0.965
HIGH	0.100	1.085	0.180	4.350	1.260	0.070	0.390	0.695	26.92	0.750	0.870	0.490	3.890	1.365	3.310

CLAM, RAZOR				SILIQUA PATULA				243002 AREA- PACIFIC NORTHWEST			SITE- M6 SHUCKED				
LENGTH WEIGHT	NUM NUM	0 MEAN	MEAN	0.089	S. D.	0.000	LOW	0.089	HIGH	0.089	0.000	0.000	0.000	0.000	0.000
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0010	0010	0010	0009	0009	0010	0010	0010	0010	0010	0010	0010	0010	0010	0010
N DET.	0005	0000	0002	0000	0000	0003	0000	0000	0000	0001	0007	0000	0000	0004	0000
MEAN	0.046	0.529	0.120	4.038	0.432	0.055	0.262	1.035	11.06	0.554	0.410	0.709	2.808	0.976	1.326
S. D.	0.062	0.285	0.071	1.885	0.099	0.026	0.137	0.148	1.95	0.162	0.404	0.248	0.578	0.368	1.036
LOW	0.020	0.250	0.030	1.600	0.225	0.030	0.106	0.860	8.57	0.360	0.110	0.295	2.125	0.450	0.453
HIGH	0.120	1.186	0.250	7.016	0.530	0.090	0.540	1.370	15.71	0.890	0.870	1.015	3.790	1.500	3.750

CLAM, RAZOR				SILIQUA PATULA				243002 AREA- ALASKA			SITE- H7 SHUCKED				
LENGTH WEIGHT	NUM NUM	0 MEAN	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	0.000	0.000	0.000	0.000	0.000
	MERCURY PPM	LEAD PPM	CADMIUM PPM	ARSENIC PPM	SELENIUM PPM	SILVER PPM	CHROM PPM	COPPER PPM	ZINC PPM	NICKEL PPM	MOLYB PPM	VANADIUM PPM	MANG PPM	ANTIMONY PPM	TIN PPM
NUMBER	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0011	0009
N DET.	0008	0000	0000	0000	0000	0000	0000	0000	0000	0000	0004	0000	0000	0000	0000
MEAN	0.083	0.767	0.165	2.349	0.449	0.103	0.400	0.896	11.05	0.469	0.181	0.950	2.409	1.125	2.091
S. D.	0.057	0.215	0.042	0.743	0.151	0.036	0.181	0.366	2.07	0.103	0.081	0.430	1.362	0.272	1.220
LOW	0.020	0.440	0.090	1.400	0.230	0.055	0.210	0.495	8.01	0.350	0.060	0.310	0.855	0.750	0.250
HIGH	0.130	1.120	0.240	4.247	0.720	0.160	0.750	1.370	15.00	0.710	0.310	1.780	5.985	1.690	3.875

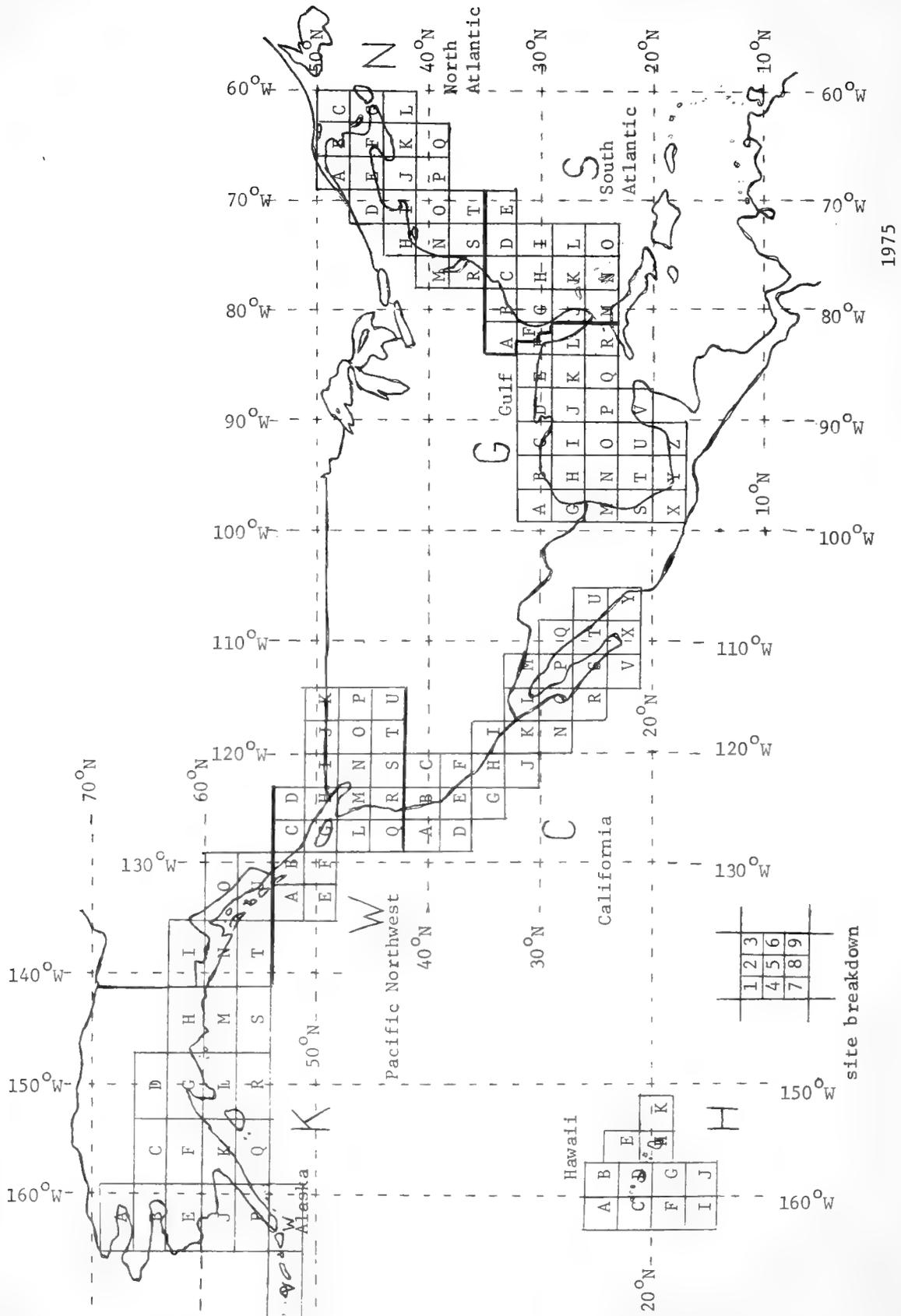
TABLE 5. SUMMARY OF TRACE ELEMENT LEVELS
IN RESOURCE SURVEY SPECIES;
BY TISSUE AND LOCATION

LOCATION LEVEL 5

CLAM, RAZOR				SILVIQA PATULA				243002 AREA- ALASKA				SITE- U8 SHUCKED			
LENGTH	NUM	0	MEAN	0.127	S. D.	0.000	LOW	0.127	HIGH	0.127	HIGH	0.300			
WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	HIGH	0.300			
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0008	0007	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008	0008
N DET.	0004	0000	0000	0000	0000	0001	0000	0000	0000	0000	0000	0000	0000	0001	0000
MEAN	0.035	0.335	0.102	2.806	0.353	0.072	0.286	0.459	15.90	0.416	0.240	0.381	1.305	1.095	0.599
S. D.	0.013	0.077	0.042	1.311	0.156	0.028	0.212	0.113	4.05	0.185	0.273	0.198	0.293	0.535	0.215
LOW	0.020	0.210	0.040	0.970	0.140	0.040	0.060	0.320	11.82	0.195	0.060	0.090	0.890	0.500	0.300
HIGH	0.050	0.405	0.170	4.400	0.500	0.110	0.760	0.670	24.64	0.790	0.720	0.680	1.660	2.000	0.940

CLAM, SURF				SPISULA SOLIDISSIMA				244005 AREA- NORTH ATLANTIC				SITE- H9 SHUCKED, WHOLE			
LENGTH	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	HIGH	0.000			
WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	HIGH	0.000			
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004	0004
N DET.	0001	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0004	0000
MEAN	0.037	1.098	0.110	3.963	0.705	0.088	0.641	2.457	16.44	1.091	0.625	0.721	3.762	0.000	0.474
S. D.	0.015	0.158	0.008	1.609	0.027	0.005	0.095	0.759	1.62	0.069	0.135	0.206	0.702	0.000	0.052
LOW	0.020	0.875	0.100	2.200	0.676	0.080	0.505	1.565	15.27	1.040	0.470	0.550	2.990	0.000	0.410
HIGH	0.050	1.250	0.120	6.090	0.740	0.090	0.720	3.310	18.75	1.190	0.775	1.000	4.380	0.000	0.530

CLAM, SURF				SPISULA SOLIDISSIMA				244005 AREA- NORTH ATLANTIC				SITE- R3 SHUCKED, WHOLE			
LENGTH	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	HIGH	0.000			
WEIGHT	NUM	0	MEAN	0.000	S. D.	0.000	LOW	0.000	HIGH	0.000	HIGH	0.300			
	MERCURY	LEAD	CADMIUM	ARSENIC	SELENIUM	SILVER	CHROM	COPPER	ZINC	NICKEL	MOLYB	VANADIUM	MANG	ANTIMONY	TIN
	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
NUMBER	0019	0018	0019	0019	0019	0019	0019	0019	0019	0019	0019	0019	0019	0019	0019
N DET.	0009	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0015	0000	0019	0000
MEAN	0.070	0.398	0.099	1.758	0.324	0.043	0.262	0.285	11.97	0.392	0.255	0.193	0.604	0.000	0.387
S. D.	0.039	0.156	0.094	1.147	0.174	0.015	0.099	0.126	1.66	0.065	0.075	0.021	0.321	0.000	0.091
LOW	0.020	0.190	0.050	0.680	0.010	0.010	0.120	0.090	9.00	0.270	0.130	0.170	0.180	0.000	0.190
HIGH	0.150	0.750	0.475	5.500	0.680	0.080	0.440	0.660	14.56	0.510	0.440	0.220	1.585	0.000	0.500



Appendix Figure 1.—Map of Microconstituent Data Bank areas and site.

DOC - NOAA - NMFS
FISH DATA LABEL

(Do not use ink; use a soft lead pencil)

DATE OF SAMPLING		
COLLECTOR'S SAMPLE #	TISSUE	
COMMON NAME		
SCIENTIFIC NAME		
YEAR CLASS	WEIGHT (specify #, oz, g)	
SEX	DEPTH (f)	LENGTH (mm)
LOCATION (Long.)	(Lat.)	(Other)
BOAT	CAPTAIN	
COLLECTOR		
BUSINESS ADDRESS OF COLLECTOR		
REMARKS		
OTHER PERTINENT INFORMATION WILL BE WELCOMED.		

Appendix Figure 2.—Fish data label.

NOAA FORM 88-36
14-75

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE

MICROCONSTITUENTS IN FISH AND FISHERY PRODUCTS

001 SOURCE LABORATORY SAMPLE NUMBER										002 TEST NO.										003										NOAA FORM 88-36 (4-75)										U. S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL MARINE FISHERIES SERVICE																																																																																																																																																																																																																																																																																																																															
1										2										3										4										5																																																																																																																																																																																																																																																																																																																															
004 SOURC LAB ID.										006 ANALYSIS LABORATORY SAMPLE NUMBER										007 COLLECTOR'S ID. AND SAMPLE NUMBER										008 FISH FAMILY					009 FISH SPECIES					010 DATE OF CATCH					012 LATITUDE OR COUNTRY																																																																																																																																																																																																																																																																																																																										
11										12										13										28					29					30					31					32																																																																																																																																																																																																																																																																																																																					
CARD										013 LONGITUDE										014 DEPTH OF CATCH										015 WATER TYP.					016 WAT. COND.					017 ENVIRON.					018 SAMP. APP.					019 REAR COND.					020 PURCH TYP.					021 SEX					022 FISH LENGTH (In meters)					023 FISH WEIGHT (In kilograms)					024 AGE YRS. MOS. AREA																																																																																																																																																																																																																																																																																												
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Appendix Figure 3.—Coding Form
NOAA 88-96.

Appendix Table 1.—National Marine Fisheries Services' laboratories and agents supplying and preparing samples for the Resource Survey.

Laboratories responsible for collection and preparation:

SEFC College Park, Md.
NWAFC Seattle, Wash.

Laboratories responsible for and assisting in collection:

NEFC Woods Hole, Mass.
NEFC Gloucester, Mass.
NEFC Narragansett, R.I.
NEFC Milford, Conn.
NEFC Sandy Hook, N.J.
NEFC Oxford, Md.
SEFC Beaufort, N.C.
SEFC Brunswick, Ga.
SEFC Miami, Fla.
SEFC St. Petersburg, Fla.
SEFC Panama City, Fla.
SEFC Pascagoula, Miss.
SEFC Galveston, Tex.
SEFC Port Aransas, Tex.
SWFC LaJolla, Calif.
SWFC Tiberon, Calif.
SWFC Honolulu, Hawaii
NWAFC Seattle, Wash.
NWAFC Auke Bay, Alas.



672. Seasonal occurrence of young Guld menhaden and other fishes in a northwestern Florida estuary. By Marlin E. Tagatz and E. Peter H. Wilkins. August 1973, iii + 14 p., 1 fig., 4 tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
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675. Proceedings of the International Billfish Symposium, Kailua-Kona, Hawaii, 9-12 August 1972. Part 1. Report of the Symposium. March 1975, iii + 33 p.; Part 2. Review and contributed papers. July 1974, iv + 355 p. (38 papers); Part 3. Species synopses. June 1975, iii + 159 p. (8 papers). Richard S. Shomura and Francis Williams (editors). For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
676. Price spreads and cost analyses for finfish and shellfish products at different marketing levels. By Erwin S. Penn. March 1974, vi + 74 p., 15 figs., 12 tables, 12 app. figs., 14 app. tables. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
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NOAA Technical Report NMFS SSRF-722

**Gulf Menhaden, *Brevoortia
patronus*, Purse Seine
Fishery: Catch, Fishing
Activity, and Age and Size
Composition, 1964-73**

William R. Nicholson

March 1978



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

NOAA TECHNICAL REPORTS

National Marine Fisheries Service, Special Scientific Report—Fisheries

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NOAA Technical Report NMFS SSRF-722

**Gulf Menhaden, *Brevoortia
patronus*, Purse Seine
Fishery: Catch, Fishing
Activity, and Age and Size
Composition, 1964-73**

William R. Nicholson

March 1978

U.S. DEPARTMENT OF COMMERCE

Juanita M. Kreps, Secretary

National Oceanic and Atmospheric Administration

Richard A. Frank, Administrator

National Marine Fisheries Service

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Gulf Menhaden, *Brevoortia patronus*, Purse Seine Fishery: Catch, Fishing Activity, and Age and Size Composition, 1964-73

WILLIAM R. NICHOLSON¹

ABSTRACT

The menhaden purse seine fishery in the Gulf of Mexico, primarily for Gulf menhaden, *Brevoortia patronus*, extends from about early April to early October. From 1964 to 1973 the catch fluctuated between 317,000 and 728,000 t and the number of vessels ranged from 65 to 82. Larger and faster refrigerated vessels replaced most of the smaller nonrefrigerated vessels and modern methods of fishing were adopted. Population levels were high and there were no large fluctuations in year class abundance. Age-1 and -2 fish supplied from 95 to 99% of the catch by weight. Over 97% of the fish were between 120 and 225 mm fork length. The mean age and size generally were slightly greater in the center of the fishery (central and eastern Louisiana) than in the eastern (Mississippi) and western areas (western Louisiana and Texas). Mean age decreased as the season progressed.

INTRODUCTION

The menhaden purse seine fishery in the Gulf of Mexico, dating prior to 1900, underwent a rapid expansion after World War II. New plants for processing meal and oil were built and larger and more modern vessels were added to the fleet. By 1964 the annual catch had risen to 410,000 t, a 10-fold increase over the 1946 catch.

Although three species of menhaden inhabit the area, only the Gulf menhaden, *Brevoortia patronus*, is important to the fishery. Yellowfin menhaden, *B. smithi*, occurs east of the Mississippi delta, and finescale menhaden, *B. gunteri*, west of the delta (Christmas and Gunter 1960). These two species together, however, probably supply, on the basis of numbers observed in catches or found in catch samples, less than 1% of the menhaden processed.

Because of general concern that the resource would be overfished and that catches would undergo a decline similar to that of Atlantic menhaden, *B. tyrannus*, an investigation was begun in 1964 by the National Marine Fisheries Service and centered at the Beaufort, N.C., laboratory. Many of the procedures and techniques developed for collecting and compiling information on the Atlantic menhaden fishery were followed. Catches of individual vessels dating from 1945 were compiled from confidential company records, and information on improvements in fishing methods, such as the use of spotter planes, fish pumps, and power blocks, were collected. A systematic sampling of catches for age, size, and sex was begun in 1964 and still continues.

The purpose of this paper is to document changes that have occurred in the fishery, update records of landings,

describe methods of sampling the catch and estimating the number of fish landed at each age, and discuss differences or similarities in age and size composition of catches throughout the fishery. Some preliminary data on catches, number of vessels and airplanes, and age composition of catches have been published in annual reports of the Beaufort Laboratory and by Chapoton (1972). Previous reports on age composition, however, were inaccurate, particularly for the years 1964-69, because a majority of fish had been over-aged during preliminary aging procedures. Subsequent reading showed a greater number of age-1 fish, fewer fish over age-2, and none over age-3.

THE FISHERY

Although a menhaden fishery has existed along the Gulf coast since the late 1800's, records of catches, the location and number of plants, and the number and types of vessels before 1946 are fragmentary. One plant is known to have operated in Texas from around the turn of the century until at least 1923. Another operated intermittently in the vicinity of Port St. Joe and Apalachicola, Fla., from at least 1918 until 1961. Another operated in the Pascagoula, Miss., area from sometime in the 1930's until 1959.

The modern purse seine fishery began after World War II as the world demand for fish meal and oil increased. Fishing usually begins in April and ends in early October. The first plant in Louisiana opened in 1946. In the next few years additional plants were built in Mississippi, Louisiana, and Texas (Fig. 1). Since 1950 the number of plants operating each year has fluctuated between 9 and 13 (Table 1), with some plants being closed or destroyed and new ones being built. The general trend has been toward larger and more efficient plants.

¹Southeast Fisheries Center Beaufort Laboratory, National Marine Fisheries, NOAA, Beaufort, NC 28516.

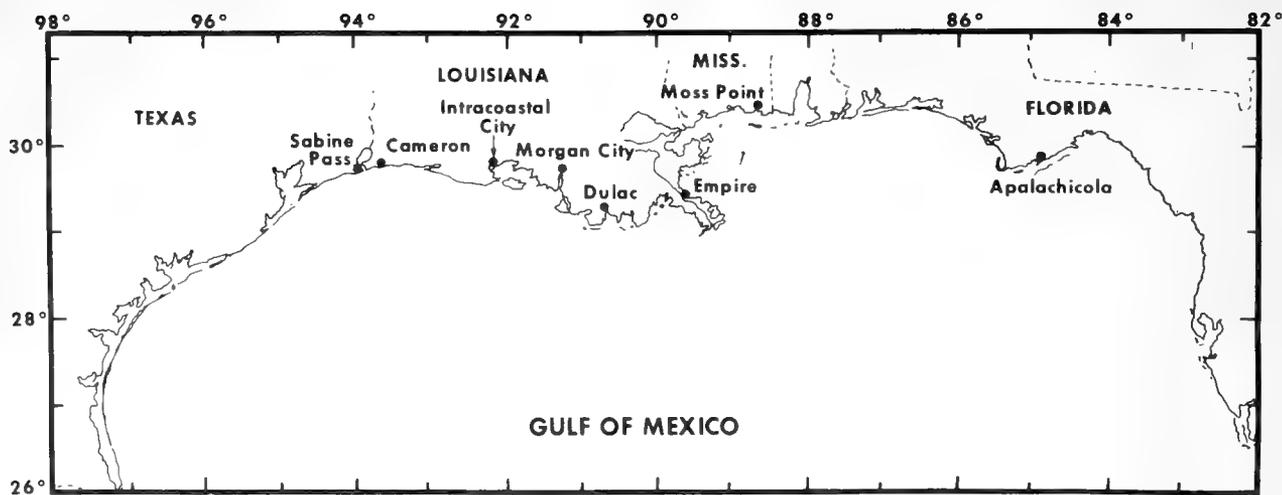


Figure 1.—Location of reduction plants for the Gulf menhaden fishery in the Gulf of Mexico.

Table 1.—Numbers of operating plants, airplanes, vessels by size, and vessels with fish pumps, power blocks, and refrigeration, Gulf menhaden fishery, 1945-73.

Years	No. of plants operating	No. of air-planes	No. of vessels ¹			Total	No. of vessels with		
			Under 75 tons	76-200 net tons	Over 200 net tons		Fish pumps	Power blocks	Refrigeration
1945	2	0	10	0	0	10	0	0	0
1946	3	0	13	1	0	14	0	0	0
1947	4	0	21	9	0	30	0	0	0
1948	5	0	27	12	0	39	0	0	0
1949	7	1	36	17	0	53	0	0	0
1950	10	3	42	23	0	65	0	0	0
1951	10	4	42	26	0	68	6	0	0
1952	10	4	41	23	0	64	7	0	0
1953	10	5	46	24	0	70	12	0	0
1954	9	7	40	32	0	72	39	0	0
1955	9	8	39	31	2	72	43	0	0
1956	10	12	38	39	4	81	63	0	2
1957	10	15	32	35	6	73	72	4	9
1958	10	15	20	48	9	77	69	7	14
1959	11	17	18	44	11	73	66	16	23
1960	10	19	12	52	11	75	71	21	29
1961	10	19	6	52	11	69	66	21	32
1962	12	23	6	54	14	74	74	43	35
1963	11	25	5	53	15	73	73	56	36
1964	11	24	5	53	18	76	76	64	40
1965	13	27	4	48	30	82	82	79	57
1966	13	29	1	42	37	80	80	80	59
1967	13	31	1	32	43	76	76	76	70
1968	12	33	2	26	41	69	69	69	65
1969	12	33	2	27	43	72	72	72	68
1970	13	34	2	26	45	73	73	73	70
1971	13	35	1	29	52	82	82	82	77
1972	11	33	0	22	53	75	75	75	75
1973	10	31	0	14	51	65	65	65	65

¹Number of vessels that landed fish 9 or more weeks.

Distribution of Fishing

From 1964 to 1969 logbooks and maps were placed aboard vessels and the captain or pilot was asked to record, among other things, the location of each purse seine set. Squares on the maps, formed by even degrees

of latitude and longitude, were divided by 10 minute intervals into 36 subareas, identified by a letter (A to F) and a number (1 to 6). The location of a given set could be referenced within a 100 mi² subarea, identified by latitude, longitude, and subarea (for example 29-84-B2). Although all vessels did not keep logs and some kept only

partial records, the locations of over 48,000 sets were recorded for the 6-yr period.

To show the relative distribution of fishing activity, particularly in reference to distance from shore, I organized the data by degrees of longitude to show the percentage of sets made less than 10, 20, 30, and 40 mi from shore (Table 2). Since longitude 89 is divided by the Mississippi Delta, I treated the data from east of the delta (89a) and west of the delta (89b) separately. West of the Mississippi delta (longitudes 89b-94), 44 to 93% of the sets were less than 10 mi from shore, 90 to 98% less than 20 mi, and 99 to 100% less than 30 mi. East of the delta (longitudes 84-89a), 100% of the sets were made less than 10 mi from shore.

In effect, the fishing area west of the delta is restricted to a narrower band adjacent to shore than is indicated by the data. Because the shoreline usually passes through subareas rather than along their boundaries, the actual distances from shore are considerably less than the maximum. Therefore, a majority of the sets are in reality less than the maximum possible distance. Probably 85 to 90% are made within 15 mi of shore. Undoubtedly many reported in subareas more than 20 mi were due to errors in recording.

Catches

Records of annual catches were compiled from confidential company sources of individual vessel landings for years 1945-73 (Table 3). In a few cases where plant records were missing (one plant in Mississippi 1949-50, one plant in Louisiana 1954-55, and one plant in Texas 1948-51), I estimated catches by multiplying the mean catch of similar vessels at nearby plants by the number of vessels that normally fished at plants whose records were missing. For Florida in 1946-47 and Mississippi in 1946 where only one plant operated, I was unable, however, to make any estimates and no published records were available.

Published records (Anonymous 1918-38, 1939-44) prior to 1945, although fragmentary and incomplete, suggest annual landings from 1918 to 1944 of about 2,000 to 12,000 t, all in Florida, Mississippi, or Texas. There was little increase until 1948, when the catch was 103,000 t, mainly as a result of new plants being built in Mississippi, Louisiana, and Texas. It had increased to 481,000 t by 1962 and thereafter fluctuated between 317,000 and 728,-

Table 3.—Purse seine catch of Gulf menhaden, in thousands of metric tons, by State, 1945-73.

Year	Florida	Mississippi	Louisiana	Texas	Total
1945	3.2	26.0	0.0	0.0	29.2
1946			8.9	0.0	
1947		10.1	24.0	0.0	
1948	15.4	34.8	40.0	12.7	102.9
1949	11.2	30.1	75.2	19.0	135.5
1950	0.6	31.1	94.3	21.2	147.2
1951	1.5	43.4	96.7	13.2	154.8
1952	4.8	70.7	129.2	24.0	228.7
1953	2.0	22.1	142.1	30.3	196.5
1954	0.0	36.0	121.8	23.4	181.2
1955	0.9	56.0	135.1	23.0	215.0
1956	0.0	70.3	144.6	29.9	244.8
1957	0.0	59.3	74.5	26.1	159.9
1958	4.6	56.1	109.5	31.3	201.5
1959	8.2	79.7	191.5	55.9	335.3
1960	2.8	99.1	213.2	65.6	380.7
1961	1.9	136.7	260.2	60.7	459.5
1962	0.0	119.5	314.1	47.1	480.7
1963	0.0	113.6	288.4	35.8	437.8
1964	0.0	107.8	271.4	30.2	409.4
1965	0.0	126.4	308.6	28.1	463.1
1966	3.1	86.4	252.0	17.6	359.1
1967	0.0	75.5	231.4	10.4	317.3
1968	0.3	67.8	282.2	23.2	373.5
1969	0.0	102.2	388.3	33.2	523.7
1970	0.0	93.4	435.2	19.5	548.1
1971	0.0	138.8	560.9	28.5	728.2
1972	0.0	80.8	420.9	0.0	501.7
1973	0.0	80.4	405.7	0.0	486.1

¹Records not available.

000 t. More vessels, larger and more efficient vessels, and improved fishing technology were primarily responsible for increased catches after 1947.

Size and Number of Vessels

The number of vessels increased rapidly from 1945 to 1950, and then more slowly, reached a peak of 82 in 1965, and thereafter fluctuated between 65 and 82 (Table 1). Because many vessels often made only a few landings each year in the early years of the fishery, I have excluded all vessels that fished less than 9 wk. Including them would have indicated greater changes in the composition of the fleet than actually occurred.

Table 2.—Distribution of purse seine sets for Gulf menhaden, by degrees of longitude and relative distance from shore, 1964-69. Longitudes 84-89a are east of the Mississippi delta, 89b-94 are west.

Sets	Longitude (°W)									
	94	93	92	91	90	89b	89a	88	87-86	85-84
Number	598	4,310	4,672	10,328	1,730	2,539	14,486	9,050	94	767
% 0 to 10 miles of shore	68	57	44	48	85	93	100	100	100	100
% 0 to 20 miles of shore	91	93	90	98	98	98	0	0	0	0
% 0 to 30 miles of shore	99	99	99	100	100	100	0	0	0	0

The shift to larger vessels of greater carrying capacity was the most striking change. Vessels less than 75 net tons constituted over 50% of the fleet until 1956. In the following years the number of vessels in this size class declined continually, dropping to 1 in 1966 and finally disappearing completely in 1972. The number of vessels between 75 and 200 net tons increased until 1960, remained fairly stable through 1964, and then declined steadily. By 1973 they composed only 22% of the fleet. Vessels over 200 net tons first appeared in 1955, increased gradually over the years, and by 1973 numbered 51, or 78% of the fleet. Most of the vessels in this size class after 1965 were greater than 300 net tons, and one was more than 400 net tons.

Improvements in Fishing Methods

Fish pumps, power blocks, refrigeration, nylon purse seines, aluminum purse boats, and airplane spotting were introduced in the Gulf menhaden fishery in the 1950's (Table 1). These techniques and equipment increased efficiency by reducing the time spent searching for fish, steaming to and from fishing grounds, and completing purse seine sets.

Fish pumps replaced the time-consuming method of brailing fish from the purse seine to the hold of the carrier vessel (Robas 1959), and first appeared on gulf coast vessels in 1951. By 1960 they were standard equipment on nearly all vessels.

A power block is a mechanical device that retrieves the net and concentrates the fish in it so they may be pumped or brailed aboard the carrier vessel. Its use reduces the average time required to concentrate the fish by about 6 min and the crew by 6 to 10 men (Schmidt 1959a, b), and permits a quick retrieval of the net if a school of fish is missed. Power blocks were introduced in

the Gulf menhaden fishery in 1956. Although their use did not spread rapidly, they were standard equipment on over 80% of the vessels by 1964.

Refrigerated vessels are able to fish greater distances from their home ports and to spend up to a week on the fishing grounds. Generally larger than nonrefrigerated vessels, they increased steadily in number after their introduction in 1957. Their use has been more extensive in the central and eastern Gulf regions, where vessels travel farther to the fishing grounds, than in the western Gulf.

Aluminum purse boats can encircle a school of fish faster and can operate in rougher waters better than wooden or steel boats. They were first employed in 1956, but their use spread slowly, and all vessels were not equipped with aluminum purse boats until about 1970.

Information was difficult to obtain on the use of nylon seines by individual vessels. A few were reported to have used them in 1956. The changeover was rapid in 1957 and 1958, and by 1959 nearly all vessels were using them.

The use of airplanes for locating schools of menhaden greatly reduced the amount of vessel searching time and was one of the more important improvements in fishing methods. Spotter planes were introduced in the Gulf menhaden fishery in 1949 and rapidly increased in number. Most plants chartered planes part time until about 1955, but employed two to four planes full time by 1960. Initially, planes only guided vessels to large concentrations of fish, but in recent years pilots have used two-way radios to direct the purse boats in setting the seine.

SAMPLING PROCEDURE

Catches of Gulf menhaden were sampled by seasonal employees who followed the procedures described for sampling catches of Atlantic menhaden (June and Reintjes 1960). For each vessel sampled, fish were taken

Table 4.—Number of samples taken from Gulf menhaden catches by plant and location, 1964-73.

Plant location	No. of samples in year									
	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Appalachicola, Fla.	1	1	4	1	0					
Moss Pt., Miss.	76	98	33	25	29	53	43	19	58	1
	66	126	100	141	173	135	119	50	136	96
	56	88	53	89	53	71	66	56	102	102
Empire, La.	152	142	57	88	111	79	0	0	108	108
	18	25	63	71	70	75	0	0	153	166
Dulac, La.	1	2	1	1	1	1	1	1	1	1
	0	5	4	4	15	0	7	4	1	1
		7	10	37	79	0	69	57	68	133
Morgan City, La.	111	126	90	103	73	147	56	41	49	133
Intracoastal City, La.	1	11	3	1	36	36	35	23	22	14
Cameron, La.	14	8	32	45	23	1	28	29	102	87
	118	112	152	76	105	157	69	57	68	94
				27	0	0	22	41	68	71
Sabine Pass, Tex.	4	16	26	1	6	3	4	9	1	1
Total	616	766	623	708	773	757	518	386	934	1,004

Plant did not operate.

from the top of the catch, which came from the last set made by the vessel, measured (millimeters, fork length), weighed (grams), and sexed. Scales were taken for aging (Nicholson and Schaaf in press). In 1964, 1965, and 1971, two samples of 20 fish (1 sample per boat) were taken daily. From 1966 to 1970, three samples of 20 fish were taken. Beginning in 1972, three samples of 10 fish each were taken. The location of the last set made by the vessel was recorded to the nearest 10 minutes of latitude and longitude.

All plants were not sampled equally. Usually, four samplers were employed and stationed at locations where they could cover two or more plants, arbitrarily grouped into ports. Locations were chosen so that plants throughout the entire range of the fishery could be sampled. The number of samples depended, in part, on the duty station of the sampler and ranged from 0 to over 150 per plant and from 386 to 1,004 per year (Table 4).

AGE AND SIZE COMPOSITION

The number of fish landed at each plant was estimated by dividing the total weight of fish landed weekly by the mean weight of fish in the weekly samples, either from that plant or from several plants arbitrarily grouped together. The number of each age was estimated by multiplying the total estimated number of fish by the percentage of each age in the samples. Weekly estimates were summed to obtain seasonal estimates. Since fish landed at plants in the eastern and western ends of the fishery tended to be smaller and younger than fish landed at plants in the middle, I summarized the data by grouping together plants in the eastern area (Mississippi and Florida), central area (Empire to Intracoastal City, La.), and western area (Cameron, La., and Sabine Pass, Tex.).

The total number of fish landed annually varied from 4,054.73 million in 1966 to 7,796.38 million in 1971 (Table 5). Age-1 and -2 fish together supplied from 97 to 99% of the fish caught, and ages 0 and 3 supplied the remainder. Age-1 fish supplied from 59 to 92% of the estimated number of fish caught annually, while age-2 fish supplied from 6 to 40%. These percentages are about the same, whether they are calculated from the estimated number of fish caught or from the number of fish in the samples (Table 6). The former method of calculating is more precise, since it corrects for differences in time and space between the ratio of weight of fish landed to number of fish in the samples.

There was remarkable little variation from year to year in the length range or mean length, either for individual ages or for all ages combined (Table 7). With few exceptions length ranged from about 115 to 215 mm. Mean annual lengths ranged from 147 to 165 mm for age-1 fish, 181 to 188 mm for age-2, 201 to 214 mm for fish over age-2, and 153 to 172 mm for all ages combined.

Weight also showed relatively little annual variation, ranging from about 20 to 250 g (Table 7). Means ranged from 65 to 101 g for age-1 fish, 122 to 148 g for age-2, 170

Table 5.—Estimated number (in millions) of Gulf menhaden at each age landed annually, 1964-73, at plants in eastern area (Mississippi and Florida), central area (Empire to Intracoastal City, La.), and western area (Cameron, La., and Sabine Pass, Tex.).

Year	Plant location	Age				Total	Percent
		0	1	2	3		
1964	Eastern	0.52	1,194.52	219.84	5.65	1,420.53	31
	Central	0.33	744.39	768.45	88.23	1,601.40	34
	Western	5.42	1,196.65	376.86	18.04	1,596.97	35
	Total	6.27	3,135.56	1,365.15	111.92	4,618.90	100
1965	Eastern	0.35	1,702.82	297.33	8.34	2,008.84	34
	Central	41.01	1,830.84	627.35	62.04	2,561.24	43
	Western	5.27	1,354.41	41.58	1.01	1,402.27	23
	Total	46.63	4,888.09	966.26	71.39	5,972.35	100
1966	Eastern	5.13	846.22	193.10	7.00	1,051.45	26
	Central	39.17	858.08	413.77	18.53	1,329.55	33
	Western	2.54	1,422.49	243.26	5.44	1,673.73	41
	Total	46.84	3,126.79	850.13	30.97	4,054.73	100
1967	Eastern	1.32	1,007.79	84.97	4.34	1,098.42	25
	Central	17.38	1,759.82	198.98	6.21	1,982.39	44
	Western	0.00	1,361.63	25.93	0.00	1,387.56	31
	Total	18.70	4,129.24	309.88	10.55	4,468.37	100
1968	Eastern	0.00	463.78	276.61	4.46	744.85	18
	Central	23.87	1,105.98	529.02	21.22	1,680.09	40
	Western	11.53	1,741.75	44.36	1.53	1,799.17	42
	Total	35.40	3,311.51	849.99	27.21	4,224.11	100
1969	Eastern	3.16	1,320.30	150.70	6.68	1,480.84	22
	Central	7.62	2,309.13	628.31	21.77	2,966.83	44
	Western	0.00	2,137.41	232.04	1.94	2,371.39	34
	Total	10.78	5,766.84	1,011.05	30.39	6,819.06	100
1970	Eastern	0.89	690.35	299.14	2.51	992.89	19
	Central	20.89	1,050.08	1,416.42	26.07	2,513.26	48
	Western	27.60	1,515.92	481.62	5.84	2,030.98	33
	Total	49.18	3,256.35	2,197.18	34.42	5,537.13	100
1971	Eastern	1.75	952.68	532.99	65.88	1,453.30	19
	Central	7.21	2,486.21	988.76	95.04	3,577.22	46
	Western	16.30	2,424.43	316.32	9.01	2,766.06	35
	Total	25.26	5,763.32	1,838.07	169.73	7,796.58	100
1972	Eastern		788.13	171.57	11.56	971.26	20
	Central	15.31	717.13	1,223.77	52.65	2,008.86	41
	Western	2.26	1,640.99	220.33	7.43	1,871.01	39
	Total	17.57	3,146.25	1,615.67	71.64	4,851.13	100
1973	Eastern	55.66	432.33	224.56	9.39	721.94	17
	Central	1.56	1,246.38	656.45	94.92	1,999.31	47
	Western	0.00	1,333.64	201.64	5.17	1,540.45	36
	Total	57.22	2,012.35	1,082.65	109.48	4,261.70	100
Mean total		31.39	3,953.63	1,208.60	66.79	5,260.41	

to 217 g for fish over age-2, and 74 to 117 g for all ages combined.

The contribution of each age group to the total weight of the catch was estimated by multiplying the number of fish caught at each age by the mean weight of fish in the samples. Two age groups, 1 and 2, accounted for over 95% of the total weight of the catch. The annual variation ranged from 95.0 to 99.3%. Age-1 fish contributed from 49 to 88%, and averaged 63% for the 10-yr period. Age-2 fish contributed from 12 to 50% and averaged 34%. Age-3 fish contributed an average of 2.6%, and age-0 fish 0.2% (Table 8).

Table 6.—Age composition, in percentage and numbers of fish, of Gulf menhaden in samples of the catch from all ports combined, 1964-73.

Year		Age 0	Age 1	Age 2	Age 3	Total
1964	Number	24	8,012	3,887	342	12,265
	Percent	0.2	65.3	31.7	2.8	100
1965	Number	114	12,370	2,510	213	15,207
	Percent	0.7	81.4	16.5	1.4	100
1966	Number	172	9,669	2,496	92	12,429
	Percent	1.4	77.8	20.1	0.7	100
1967	Number	93	12,590	1,320	62	14,065
	Percent	0.7	89.5	9.4	0.4	100
1968	Number	123	10,348	4,679	142	15,292
	Percent	0.8	67.7	30.6	0.9	100
1969	Number	62	12,241	2,633	103	15,039
	Percent	0.4	81.4	17.5	0.7	100
1970	Number	89	6,750	3,511	52	10,402
	Percent	0.9	64.8	33.8	0.5	100
1971	Number	20	5,402	2,092	138	7,652
	Percent	0.3	70.6	27.3	1.8	100
1972	Number	67	6,839	2,764	210	9,880
	Percent	0.7	69.2	28.0	2.1	100
1973	Number	132	5,769	2,892	153	8,946
	Percent	1.5	64.5	32.3	1.7	100

Table 7.—Mean fork length (mm) and weight (g) of Gulf menhaden in combined samples of the catch from all ports, by age, 1964-73.

Year	Length at age				Weight at age			
	0	1	2	3	0	1	2	3
1964	120	154	184	201	36	72	131	183
1965	116	147	181	204	33	65	131	192
1966	116	155	182	203	31	79	130	178
1967	102	151	181	203	22	69	122	170
1968	111	157	182	214	27	79	125	207
1969	123	147	186	207	42	66	137	198
1970	110	160	181	208	31	83	125	184
1971	119	157	188	204	31	79	140	180
1972	108	161	187	209	26	82	136	182
1973	121	165	187	213	36	101	148	217
Mean	115	155	184	207	32	78	133	190

AGE AND SIZE DISTRIBUTION BY LONGITUDE

To determine if fish were stratified by age and size along an east-west axis, I calculated the mean age and mean length of each age for each degree of longitude (dividing 89 into two parts: 89a east and 89b west of the delta) by month and year. For summarizing mean lengths I combined all months; for summarizing mean ages I grouped longitudes into three areas: eastern (84-89a), central (89b-91), and western (92-94). Too few samples were obtained from longitudes 84°-87° and 94° to calculate useful mean lengths for each longitude.

There were some differences in mean lengths by longitude, but they were small and not consistent for either age-1 or -2, although 10-yr means of age-2 fish were slightly greater for central longitudes (89b-91) than for the others (Table 9). Monthly means showed no trends.

The mean age tended to be highest in the central area and lowest in the western (Table 10). In all years it was

Table 8.—Estimated weights (thousands of metric tons) and percentages of each age of Gulf menhaden landed in the purse seine fishery and the actual weight of fish caught, 1964-73.

Year		Age 0	Age 1	Age 2	Age 3	Total	Actual weight
1964	Weight	0.23	225.76	178.83	20.48	425.30	409.40
	Percent	0.1	53.1	42.0	4.8	100.0	
1965	Weight	1.54	317.72	126.58	13.71	459.55	463.10
	Percent	0.4	69.1	27.5	3.0	100.0	
1966	Weight	1.45	247.02	110.52	5.51	364.50	359.10
	Percent	0.4	67.8	30.3	1.5	100.0	
1967	Weight	0.41	284.92	37.81	1.79	324.93	317.30
	Percent	0.1	87.7	11.6	0.6	100.0	
1968	Weight	0.96	261.61	106.25	5.63	374.45	373.50
	Percent	0.2	69.9	28.4	1.5	100.0	
1969	Weight	0.45	380.61	138.51	6.02	525.59	523.70
	Percent	0.1	72.4	26.4	1.1	100.0	
1970	Weight	1.52	270.28	274.65	6.51	552.96	548.10
	Percent	0.3	48.9	49.6	1.2	100.0	
1971	Weight	0.78	455.30	257.33	30.59	744.00	728.20
	Percent	0.1	61.2	34.6	4.1	100.0	
1972	Weight	0.46	257.99	219.73	13.04	491.22	501.70
	Percent	0.1	52.5	44.7	2.7	100.0	
1973	Weight	2.06	304.25	160.23	23.75	490.29	486.10
	Percent	0.4	62.1	32.7	4.8	100.0	
Mean Weight	Percent	0.99	300.55	160.04	12.70	474.28	471.02
	Percent	0.2	63.4	33.7	2.7	100.0	

Table 9.—Mean lengths (mm) of age-1 and -2 Gulf menhaden in purse seine catches, by degrees of longitude, 1964-73. Longitude 89a is east of the Mississippi delta, 89b is west.

Year	Age	Longitude (°W)						
		88	89a	89b	90	91	92	93
1964	1	151	153	162	156	158	151	153
	2	175	178	189	182	182	181	183
1965	1	138	141	149	150	162	151	152
	2	170	176	186	182	187	179	183
1966	1	158	157	157	156	162	151	151
	2	175	178	183	183	184	177	179
1967	1	146	150	146	151	158	150	149
	2	181	181	178	181	183	175	179
1968	1	160	156	154	141	164	155	155
	2	176	183	186	183	185	182	180
1969	1	146	147	141	150	151	156	146
	2	184	185	187	184	188	187	184
1970	1	163	160	—	158	161	168	157
	2	177	179	—	183	185	178	178
1971	1	155	155	—	158	162	159	151
	2	186	186	—	190	191	188	185
1972	1	159	162	153	154	163	166	158
	2	177	182	187	191	193	186	183
1973	1	159	164	161	166	167	164	159
	2	183	186	195	186	184	184	180
Mean	1	154	155	153	154	161	157	153
	2	175	181	186	185	185	182	181

lowest in the western area. In 6 of 10 yr it was higher in the central than in the eastern area and in the other 4 yr it was about the same in both areas. In 1967, when the mean age was about the same in all areas, the fishery was dominated by the 1966 year class, which composed 92% of the fish caught. Monthly means generally declined as the season progressed.

Table 10.—Mean ages of Gulf menhaden by month and area, 1967-73.

Area (long.)	Month	Year										Mean
		1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	
Eastern (84-89a)	Apr.	1.38	1.24	1.05	1.16	1.65	1.34	—	—	—	1.74	1.37
	May	1.31	1.26	1.14	1.15	1.64	1.16	1.32	1.68	1.42	1.61	1.37
	June	1.13	1.10	1.27	1.16	1.48	1.21	1.27	1.41	1.44	1.64	1.31
	July	1.15	1.08	1.36	1.14	1.45	1.14	1.22	1.51	1.40	1.62	1.31
	Aug.	1.09	1.11	1.14	1.18	1.44	1.11	1.19	1.46	1.36	1.53	1.26
	Sept.	1.01	1.13	1.06	1.06	1.17	1.02	1.22	1.27	1.36	1.58	1.19
	Oct.	1.11	—	—	—	1.26	1.05	—	1.33	1.20	1.56	1.25
	Mean	1.17	1.15	1.17	1.14	1.44	1.15	1.24	1.44	1.36	1.61	1.29
Central (89b-91)	Apr.	2.10	1.73	1.00	—	1.95	—	—	—	—	—	1.70
	May	1.82	1.59	1.60	1.13	1.52	1.18	1.89	—	1.38	1.88	1.53
	June	1.68	1.33	1.38	1.03	1.41	1.23	1.59	1.44	1.51	1.58	1.42
	July	1.50	1.27	1.45	1.03	1.43	1.23	1.56	1.47	1.81	1.54	1.43
	Aug.	1.51	1.29	1.28	1.10	1.47	1.14	1.31	1.37	1.68	1.65	1.38
	Sept.	1.36	1.00	1.25	1.07	0.99	1.48	1.61	1.46	1.48	1.17	1.29
	Oct.	—	—	—	1.00	1.06	1.30	1.13	—	—	—	1.12
	Mean	1.70	1.37	1.33	1.06	1.40	1.26	1.52	1.43	1.57	1.56	1.42
Western (92-94)	Apr.	—	—	1.00	1.00	—	1.00	—	—	—	—	1.00
	May	1.33	1.15	1.42	1.07	1.17	1.00	1.66	1.39	—	1.10	1.25
	June	1.53	1.03	1.04	1.13	1.15	1.26	1.44	1.28	1.29	1.03	1.22
	July	1.53	1.03	1.04	1.13	1.15	1.26	1.44	1.28	1.19	1.03	1.22
	Aug.	1.43	1.01	0.99	1.02	1.05	1.20	1.32	1.02	1.15	1.32	1.15
	Sept.	1.10	0.92	0.79	1.00	0.99	1.09	1.01	0.99	1.17	1.30	1.04
	Oct.	1.00	—	—	—	1.00	1.00	1.00	—	1.08	—	1.02
	Mean	1.30	1.03	1.05	1.05	1.09	1.12	1.13	1.19	1.18	1.16	1.13

Table 11.—Mean lengths (mm) of Gulf menhaden of all ages and percentages of age-1 fish in samples of purse seine catches, by port, 1964-73.

Year	Mean and percent	Port					
		Moss Pt. Miss.	Empire La.	Dulac La.	Morgan City, La.	Intracoastal City, La.	Cameron La.
1964	Mean length	156	176	—	168	—	161
	% Age-1	84	40	—	62	—	73
1965	Mean length	145	157	165	168	161	152
	% Age-1	85	70	69	70	89	97
1966	Mean length	162	166	170	169	—	152
	% Age-1	83	68	57	65	—	86
1967	Mean length	151	163	160	158	—	150
	% Age-1	91	79	90	87	—	99
1968	Mean length	166	169	175	174	159	154
	% Age-1	60	49	33	57	80	96
1969	Mean length	152	153	—	169	167	152
	% Age-1	85	85	—	69	71	86
1970	Mean length	168	—	168	173	173	165
	% Age-1	72	—	53	43	46	73
1971	Mean length	168	—	168	179	170	158
	% Age-1	60	—	71	63	71	84
1972	Mean length	164	173	182	186	185	162
	% Age-1	85	51	37	15	26	89
1973	Mean length	169	180	177	184	—	163
	% Age-1	57	45	75	55	—	87

Mean lengths and weights of all ages combined also tended to be greater in the center of the fishing area, since mean ages were greater and catches contained a higher proportion of older, larger fish. The variation was similar to, but less than that for mean ages. Monthly means showed similar trends.

At ports in the center of the fishery (Empire to Intracoastal City) mean lengths were greater than at ports in

the eastern (Moss Pt.) or western (Cameron) areas, and the percentage of age-1 fish in most cases was less (Table 11). The tendency of fish to be older and larger at ports in the center of the fishery probably reflects the tendency of vessels to fish most often in areas close to their home ports. The percentage of age-1 fish tended to be greatest at Intracoastal City, the most western port in the central area, than at other ports in the central area, but smaller than at Cameron.

RECRUITMENT AND RELATIVE ABUNDANCE

Fish usually enter the fishery at age-1 at a minimum size of about 120 mm, although some age-0 fish enter at about the same size in September and October. Since some age-1 fish are still less than 100 mm in July, as shown by catch samples, a year class probably is not fully recruited until August or September. The removal of large and the recruitment of small age-1 fish during the fishing season tends to suppress the amount of increase in the mean and modal lengths during the fishing season relative to actual growth.

If age groups are distributed equally in time and space throughout a fishery and if the distribution of fishing effort does not change each year, the catch per unit of effort (CPUE) for each age group is an estimate of relative year class abundance. Since these conditions are closely approximated in the Gulf menhaden fishery, I based estimates of year class abundance on the CPUE of each age group. As a measure of effort, I used the adjusted vessel week² which was calculated from the CPUE of a selected group of vessels and the total catch of all vessels.

For the period covered, there was relatively little variation in year class abundance (Table 12). The total CPUE of all ages in a year class combined ranged from 2.577 million fish per week for the 1965 year class to 5.377 million for the 1968 year class, with a mean of 3.742 million for all years. The most abundant year classes appeared to be the 1964, 1968, and 1970, the least abundant the 1965 and 1971. On the basis of the CPUE of age-2 fish only, the 1962 year class also was probably strong.

There also was little variation in overall abundance. The CPUE for total number of fish, regardless of age, averaged 3.63 million for the 10 yr and ranged from 2.95 (1973) to 4.60 million (1969). Years of greatest relative abundance were 1965, 1969, and 1971 (4.42, 4.60, and 4.38 million, respectively); years of least abundance were 1966, 1972, and 1973 (3.02, 3.01, and 2.95 million, respectively).

²Nicholson, W. R. 1977. Fishing effort, mortality, and MSY in the Gulf menhaden, *Brevoortia patronus*, purse seine fishery. Unpubl. manuscr., 20 p.

Table 12.—Catch per unit of effort (millions of fish) of Gulf menhaden, at each age, 1962-72 year classes.

Year class	Age 1	Age 2	Age 3	Total
1962	—	1.175	0.053	—
1963	2.698	0.715	0.023	3.436
1964	3.618	0.633	0.008	4.259
1965	2.330	0.227	0.020	2.577
1966	3.025	0.627	0.021	3.673
1967	2.442	0.682	0.022	3.146
1968	3.891	1.392	0.094	5.377
1969	2.062	1.034	0.045	3.141
1970	3.241	1.006	0.076	4.323
1971	1.959	0.750	—	—
1972	2.088	—	—	—

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Doyle F. Sutherland

May 1978

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NOAA Technical Report NMFS SSRF-724

**Estimated Average Daily
Instantaneous Numbers of
Recreational and Commercial
Fishermen and Boaters in the
St. Andrew Bay System,
Florida, and Adjacent Coastal
Waters, 1973**

Doyle F. Sutherland

May 1978

U.S. DEPARTMENT OF COMMERCE

Juanita M. Kreps, Secretary

National Oceanic and Atmospheric Administration

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National Marine Fisheries Service

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Estimated Average Daily Instantaneous Numbers of Recreational and Commercial Fishermen and Boaters in the St. Andrew Bay System, Florida, and Adjacent Coastal Waters, 1973

DOYLE F. SUTHERLAND¹

ABSTRACT

In the St. Andrew Bay system and adjacent coastal waters, 92.0% of the estimated recreational fishing effort was for finfish, 3.7% for crabs, 2.7% for scallops, 1.4% for oysters, and 0.2% for shrimp. Coastal waters were the most used area for finfish fishing (36.2%), followed by St. Andrew Bay (31.8%), North and West Bays (21.6%), and East Bay (10.4%). Of the estimated effort, 43.5% was from fixed platforms extending over water, 30.8% from private boats, and the remaining 25.7% from shoreline platforms, charter boats, and water. The most popular method of finfish fishing was with a rod and reel (93.9%).

The annual number of daytime anglers was estimated to range from 208,400 to 303,200 with associated expenditures ranging from \$4.2 to \$6.1 million. The estimates are based on the number of anglers actually seen fishing. The number of transit anglers and other recreational fishermen probably equal or exceed the basic estimates. The average daily instantaneous number of occupants of transit motorboats alone was estimated to reach 52 in North and West Bays, 32 in East Bay, 392 in St. Andrew Bay, and 207 in coastal waters.

The distribution of commercial fishing effort among fisheries was estimated to be 34.7% for shrimp, 33.3% for oysters, 22.0% for finfish, 8.9% for scallops, and 1.1% for crabs. The principal area for each fishery was: East Bay for shrimp (36.5%), oysters (85.7%), and crabs (85.2%); coastal waters for finfish (44.1%); and St. Andrew Bay for scallops (84.4%). The highest estimated average daily instantaneous number of active and transit commercial fishermen in each fishery was 66 for shrimp, 37 for oysters, 91 for finfish, 19 for scallops, and 7 for crabs.

INTRODUCTION

Recreational fishing, boating, water skiing, snorkeling, scuba diving, and similar activities attract millions of persons to marine and estuarine waters each year. The demand for recreational space increases as the population grows and leisure time lengthens. Maintenance of the aesthetic values and biological productivity of the coastal zone, consequently, becomes more difficult.

Vast quantities of living resources are harvested annually by fishermen. Many are occasional fishermen; others are incessant; some fish for sport, others for food, and still others for combinations of sport, food, and economic gains. Few game and food fishes escape their attention. Many edible invertebrates also are harvested.

Data on recreational fishing in marine waters are generally unavailable or inadequate for management considerations. Commercial fisheries, however, are well documented annually, nationwide. Estimates of salt-water angling effort and catch are sparse, although such data were obtained in 1960, 1965, and 1970 by the Bureau of Census for the Bureau of Sport Fisheries and Wildlife

and the National Marine Fisheries Service (Clark 1962; Deuel and Clark 1968; Deuel 1973). Estimates of salt-water angling effort for specific areas have been made by Richards (1962), Moe (1963), Miller and Gotshall (1965), and Pinkas et al. (1967). Attempts to assess the value of recreational angling for State and local areas have been made by Ellis et al. (1958), Brown et al. (1964), Gilbert and Nobe (1969, cited by Gordon et al. 1973), and Gordon et al. (1973).

This report presents the results of a 1-yr study undertaken to: 1) provide resource managers with comparative statistics on recreational and commercial fishing effort in the St. Andrew Bay system and adjacent coastal waters; 2) determine the socioeconomic value of this area to recreational and commercial fishermen; and 3) contribute to the development of methods for obtaining useful statistics on recreational fishing in the coastal zone. The term effort as used in this paper is defined as the number of fishermen and persons that were counted or estimated.

STUDY AREA

The study area was limited to the St. Andrew Bay system and adjacent coastal waters (Fig. 1) located in Bay

¹ Panama City Laboratory, Southeast Fisheries Center, National Marine Fisheries Service, NOAA, Panama City, FL 32401.

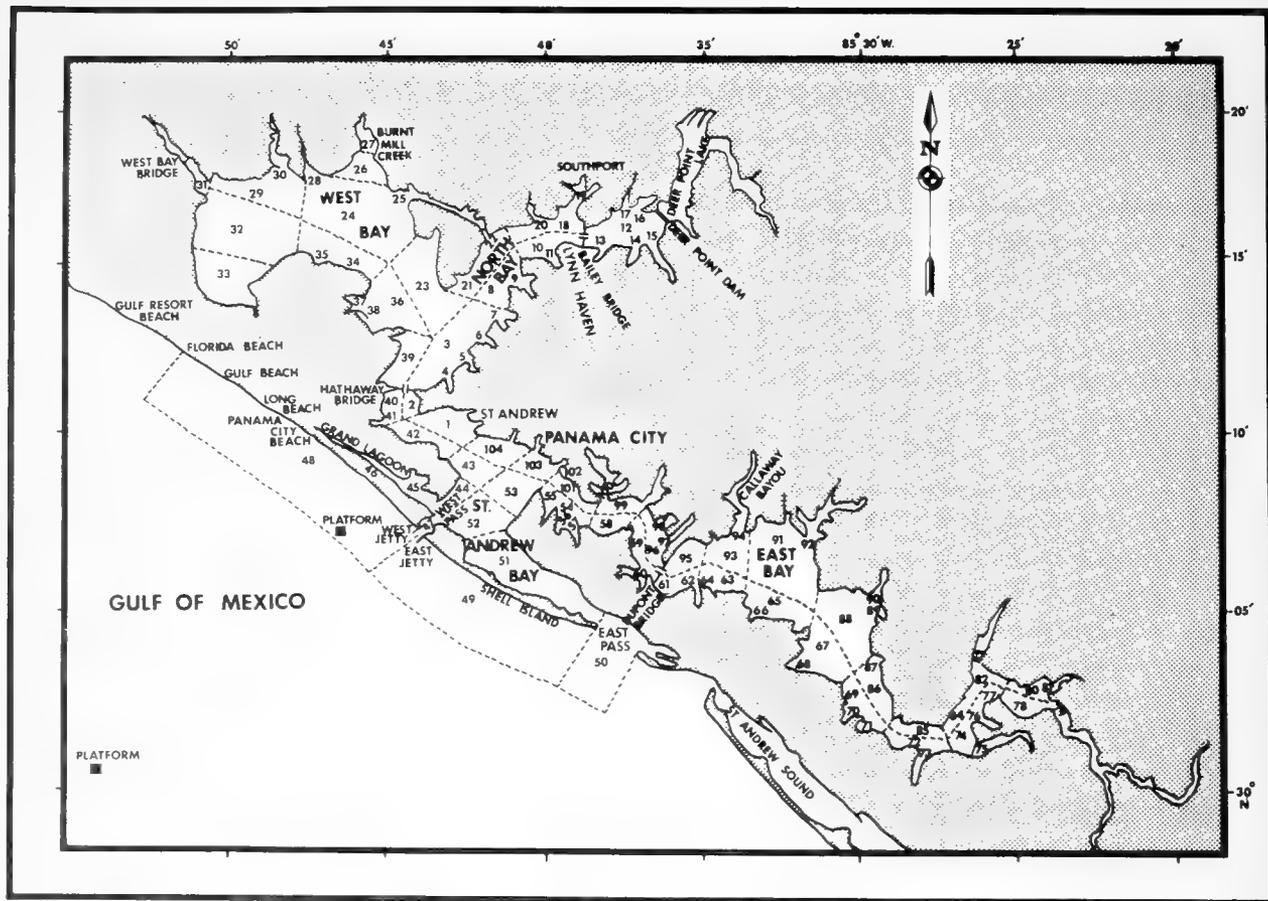


Figure 1.—Survey area and numbered subareas of the St. Andrew Bay system, Fla., and adjacent coastal waters.

County, Fla., along the northeastern Gulf of Mexico (long. 85°23' to 85°53' W, lat. 30°00' to 30°20' N). The system is a shallow plain estuary of about 90 square miles (233 km²). It consists of North Bay, West Bay, East Bay, and St. Andrew Bay. Two passes (East Pass, a natural channel, and West Pass, an excavated channel) connect St. Andrew Bay to the Gulf of Mexico.

For statistical and logistical reasons the study area was divided into four major areas and each major area into several subareas. The major areas were: 1) North and West Bays, 2) East Bay, 3) St. Andrew Bay, and 4) coastal waters. All bayous and brackish water creeks were included in the areas that could be navigated by outboard motorboat or surveyed from an outboard motorboat with the aid of binoculars.

MARINE ESTUARINE FEATURES

The St. Andrew Bay system was described by Waller (1961) as a positive estuary, in that freshwater inflow exceeds evaporation. Econfina Creek, which is dammed at Deer Point in West Bay, is the principal source of freshwater in the system. Several small creeks contribute to the total inflow. The inland bays are generally less saline

than the coastal bay. St. Andrew Bay salinity approaches that of the Gulf of Mexico waters (hereafter referred as gulf waters) (Hopkins 1964). That salinity and turbidity are related was also revealed by Hopkins (1964); the lower saline waters of the inland bays have the highest turbidity. Waller (1961) found lower salinities and transparencies on the westward side of the bay system. Ichiye (in Waller 1961) suggested the condition may result from the Coriolis effect. Repeated observations have shown that gulf waters are usually less transparent west of West Pass than to the east. Floating vegetation of estuarine and freshwater origin is frequently seen off West Pass and seldom off East Pass, suggesting that most of the freshwater flows out of the system through West Pass.

The bay system has mean depths of 1.8 m in North Bay, 2.1 m in West Bay, 2.1 m in East Bay, and 5.2 m in St. Andrew Bay (Waller 1961). Maximan depths to about 15 m are found in ship channels in West Pass and St. Andrew Bay and in the intracoastal waterway through East, St. Andrew, and West Bays (National Ocean Survey, Nautical Chart 868-5C).

East Pass is not maintained, hence it is comparatively shallow and has a constantly shifting entrance channel.

Ichiye and Jones (1961) estimated 65-75% of the tidal volume flows through this pass.

Except for the maintained ship channel in West Pass and seaward approach, the gulf shelf off St. Andrew Bay slopes gradually and smoothly from the shore seaward. At the outer limit of the survey area, the water depth averages 18-20 m.

Extensive beds of submerged vegetation, primarily *Thalassia* and *Diplanthera*, are found in shallow waters of the bay system and in East Pass. Only small scattered beds are evident in West Pass and in coastal waters.

Monthly average water temperatures of the bay range from 11.5°C in January to 28.8°C in July-August (Hopkins 1964). Mean annual rainfall near Panama City was 110 cm and the mean air temperature was 20.6°C for years 1924-46 (Tyndall Air Force Base, unpubl. manuscr.)

PLANS AND PROCEDURES

This study possibly represents the first attempt to derive estimates of all daytime recreational and commercial fishermen and boaters in an estuarine system and adjoining marine waters. Schemes of stratified random sampling and measures of average fishing time have been used successfully to estimate total effort in other studies (Ellis et al. 1958; Pinkas et al. 1967; Deuel 1973). Such schemes could not be used in this study for the following reasons: 1) reliable estimates of total effort require an intensive survey; 2) all types of fisheries, platforms, and methods of fishing were not known at the beginning of the survey; and 3) the peculiarities of each known fishery precluded randomization of the survey effort within areas by fishery or other strata.

To accomplish the stated objectives of this study, the survey was designed to obtain reliable estimates of the average daily instantaneous fishing effort and boating activity in the four major areas. To facilitate comparison of that effort and activity, the four major areas were surveyed systematically on the same days within a fixed period. For logistic reasons, each major area was subdivided into several subareas (Fig. 1).

The plan was to survey the study area on a weekday and weekend-day each week of 1973. Since the surveys were done in small boats, fair weather days were usually selected; most were done in midweekdays and on Saturdays. Time of day, day of the week, starting point, and direction of travel were recognized as unmeasured sources of variation affecting the effort estimates. Of the 104 scheduled surveys, 93 were completed and 11 were abandoned owing to adverse weather or motor failure. The effect was to reduce the number of surveys for computing daily average numbers.

The estimated daily averages were computed from actual counts of the observed effort and activity. Counted were: 1) fishermen and persons participating in each fishery by platform and method of fishing; 2) fishing boats that were used in each fishery; 3) occupants of transit boats; and 4) type of transit boat. The term fishermen refers to those individuals actively fishing or

have fishing equipment in possession; persons refers to all individuals on a fishing platform including fishermen; occupants refers only to individuals on transit boats that may or may not include fishermen; and transit boats refers to those being launched, hauled, underway, anchored, beached, or moored away from their home docks but not being used as a fishing platform when observed.

Counts were made by the surveyors in single traverses of each subarea. In most subareas, the task was completed in a few minutes; the coastal subareas and other heavily used subareas regularly required from 10 to 60 min to complete. All counts regardless of the time of day or duration were assumed to be estimates of the "instantaneous" numbers of persons in all subareas during the survey day—0800-1630 h.

The four major areas were surveyed by three persons—one assigned to North and West Bays, one to East Bay, and one to St. Andrew Bay and adjacent coastal waters. Each surveyor was equipped with an outboard motorboat, a navigation chart of the area and subareas, 7 × 50 binoculars, fishing effort survey logs, and a fishing effort survey guide. The guide contained a numerically coded list of fisheries, platforms, and methods of fishing that were known or suspected to exist in the study area. Corrections and additions to the list were made when revealed by the survey. This list is shown below as it existed at the end of the survey.

<i>Fishery</i>	<i>Platform</i>	<i>Method</i>
Fishfish—food, sport or bait	Private boat	Rod and reel—still
	Commercial boat	Rob and reel—cast
Shrimp—food or bait	Party boat	Rob and reel—troll
	Charter boat	Canepole or hand-line
Crab—food or bait	Bridge	line
	Pier	Cast net
Oyster—food	Dock	Hands
Scallop—food	Jetty	Tongs or rakes
	Shore	Spear
	Seawall	Seine
	Abutment	Trotline
	Water—wade	Trap
	Water—swim	Trawl
		Gill net
		Dip net
		Dredge
		Scuba
		Snorkel

On entering each assigned subarea, the surveyor logged the subarea number, time and code numbers of the fisheries, appropriate platforms, and methods of fishing. All fishermen and persons on stationary platforms were counted. In some subareas within major areas, boats were occasionally too numerous or widely dispersed to classify and to count all individuals on-board. Instead, a count of fishermen, persons, or occupants was made for a sample of boats in each fishery or activity and the average per boat expanded by the total number of boats in each classification.

Fishermen and total number of persons on fishing

boats or transit boats were particularly difficult to assess owing to concealment by the cabin structure. Number, mobility, and distribution of the boats added to the difficulty. The effort could usually be classified rapidly and accurately by observing the fishing gear, activity of individuals on the boats, movement of the boat, and awareness of the fisheries in the subareas. Close approach and prolonged observation was necessary in cases where an unusual activity was observed or when a single boat was used for more than one fishery.

The effort on fixed platforms also presented problems of classification and assessment. Activity on those platforms was rarely static. Fishermen often changed locations and methods of fishing, left their gear unattended, fished only when fish were sighted, and engaged in two or more fisheries simultaneously. Presence of a large number of persons not fishing further complicated the problem. To minimize the error of assessment, the survey was done in the shortest possible time consistent with good judgment. When the effort was highly concentrated, a total count of all persons on the platform was obtained, followed by a count of the fishermen by fishery and method. Persons moving about, entering or leaving with fishing gear in possession, were classified as fishermen. Some error in classification undoubtedly resulted. For example, handlines used by anglers may have appeared identical to the lines used by crabbers; a fish stringer may have appeared as either; a crab trap may have been set and retrieved by rod and reel; and several persons may have shared fishing equipment.

Snorkel and scuba divers engage in diverse recreational activity. In the coastal area it is a popular method of fishing for finfish. Because time or circumstance did not permit personal interviews, they were arbitrarily included in the count of persons using water as the platform in the finfish fishery. In St. Andrew Bay, snorkel and scuba gear are frequently used by recreational and commercial fishermen in their search for scallops. The fishery, however, was easily identified, and the method of gathering scallops was the same as used by others, i.e., hand or dip net.

METHODS OF ESTIMATING EFFORT

Average Daily Instantaneous Effort

Estimates of the average daily instantaneous fishing effort and boating activity were derived by dividing the number of monthly surveys into the sum of the instantaneous counts or estimates in all subareas each month. Estimated averages were calculated for weekdays and weekend-days each month by fishery, platform, method of fishing, and type of boat within each major area.

In those instances when it was necessary to estimate the number of fishermen, persons, or occupants on boats in a subarea the following formula was used:

$$\bar{x} = \left(\frac{A}{B} \right) C$$

where \bar{x} = estimated number

A = number of fishermen, persons, or occupants in sample

B = number of boats in sample

C = total number of boats.

No attempt was made to count or estimate the number of fishermen on party boats (also called head boats) as those boats did not fish in the study area. Fishermen on private boats when still or cast fishing were identified and counted separately from the total number of persons on board. All persons on trolling boats were counted as fishermen. The distinction between methods of fishing is that still and cast fishing is usually an individual effort, and trolling is often a collective effort. All persons on commercial boats, excluding party boats, also were counted as fishermen. Boats were considered the principal platform when used to reach a secondary platform such as a bridge or shore. When used for snorkeling or scuba diving for finfish, water was considered the principal platform. Persons snorkeling or scuba diving from boats often could not be distinguished from those entering the water from shore.

The estimates of effort were summarized for all stationary platforms, and grouped into three categories as follows: 1) extension (bridge, pier, dock, jetty); 2) shoreline (shore, abutment, seawall); and 3) water (wade, swim).

Total Daytime Angling Effort

Estimates of the maximum, minimum, and average number of anglers for the 0800-1630 period were derived from expanded average daily instantaneous numbers. The expansion factors used for anglers and persons on private and charter boats were taken from the results of a survey of sport fishing in Virginia by Richard (1962). In that survey, instantaneous counts were made at 2-h intervals from a single observation point and the corrected totals from dockside interviews. Maximum and minimum variations in the instantaneous counts of private boats yielded corrected total counts when expanded by factors of 2.79 and 1.83, respectively. The average expansion factor was 2.31. For charter boats the expansion factors were 2.18 for maximum estimation, 1.52 for minimum estimation, and 1.80 for average estimation.

Estimates of daytime angling effort on fixed platforms were computed by methods analogous to private and charter boats. Interval counts and interviews were made at three locations in the St. Andrew Bay system and coastal waters at 2-h intervals twice monthly. Variations in angler effort are shown in Table 1. Since the average fishing time on those platforms was less than 2 h, those anglers who arrived after a surveyor's visit and left before the surveyor's next visit were not counted. Thus, the estimated total number of anglers exceeded the sum of interval counts. The estimated total was computed by the method of Moyle and Franklin (1957). The expansion factors derived from the instantaneous counts and

Table 1.--Number of anglers counted bihourly, number of anglers interviewed, and total hours fished at three locations in St. Andrew Bay system, Florida, and adjacent coastal waters, 1973.

Location	Time of counts				Anglers interviewed	
	0900	1100	1300	1500	Number	Hours fished
West Jetty	196	409	351	294	298	594.25
Hathaway Bridge	252	323	249	273	234	508.50
Deer Point Dam	158	144	156	189	180	305.00
Total	606	876	736	756	712	1,407.75

the corrected totals were 4.96 for maximum variation, 3.43 for minimum variation, and 4.4 for average variation.

RECREATIONAL FISHING EFFORT

Distribution of Effort

Finfish fishing was by far the most important of the five recreational fisheries that were disclosed by the effort survey (Table 2). Of the sum of the estimated average daily instantaneous number of recreational fishermen, 92.0% fished for finfish, 3.7% for crabs, 2.7% for scallops, 1.4% for oysters, and 0.2% for shrimp.

Finfish fishing dominated the recreational fishing effort in all areas. Coastal water was the most important single area for finfish fishing (36.2%), closely followed by St. Andrew Bay (31.8%). St. Andrew Bay was the most important for crabbing (64.8%) and scalloping (93.8%), East Bay for oystering (71.8%), and North and West Bays for shrimping (56.3%). While finfish fishing and crabbing were important activities in all areas, oystering and shrimping were limited to the bay system and scalloping to St. Andrew Bay and adjacent coastal waters (Table 3).

Finfish Fishing Effort

The estimated recreational finfish fishing effort on weekdays, weekend-days each month in the four major areas is shown in Figure 2. The effort on weekend-days exceeded the weekday effort each month in all areas. The seasonal effort pattern differed by area, however. In North and West Bays and in East Bay, the greatest effort occurred during late fall and winter months, while in St. Andrew Bay and coastal waters it occurred during spring through fall months.

Factors contributing to the differences in seasonal fishing pattern in the four major areas were chiefly environmental conditions, availability of finfish, and vacation schedules. Adverse weather and sea conditions limit boat operations in open bay and coastal waters in late fall through early spring. Pelagic fishes decline in avail-

Table 2.--Percentage distribution of recreational fishing effort among fisheries and areas, 1973.

Fishery	North and West Bays	East Bay	St. Andrew Bay	Coastal waters	Sum
Finfish	19.8	9.6	29.3	33.3	92.0
Crabs	0.8	0.4	2.4	0.1	3.7
Scallops	0.0	0.0	2.6	0.2	2.7
Oysters	0.3	1.0	0.1	0.0	1.4
Shrimp	<0.1	<0.1	<0.1	0.0	0.2

Table 3.--Percentage distribution of recreational fishing effort within fisheries by areas, 1973.

Fishery	North and West Bays	East Bay	St. Andrew Bay	Coastal waters	Sum
Finfish	21.6	10.4	31.8	36.2	100
Crabs	21.9	9.5	64.8	3.8	100
Scallops	0.0	0.0	93.8	6.2	100
Oysters	18.7	71.8	9.5	0.0	100
Shrimp	56.3	19.9	23.8	0.0	100

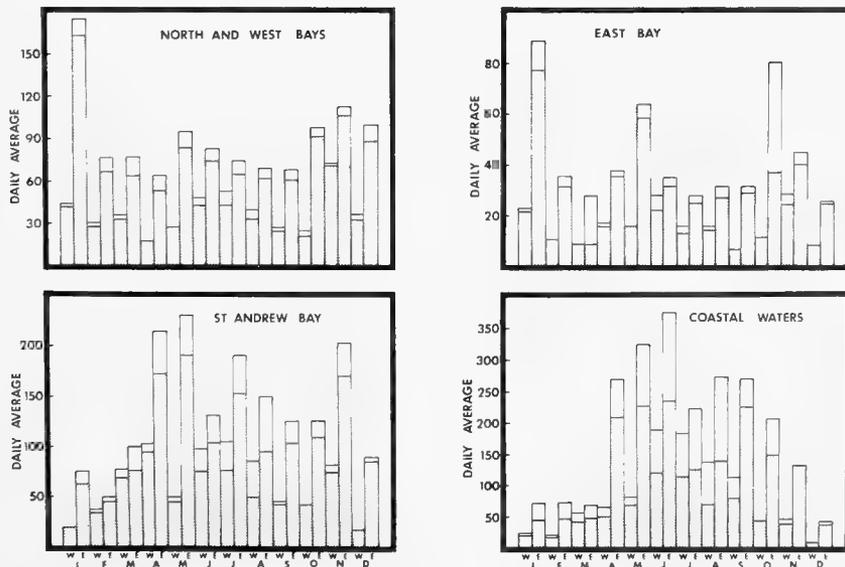


Figure 2.—Estimated average daily instantaneous numbers of recreational finfish fishermen (dark) and persons (light) by areas, weekdays (W), and weekend-days (E) each month in 1973.

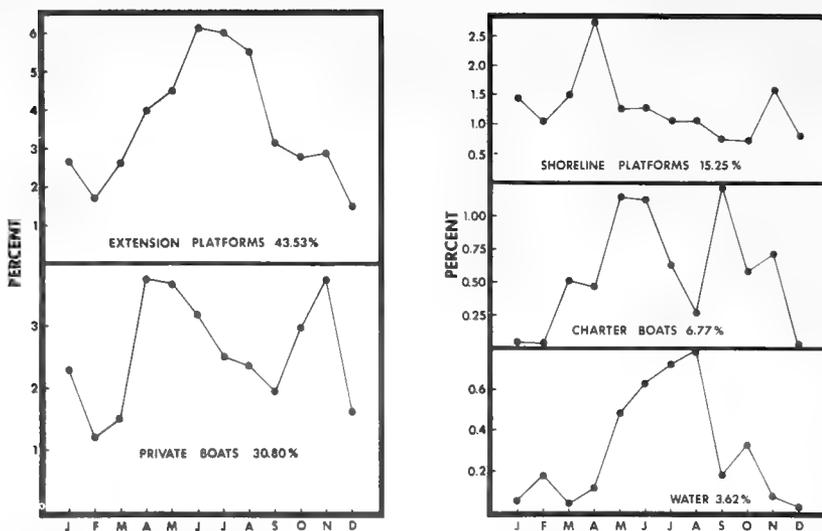


Figure 3.—Percentage distribution of the estimated average daily instantaneous numbers of recreational finfish fishermen in all areas by type of platform used each month in 1973.

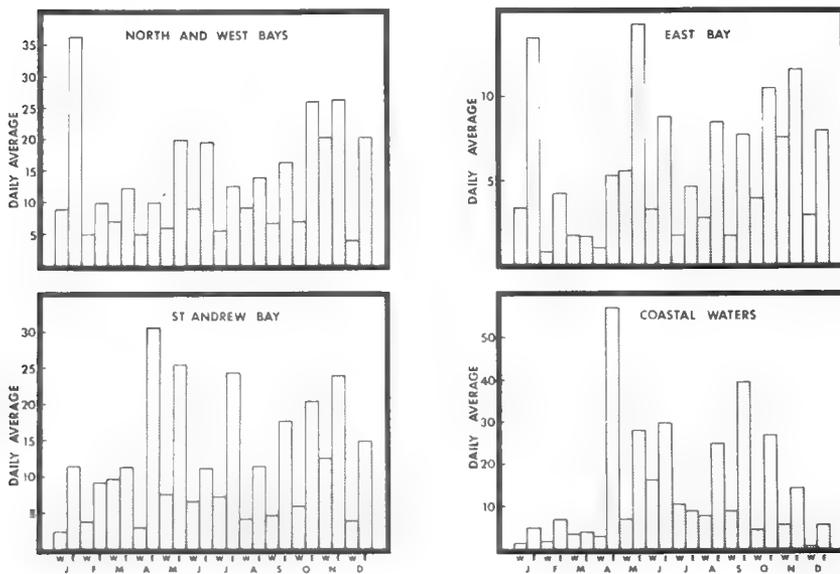


Figure 4.—Estimated average daily instantaneous numbers of private boats used in recreational finfish fishing by areas, weekdays (W), and weekend-days (E) each month in 1973.

ability during these months and certain bay fishes, particularly spotted seatrout, *Cynoscion nebulosus*; red drum, *Sciaenops ocellata*; and mullet, *Mugil sp.*, become increasingly available in protected waters. The latter are pursued vigorously by fishermen in small boats and from fixed platforms in lagoons and bayous of the bay areas. Fishing effort in St. Andrews Bay increases in March with the arrival of Spanish mackerel, *Scomberomorus maculatus*, and in coastal waters with the arrival of king mackerel, *Scomberomorus cavalla*, from mid-May to early June. Summer visitors to the area contribute heavily to recreational fishing in St. Andrew Bay and coastal waters.

The percentage distribution of recreational finfish fishing effort by type of platform and by month is shown in Figure 3. The sum of all daily estimates of persons finfish fishing was included in the percentage calculations. The relative importance of fixed platforms that extend out from the shorelines to other types is clearly indicated. Limitations of the coastal water survey to 2 miles offshore minimizes the relative importance of charter boats as a fishing platform. Frequently, charter boats were seen fishing just beyond the 2-mile boundary during the survey period; many others were observed in transit within the survey area. The limitation also applied to private boats, but to a lesser extent.

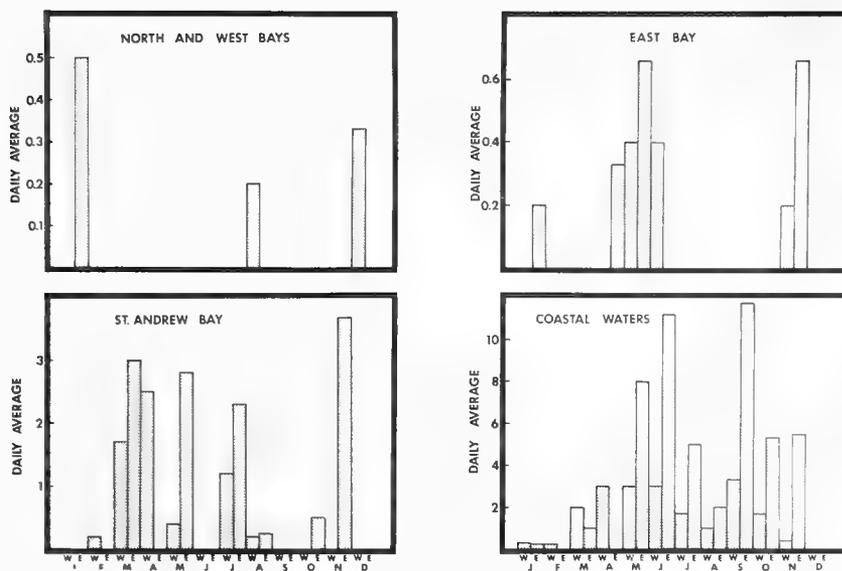


Figure 5.—Estimated average daily instantaneous numbers of charter boats used in recreational finfish fishing by areas, weekdays (W), and weekend-days (E) each month in 1973.

The areal distribution of, and estimated recreational finfish fishing effort on, private and charter boats by months, weekdays, and weekend-days are shown in Figures 4 and 5. All methods of fishing for food, sport, and bait finfish are included in the estimates. The daily and monthly variations in distribution and numbers of private boats were similar to those of finfish fishermen (Fig. 2) for the reasons previously described. In contrast to private boats, charter boats were infrequently seen in North, West, or East Bays. While fishermen occasionally charter a boat to fish in those areas, the relatively small number of fishermen and persons counted on those boats suggested that most were used privately by the owner for recreational fishing. Seasonal irregularities in the estimated numbers of charter boats in St. Andrew Bay and adjacent coastal waters were largely due to changes in availability and movement of game fishes and to sea conditions.

The percentage distribution of recreational finfish fishing effort by method of fishing, area, and platform is shown in Table 4. The percentages were computed from the sum of all daily estimates of recreational finfish fishermen and persons snorkeling and scuba diving. Of the various methods of finfish fishing, still, cast, and troll fishing with a rod and reel was by far the most popular, composing 93.9% of the effort in all areas from all platforms. Still fishing with a rod and reel, canepole, and handline composed 61.2% of the effort followed by trolling (22.4%) and casting (12.2%). A substantial number of persons used snorkel and scuba gear in pursuit of finfish (3.2%). Spear (gig) and net fishing composed only 1.0% of the estimated daily effort.

Recreational Anglers and Expenditures

Estimates of the number of recreational anglers in the St. Andrew Bay system and adjacent coastal waters in

Table 4.—Percentage of distribution of recreational finfish fishing effort by methods of fishing, areas, and platforms in 1973.

Methods	North and West Bays %	East Bay %	St. Andrew Bay %	Coastal waters %	All areas %
-----from private boats-----					
RR*-still	65.97	55.97	43.53	25.15	44.99
RR-cast	28.22	35.15	18.05	1.69	17.43
RR-troll	4.60	7.13	37.52	73.08	36.55
Canepole**	0.80	2.30	0.04	0.08	0.52
Spear	0.11	0.12	0	0	0.04
Gillnet	0.11	0.53	0.31	0	0.17
Cast net	0.15	0	0.25	0	0.11
Dip net	0	0.12	0	0	0.01
Seine	0	0.69	0.27	0	0.15
Trotline	0	0	0.04	0	0.01
Trawl	0.04	0	0	0	0.01
-----from charter boats-----					
RR-still	34.64	22.07	1.46	0.48	1.08
RR-cast	16.34	65.95	1.12	0	1.25
RR-troll	49.02	7.98	97.42	99.52	97.66
-----from extension platforms-----					
RR-still	88.06	90.35	91.41	84.30	87.65
RR-cast	6.32	7.01	3.43	14.44	9.02
Canepole**	4.54	2.01	4.21	1.21	2.77
Cast net	0.95	0.62	0.92	0.05	0.52
Spear	0.13	0	0.04	0	0.04
-----from shoreline platforms-----					
RR-still	81.36	72.48	79.77	80.04	79.46
RR-cast	9.28	23.77	12.09	19.96	12.71
Canepole**	5.49	2.60	6.97	0	5.87
Cast net	3.86	1.15	1.17	0	1.97
-----from water-----					
RR-still	17.96	20.47	17.54	3.35	8.66
RR-cast	27.89	57.69	26.39	0.65	11.32
Canepole*	0	0	0.25	0	0.07
Spear	4.78	4.60	0	0	0.36
Cast net	27.22	13.65	4.18	1.30	3.58
Gill net	8.79	0	0	0	0.33
Seine	13.37	3.64	7.74	0	2.87
Snorkel	0	0	11.63	64.65	44.42
SCUBA	0	0	32.28	30.04	28.40

*Rod and reel

**Includes handlines

1973 and their expenditures were derived from two sources: first, from an estimate of the total number of daytime anglers in each area by months, weekdays, and weekend-days; second, from an estimate of the monies spent per angler per day.

Results of the 1970 national survey of fishing and hunting (U.S. Fish and Wildlife Service, Bureau of Sport

Fisheries and Wildlife 1972) showed that 9,460,000 saltwater fishermen on all coasts spent \$1,224,705,000 for 113,694,000 recreational days. From those data, an average of \$129 during the entire year or \$10.77 each recreational day was calculated to have been spent by each saltwater fisherman. On the gulf coast each of 2,272,000 fishermen spent an average of \$178 during the entire year, or \$11.36 per recreational day.

In a 1974 survey of Florida's coastal counties, Fred W. Bell (pers. commun.) found that the expenditures relating to a recreational angling day averaged \$21.32. An expenditure of \$18.97 per angling day was used in this study to estimate the expenditures of recreational anglers in St. Andrew Bay system and adjacent waters. That figure was derived by reducing \$21.32 by 11% to account for the inflationary rate during the period 1973-74.

The term "recreational fishermen" as used by the reference sources above applied to recreational anglers only. The term "angler" as currently used refers only to fishermen who use a hook-and-line to take finfish. Therefore, the average expenditure of \$18.97 for an angling day applies only to recreational angling for finfish and not to other methods of finfish fishing or to other fisheries. The estimates of anglers and expenditures presented in this section, then, are based on numbers of finfish fishermen identified as fishing with hook-and-line only.

The estimated annual number of daytime anglers in St. Andrew Bay and adjacent coastal waters in 1973 and their expenditures are summarized in Table 5 by area and angling platform.

The number of daytime anglers in all areas and on all platforms was estimated to range from a minimum of 208,400 to a maximum of 303,200 and the expenditures from a minimum of \$4.2 million to a maximum of \$6.1 million. The estimates include only those anglers that fished from 0800 to 1630 h. Excluded were an approximately equal number of individuals that were classified as occupants of transit boats, the majority of whom were enroute to or returning to finfish fishing grounds.

Crab Fishing Effort

Recreational crab fishing was second in importance to finfish fishing in the St. Andrew Bay system and adjacent coastal waters, composing 3.7% of the recreational fishing effort. Most crab fishing effort was limited to summer months when the blue crab, *Callinectes sapidus*, was available in shallow water. A small winter fishery for the blue crab was observed in West Bay, subarea 25. The water in that subarea, warmed by the effluent from an electric generating plant, provided a suitable shallow-water habitat for the crabs in the winter months. The crab was sought primarily for its food value.

The fiddler crab, *Uca* sp., was observed to be harvested by an occasional recreational angler. The crabs are used locally as bait for catching sheepshead, *Archosargus probatocephalus*, and black drum, *Pogonias cromis*.

The estimated recreational crab fishing effort is shown in Figure 6 for major areas, weekdays, and weekend-days each month in 1973. The estimates include both food and bait crab fishing from all platforms by all methods.

Classification and assessment of fishermen and persons participating in the recreational crab fishery were particularly difficult for the surveyor, for it was not essential that all participants have fishing equipment in possession. That is, fishermen may actively search for crabs by wading or boating in shallow water but do not participate in their capture. Frequently, several crab fishermen share a single dip net or crab trap. In areas where both crabs and scallops were found, the fishermen often engage in the two fisheries simultaneously. Baited traps and handlines usually require less than full attention of fishermen. During periods of inactivity, the fishermen may appear to the surveyor as observers. As a result, the number of fishermen may be underestimated or in some cases the effort incorrectly classified.

Comparison of platforms and the estimated average daily instantaneous number of private boats used in the recreational crab fishery are shown in Figures 7 and 8.

Table 5. Estimates of the annual number of daytime anglers and expenditures (in hundreds) in St. Andrew Bay and adjacent coastal waters in 1973 by area and fishing platforms

Area	Number of anglers		Expenditures		St. Andrew Bay Anglers	Coastal Waters Anglers	Coastal Waters Dollars	Total	
	Maximum	Average	Maximum	Average				Anglers	Dollars
St. Andrew Bay									
Maximum	1,000	1,000	1,000	1,000	4,000	2,000	5,000	600	16,719.9
Minimum	1	1	1	1	140	140	1,615	561	11,205.2
Average	1,000	1,000	1,000	1,000	140	140	1,615	703.9	14,056.7
St. Andrew Bay and Coastal Waters									
Maximum	4	4	4	4	625	110	2,428.5	150.6	3,008.1
Minimum	1	1	1	1	477	47	1,631.6	165.4	2,105.7
Average	4	4	4	4	500	90	1,952.5	124.9	2,493.7
St. Andrew Bay and Coastal Waters (Transit Boats)									
Maximum	1,000	1,000	1,000	1,000	9,000	600	12,741.7	1,480.9	29,576.0
Minimum	1	1	1	1	70	44	8,810.4	1,024.1	20,451.7
Average	1,000	1,000	1,000	1,000	70	52	7,388.5	1,207.5	24,112.4
St. Andrew Bay and Coastal Waters (Boats)									
Maximum	1,000	1,000	1,000	1,000	6,000	90	153.5	520	10,398.2
Minimum	1	1	1	1	4,200	6	126.5	363.7	7,261.3
Average	1,000	1,000	1,000	1,000	5,000	7	149.6	428.3	8,553.6
St. Andrew Bay and Coastal Waters (Wading)									
Maximum	2,000	2,000	2,000	2,000	400	11	234.0	42.5	850.7
Minimum	2	2	2	2	324	6	161.8	29.4	588.1
Average	2,000	2,000	2,000	2,000	300	9	190.5	34.6	691.1

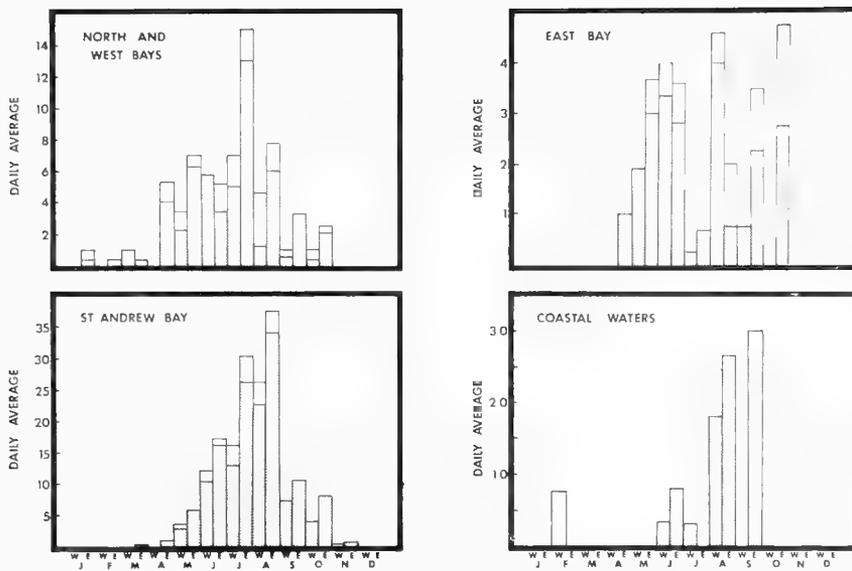


Figure 6.—Estimated average daily instantaneous numbers of recreational crab fishermen (dark) and persons (light) by areas, weekdays (W), and weekend-days (E) each month in 1973.

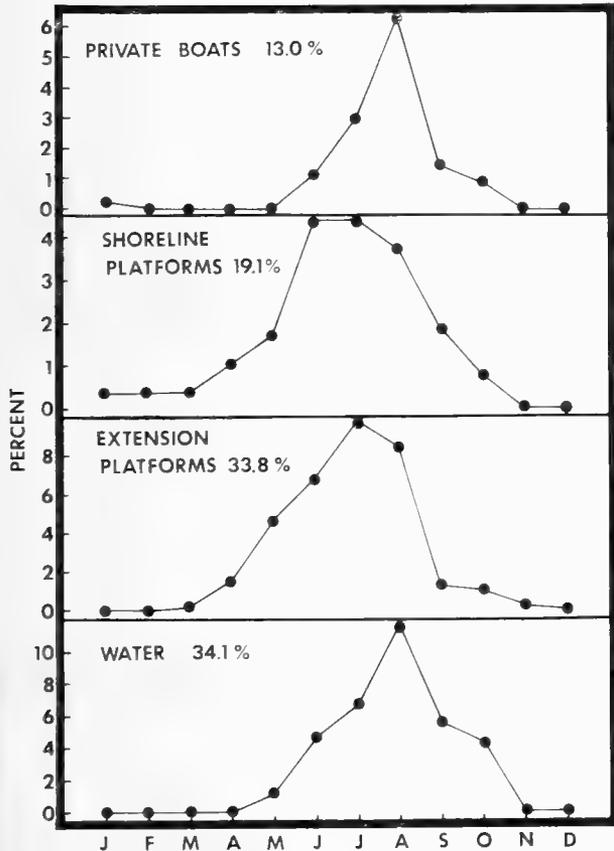


Figure 7.—Percentage distribution of the estimated average daily instantaneous numbers of recreational crab fishermen in all areas by type of platform used each month in 1973.

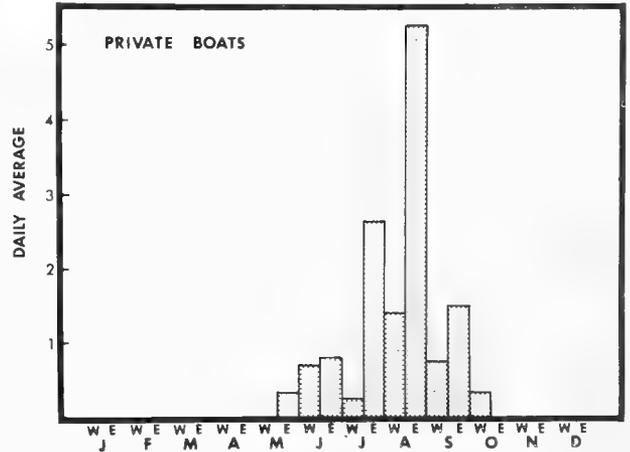


Figure 8.—Estimated average daily instantaneous numbers of private boats used for recreational crab fishing in all areas on weekdays (W) and weekend-days (E) each month in 1973.

Table 6.—Percentage distribution of recreational crab fishing effort by methods of fishing, areas, and platforms in 1973.

Methods	North and West Bays %	East Bay %	St. Andrew Bay %	Coastal waters %	All areas %
-----private boats-----					
Dip net	66.3	100.0	95.2	0	57.9
Trap	27.4	0	4.8	0	13.4
Trotline	6.3	0	0	0	1.7
-----extension platforms-----					
Dip nets	10.9	35.6	1.2	0	4.9
Trap	82.1	12.2	83.4	3.73	79.7
Handline	7.0	52.2	15.4	0	15.4
-----shoreline platforms-----					
Dip net	31.8	60.3	16.1	0	28.1
Trap	38.0	33.4	70.1	0	50.5
Handline	30.2	6.2	13.8	0	21.4
-----water-----					
Dip net	100.0	93.7	99.7	5.16	99.2
Handline	0	6.3	0.3	0	0.8

The order of preference for crab fishing platforms as indicated by the estimated number of fishermen was water

(36.1%), extension platforms (34.1%), shoreline platforms (17.7%), and private boats (12.1%).

Assessment of the methods of recreational crab fishing by type of platform and month is shown in Table 6.

Crabbers fishing in shallow water by wading or boating preferred to visually search and capture crabs with a dip net (93.6%). Since the crabs frequent shallow water and were widely distributed, availability was virtually assured at all access sites. A trap was preferred by those fishermen on extension and shoreline platforms (65.1%). The crab fishing effort by trapping may be underestimated, however, for many traps are fished almost continuously from private docks.

Scallop Fishing Effort

The bay scallop, *Pecten irradians*, supported a substantial recreational fishery in 1973. That fishery attracted 2.8% of the estimated effort for all fisheries and was third in importance to recreational fishermen after finfish and crabs.

Unlike finfish and crabs, scallops were limited in distribution to lower St. Andrew Bay and East Pass. According to the distribution of fishing effort they were found in abundance only in subareas 44, 45, and 50-53.

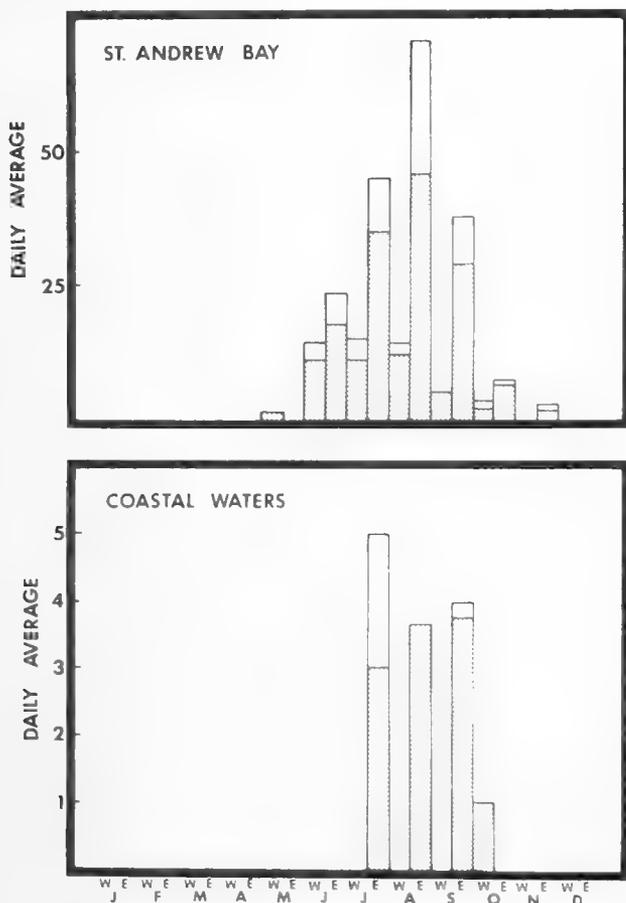


Figure 9.—Estimated average daily instantaneous numbers of recreational scallop fishermen (dark) and persons (light) by areas, weekdays (W), and weekend-days (E) each month in 1973. None was observed in North, West, and East Bays.

An occasional scallop fisherman was seen in other sub-areas of St. Andrew Bay; none were seen in North, West, or East Bay. While scallops apparently reside in grass beds all year (Gutsell 1931), the annual harvest began in early May and extended through September. Florida State law permits taking of scallops by hand or dredge from 1 June through 15 October and only by hand on other days.

The estimated recreational scallop fishing effort is shown in Figure 9 by areas on weekdays and weekend-days each month in 1973. The estimated effort includes all methods of fishing from all platforms.

Only two platforms were used in this fishery, private boats and water (Figs. 10, 11). Private boats served primarily as a means of transport to scallop grounds. Most fishermen entered the water and fished by wading, snorkeling, and scuba diving. Those that used water as the primary platform entered from shore.

Most fishermen preferred to search for scallops and catch them by hand (Table 7). Snorkel and scuba equipment extended the effort to considerable depth. Comparatively few fishermen searched for scallops while standing in a boat or by wading and dip netting them in a manner similar to crab fishing. A dredge was fished occasionally from private motorboats.

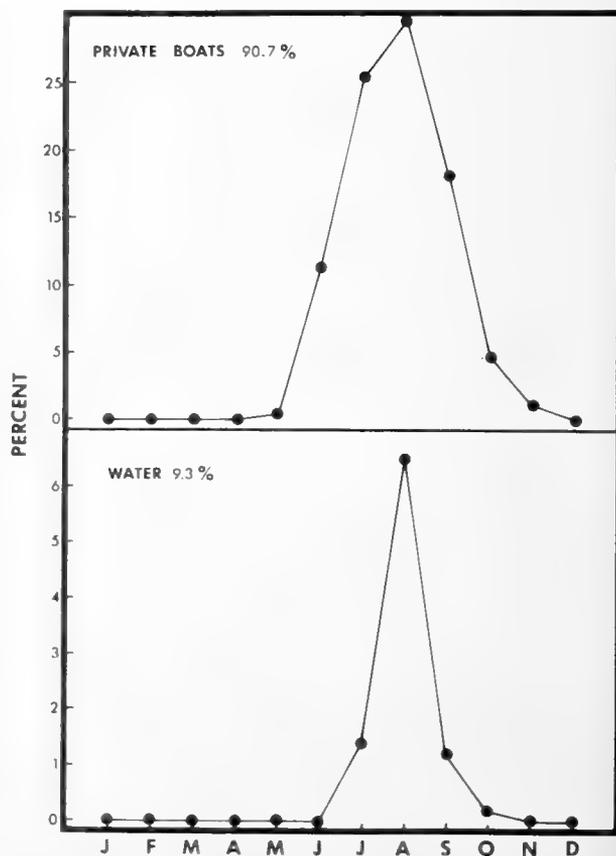


Figure 10.—Percentage distribution of the estimated average daily instantaneous numbers of recreational scallop fishermen in all areas by type of platform used each month in 1973.

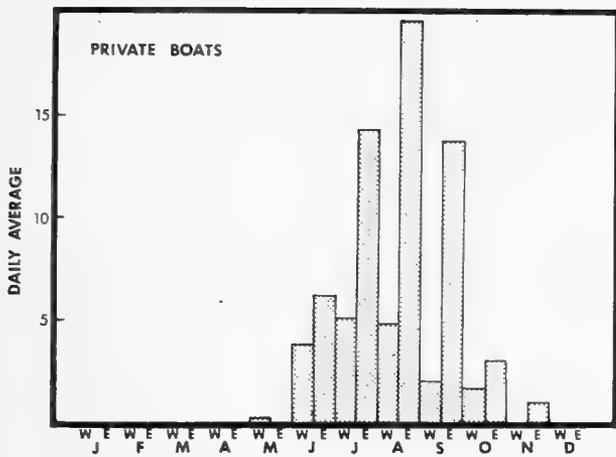


Figure 11.—Estimated average daily instantaneous numbers of private boats used for recreational scallop fishing in all areas on weekdays (W) and weekend-days (E) each month in 1973.

Table 7.—Percentage distribution of recreational scallop fishing effort by methods of fishing, areas, and platforms in 1973.

Method	Private boats			Water		
	St. Andrew Bay %	Coastal waters %	All areas %	St. Andrew Bay %	Coastal waters %	All areas %
Hands	89.2	26.7	86.0	84.1	100.0	89.1
Dredge	9.70	73.3	13.0	0	0	0
Dip net	1.1	0	1.0	15.9	0	10.9

Oyster Fishing Effort

The oyster fishery attracted 1.4% of the estimated recreational fishing effort and was fourth in importance to recreational fishermen after finfish, crabs, and scallops. Of that effort, 71.8% occurred in East Bay, 18.7% in North and West Bays, and 9.5% in St. Andrew Bay. None occurred in coastal waters.

In East Bay, subareas 92 and 94 supported most of the oystering effort, although numerous oyster beds are located in the bay and in most bayous. Subarea 12 and adjoining bayous, subarea 19 and adjoining bay area, and subarea 30 and adjoining bay area were popular oyster grounds in North and West Bays. Virtually all recreational oystering in St. Andrew Bay was observed in subareas 59 and 60.

The estimated recreational oyster fishing effort is shown in Figure 12 by areas, weekdays, and weekend-days each month in 1973. The taking of oysters is prohibited by law in June, July, and August.

Oyster fishing was done primarily from private boats as the more productive beds were inaccessible from fixed platforms. During periods of very low tide, exposed oysters were harvested in limited numbers from shore or by wading. Assessment of the recreational oystering effort by type of platform is shown in Figure 13 and the number of private boats in Figure 14.

Most of the oysters were harvested with tongs or rakes from boats anchored over oyster beds (Table 8). In shall-

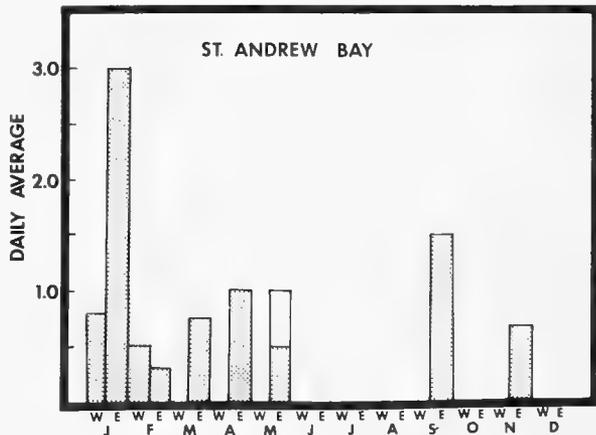
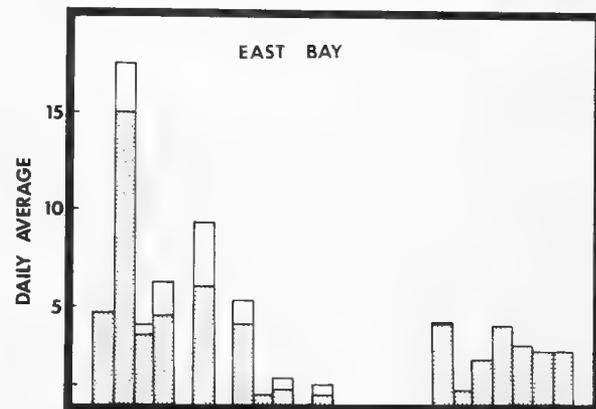
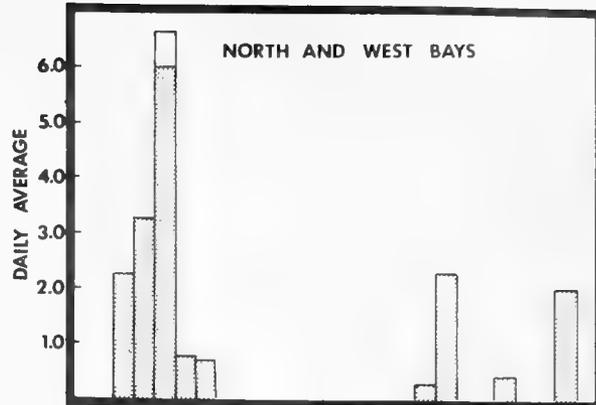


Figure 12.—Estimated average daily instantaneous numbers of recreational oyster fishermen (dark) and persons (light) by areas, weekdays (W), and weekend-days (E) each month in 1973. None was observed in coastal waters.

low water and intertidal zone the oysters were simply gathered by hand or dip net.

Shrimp Fishing Effort

From the results of this survey, shrimp was ranked fifth and least important of the daytime recreational fisheries in the St. Andrew Bay system and adjacent coastal waters in 1973. That effort, composed 0.2% of the

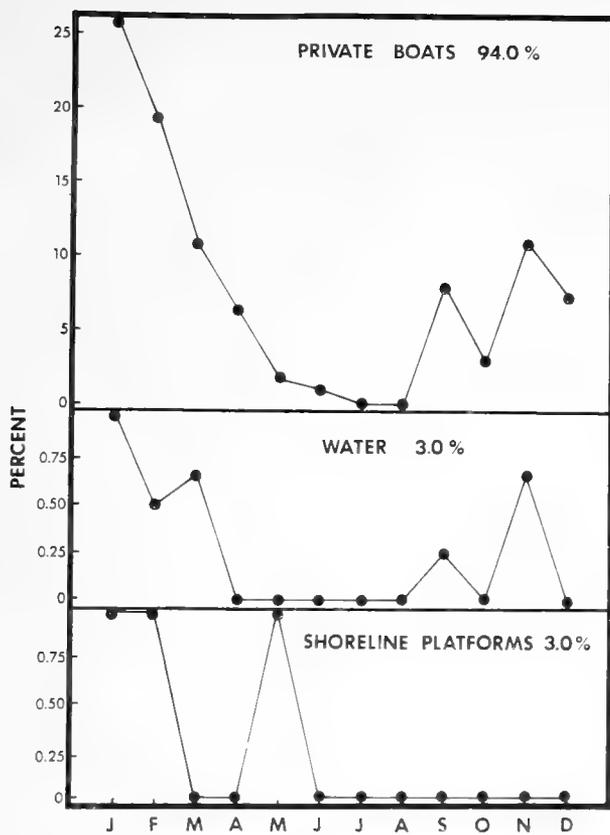


Figure 13.—Percentage distribution of the estimated daily instantaneous numbers of private boats used for recreational scallop fishing in all areas on weekdays (W) and weekend-days (E) each month in 1973.

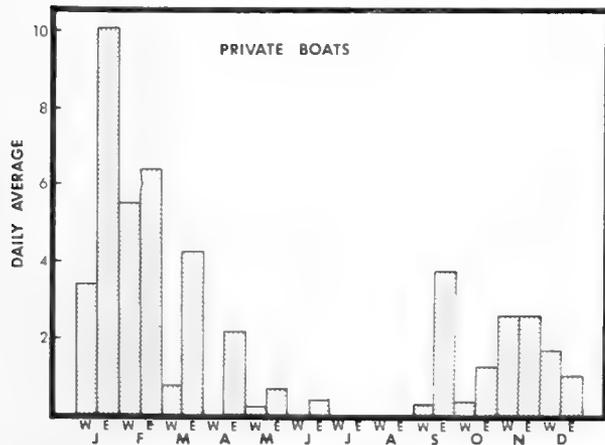


Figure 14.—Estimated average daily instantaneous numbers of private boats used for recreational scallop fishing in all areas on weekdays (W) and weekend-days (E) each month in 1973.

estimated effort for all fisheries, was irregularly distributed through the year and was essentially limited to weekend-days in North and West Bays (Fig. 15).

Table 8.—Percentage distribution of recreational oyster fishing effort by methods of fishing, areas, and platforms in 1973.

Methods	North and West Bays %	East Bay %	St. Andrew Bay %	All areas %
Private boats				
Tongs	82.68	93.11	93.63	90.89
Hands	3.87	5.82	6.37	5.45
Dredge	11.55	0	0	2.51
Dip net	1.90	1.07	0	1.14
Shoreline platforms				
Tongs	0	30.00	0	10.00
Hands	0	70.00	100.00	90.00
Water				
Tongs	0	47.92	0	29.77
Hands	100.00	52.08	0.67	70.23

The observed recreational shrimping was limited to trawling with private boats and trapping from shoreline platforms. The trawling effort could easily be identified by the boat rigging and trawl warp. Shrimp trapping, however, was a problem as the method differs little from that used by crabbers. By close observation, the surveyor could usually detect differences in the trap and accessories used in the two fisheries. On occasion, the fishery could only be determined from personal interviews.

Assessment of the platforms and methods that were used in the recreational shrimp fishery is shown in Figures 16 and 17 and Table 9.

TRANSIT RECREATIONAL BOATS AND OCCUPANTS

This survey included an assessment of transit recreational boats and occupants. Since circumstances did not permit personal interview of the occupants, their activities were simply classed according to boat type. From repeated observations, the function of most boats could be determined from the boat structure, gear, appearance of the occupants, location, and direction of travel. On weekdays and in inclement weather, an estimated 90-100% of the observed private motorboats were enroute to or returning from fishing. On weekend-days during fair weather the proportion of nonfishing motorboats increased but probably did not exceed 20%.

Included in the category of private motorboats were licensed and unlicensed boats of all sizes or classes used for recreational purposes, rentals with or without guides, canoes with or without a motor, and motorized inflatable craft. Nonmotorized rafts, such as inner tubes and similar floatation devices, were excluded since they relate more to swimming than fishing. The estimated average daily instantaneous number of private motorboats is shown in Figure 18 by areas, weekdays, and weekend-days for each month in 1973.

Sailing was an important recreational pursuit in local waters. However, an occasional sailboat was seen trolling while under full sail. They also served as an anchored platform for finfish fishing, crabbing, and scalloping. Classification and assessment in such cases was the same as other private boats. Of the observed sailboats, probably less than 5% were used as fishing platforms. An area comparison of the estimated average daily number of transit sailboats is shown in Figure 19.

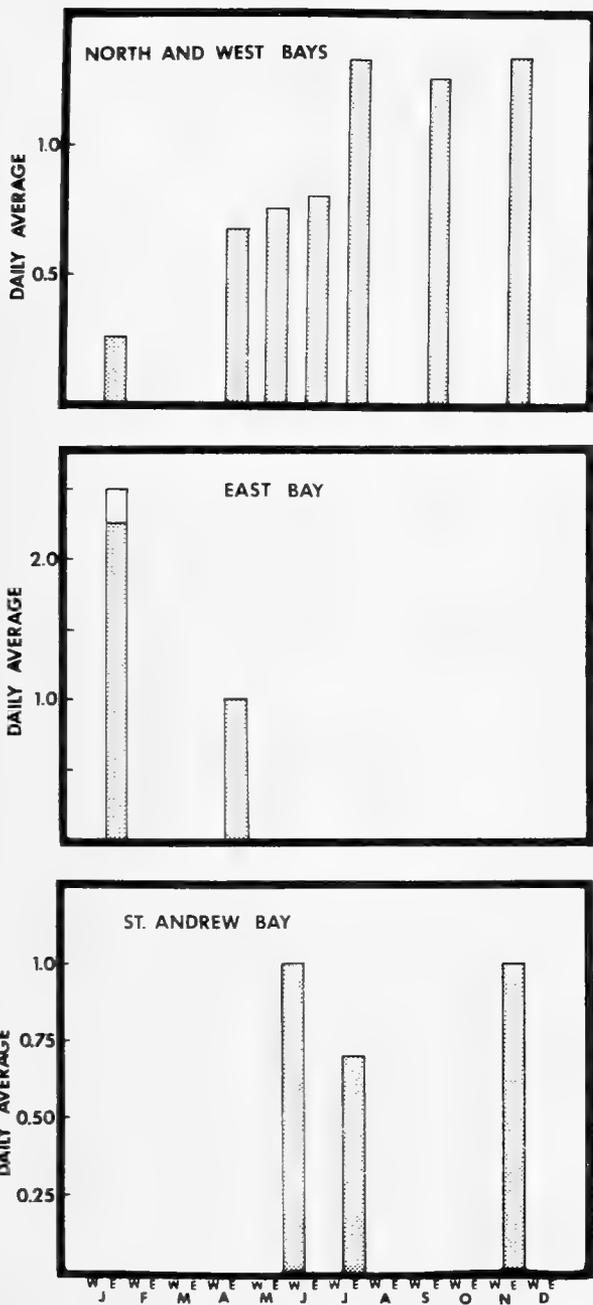


Figure 15.—Estimated average daily instantaneous numbers of recreational shrimp fishermen (dark) and persons (light) by areas, weekdays (W), and weekend-days (E) each month in 1973. None was observed in coastal waters.

Skiing, like sailing, was an important recreational water sport in local waters. Ski boats are commonly used alternately for skiing and fishing. Their proportionate use as a fishing platform was not determined by this survey. An area comparison of the estimated average daily number of transit ski boats is shown in Figure 20.

From 125 to 130 charter boats and about 15 party boats operated intermittently or on a daily schedule out of local marinas in 1973. They are included in this section

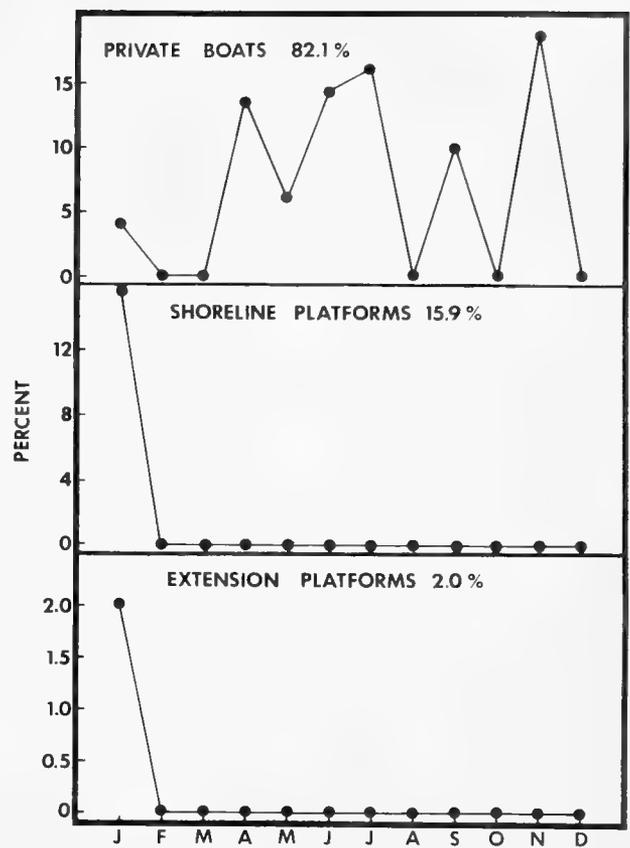


Figure 16.—Percentage distribution of the estimated average daily instantaneous numbers of recreational shrimp fishermen in all areas by type of platform used each month in 1973.

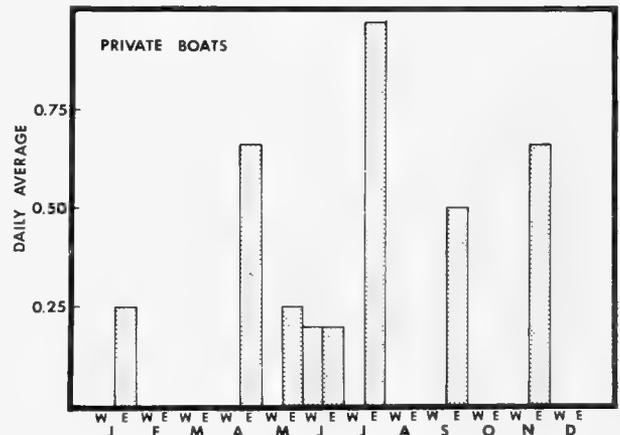


Figure 17.—Estimated average daily instantaneous numbers of private boats used for recreational shrimp fishing in all areas on weekdays (W) and weekend-days (E) each month in 1973.

Table 9.—Percentage distribution of recreational shrimp fishing effort by methods of fishing areas and platforms in 1973.

Method	North and West Bays %	East Bay %	St. Andrew Bay %	Coastal waters %	All areas %
	-----private boats-----				
Trawl	96.08	22.22	2.67	0	82.50
	-----shoreline platforms-----				
Trap	3.92	77.78	0	0	17.70

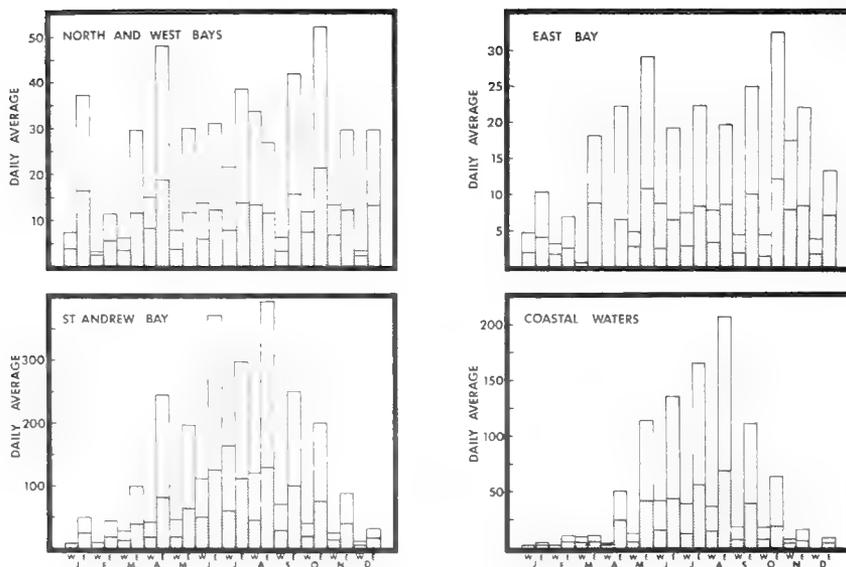


Figure 18.—Estimated average daily instantaneous numbers of transit private motorboats (dark) and occupants (light) by areas, weekdays (W), and weekend-days (E) each month in 1973.

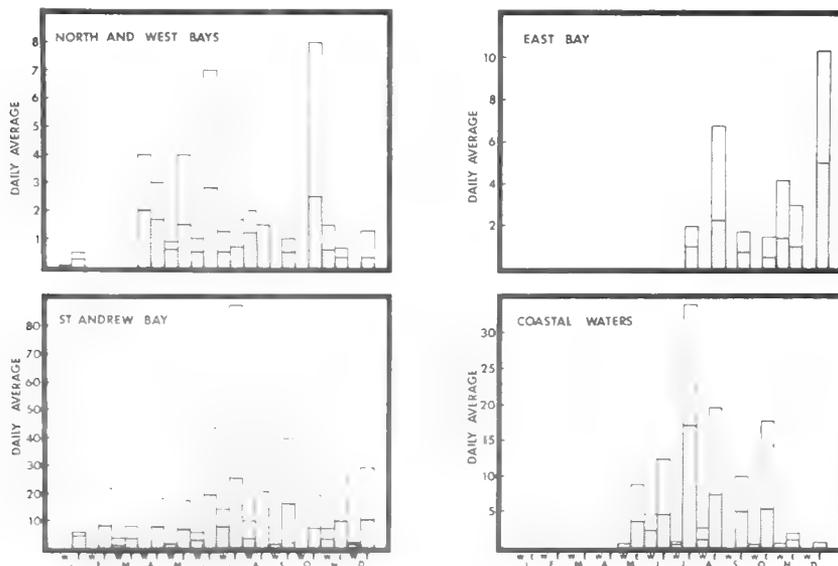


Figure 19.—Estimated average daily instantaneous numbers of transit private sailboats (dark) and occupants (light) by areas, weekdays (W), and weekend-days (E) each month in 1973.

because of their direct participation in recreational fin-fish fishing, recognizing such boats do, in fact, commercialize recreational fishing. Charter boats are those boats licensed for hire by the U.S. Coast Guard and the captain is licensed to carry passengers for a fee. Generally, fishermen verbally contract the services of the boat and captain. Party boats and captains, also licensed by the U.S. Coast Guard, normally do not operate on a contractual basis. Instead, they charge a fixed fee for passage and services.

Charter boats can usually be identified from a distance by their hull design, rigging, and arrangement of fishing accommodations in the cockpit. Most of the fin-

fish fishing effort by chartered boats was in coastal and offshore waters. As a result, a substantial part of the fishing effort was outside the survey area. The estimated number of transit boats and fishermen in St. Andrew Bay and coastal waters (Fig. 21) largely reflects the intensity of recreational fishing effort in offshore waters.

According to the effort survey, party boats were not used as a fishing platform in St. Andrew Bay or adjacent coastal waters in 1973. Apparently the number and species of bottom fishes usually sought by the party boat fleet was insufficient to supply the demand. Most of the boats that regularly made daily trips traveled 10-20 miles offshore to find fish; a few traveled 40-50 miles offshore

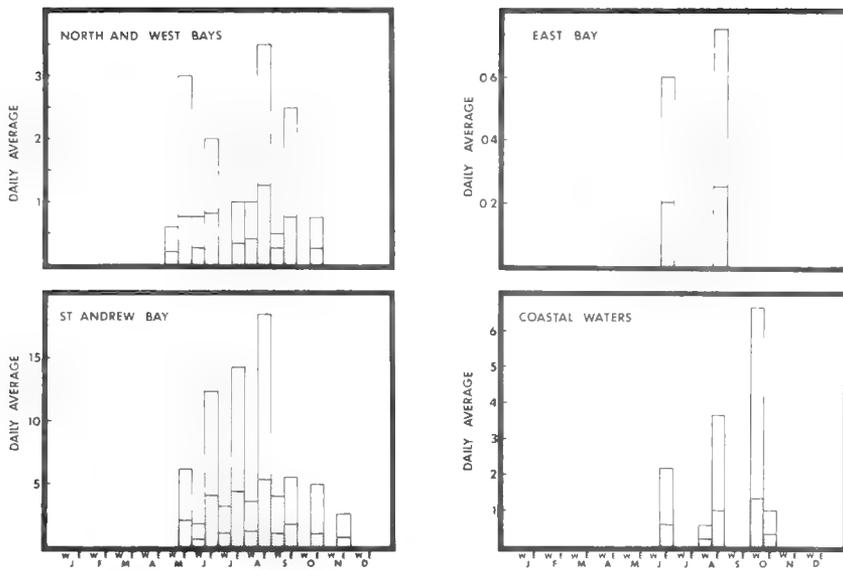


Figure 20.—Estimated average daily instantaneous numbers of transit private ski boats (dark) and occupants (light) by areas, weekdays (W), and weekend-days (E) each month in 1973.

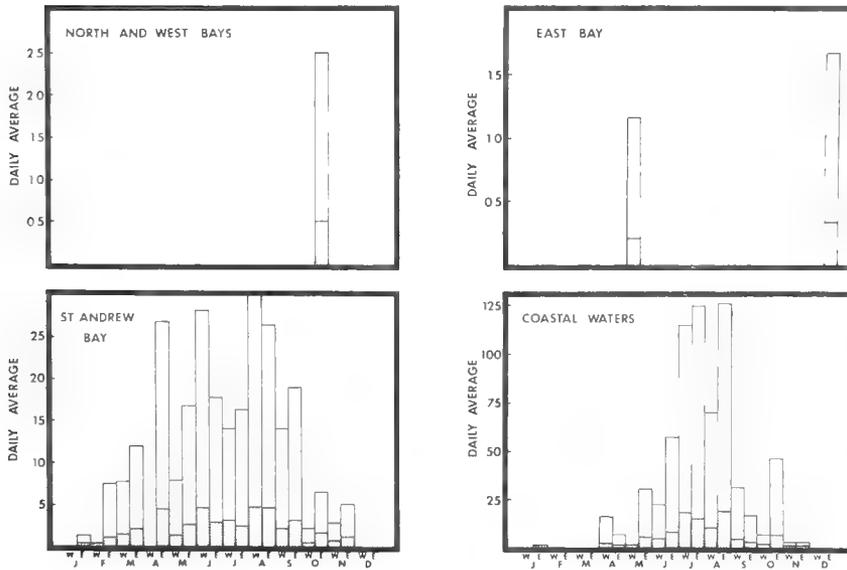


Figure 21.—Estimated daily instantaneous numbers of transit charter boats (dark) and occupants (light) by areas, weekdays (W), and weekend-days (E) each month in 1973.

each day. The larger party boats are licensed to carry a maximum of 90 persons, but usually limit the number of fishermen to about 70; a minimum of 15 fishermen is generally required by the boat operators. The average number of fishermen on party boats probably averages 30-40 over the entire season. At a distance, party boats may be confused with commercial snapper boats, for the hull design is similar, otherwise there was little difficulty assessing transit party boats. The estimated number of transit party boats is shown in Figure 22.

COMMERCIAL FISHING

Distribution of Effort

From the results of the survey for commercial fishing effort, five commercial fisheries existed in the St. Andrew Bay system and adjacent coastal waters in 1973. Those fisheries, identical to the ones described under recreational fishing, were: shrimping for food or bait, oystering for food, finfish fishing for food or bait, scalloping

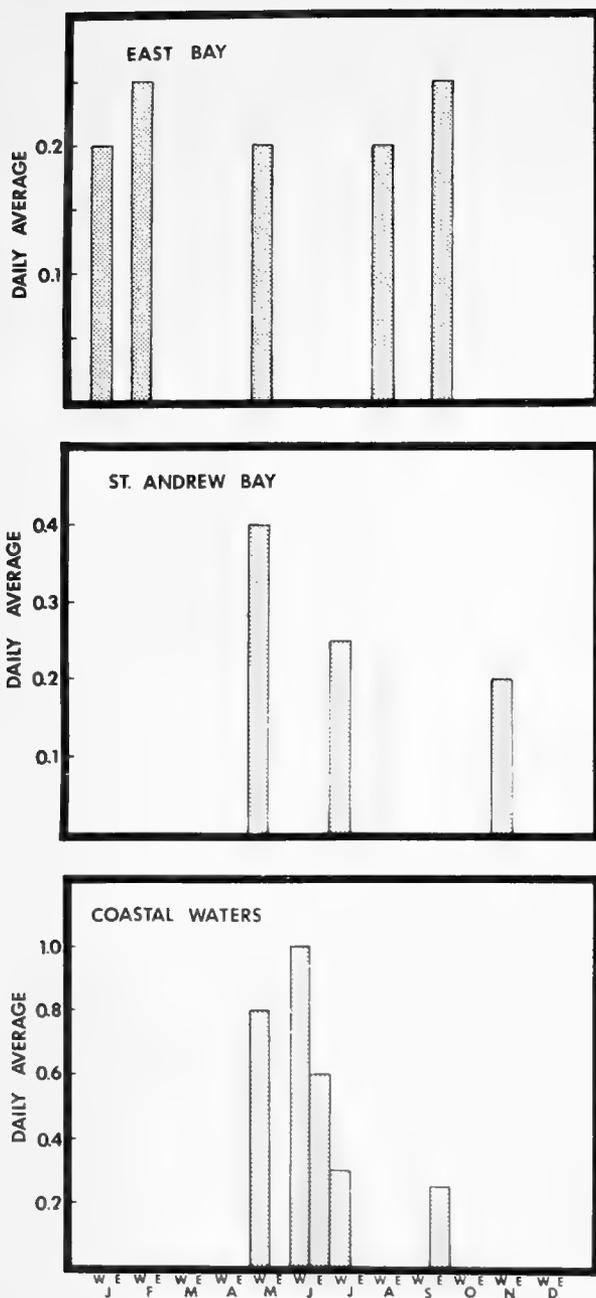


Figure 22.—Estimated average daily instantaneous numbers of transit party boats by areas, weekdays (W), and weekend-days (E) each month in 1973. None was observed in North and West Bays.

Table 10.—Percentage distribution of all commercial fishing effort among fisheries and areas, 1973.

Fishery	North and West Bays	East Bay	St. Andrew Bay	Coastal waters	Total
Shrimp	12.0	12.7	10.0	0.0	34.7
Oysters	4.6	28.5	0.2	0.0	33.3
Finfish	5.6	2.2	4.5	9.7	22.0
Scallops	0.0	0.1	7.5	1.3	8.9
Crabs	<0.1	1.0	<0.1	0.0	1.1

for food, and crabbing for food. The percentage distribution of effort among the fisheries, based on the sum of all effort estimates was (Table 10): shrimp, 34.7%; oysters, 33.3%; finfish, 22.0%; scallops, 8.9%; and crabs, 1.1%.

The area preference for each fishery as indicated by the effort estimates was (Table 11): East Bay for shrimp (36.5%), oysters (85.7%), and crabs (85.2%); coastal waters for finfish (44.1%); and St. Andrew Bay for scallops (84.4%).

Shrimp Fishing Effort

Of the five fisheries in the St. Andrew Bay system and adjacent coastal waters revealed by this survey, shrimp was first in importance to commercial fishermen. The effort was well distributed throughout the bay system (Table 11). While no shrimping effort was observed within the coastal waters, a viable fishery existed just offshore of the survey boundary.

Trawlers rigged with either a single or double trawl fished for shrimp in the bay system. The single rigged trawler, generally smaller and more maneuverable of the two, fished from maximum depth to the edge of shallow water grass beds, whereas the double rigged trawlers were generally limited to fishing deep water in and along the intracoastal waterway and other navigation channels.

The estimated daytime commercial shrimping effort, shown in Figure 23, is thought to be a relatively small part of the total shrimping effort in St. Andrew Bay. Since shrimp are more vulnerable to trawls fished at night, the major effort undoubtedly occurred at that time. The estimated numbers of transit shrimp boats (Fig. 24) partially reflect the intensity of the night fishery. Most of those boats were observed by the surveyors during the early morning and late afternoon hours enroute to the docks or returning to the shrimp fishing grounds. The estimates of transit shrimp boats in adjacent coastal waters are indicative of the night shrimping effort in offshore waters.

The commercial shrimp fishing effort observed in St. Andrew Bay system was entirely by trawling.

Oyster Fishing Effort

The oyster fishery was second in importance to commercial fishermen in the study area accounting for 33.3% of the total estimated daily effort expended among all

Table 11.—Percentage distribution of commercial fishing effort within fisheries by area, 1973.

Fishery	North and West Bays	East Bay	St. Andrew Bay	Coastal waters	Total
Shrimp	34.6	36.5	28.9	0.0	100
Oyster	13.9	85.7	0.4	0.0	100
Finfish	25.5	9.9	20.5	44.1	100
Scallop	0.0	1.1	84.4	14.5	100
Crab	9.1	85.2	5.7	0.0	100

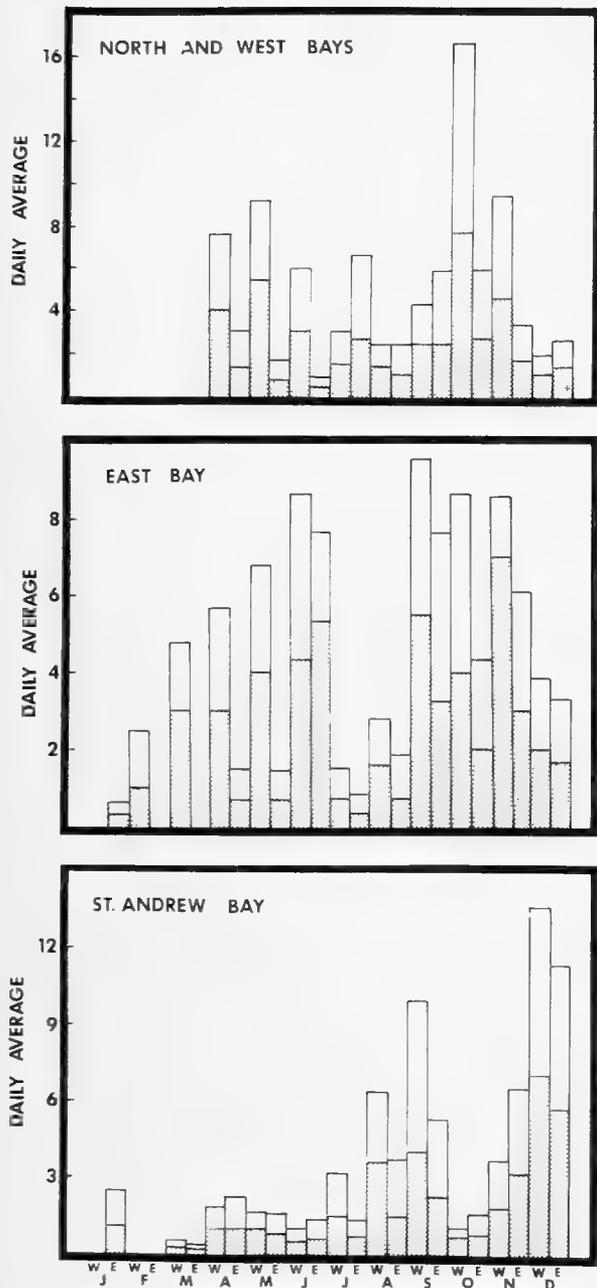


Figure 23.—Estimated average daily instantaneous numbers of commercial shrimp fishermen (light) and boats (dark) by areas, weekdays (W), and weekend-days (E) each month in 1973. None was observed in coastal waters.

fisheries. Of the oyster fishing effort 85.7% was in East Bay, 13.9% in North and West Bays, 0.4% in St. Andrew Bay, and 0% in coastal waters (Table 11).

The observed oyster fishing effort was essentially limited to subareas 88, 90, 91, and 92 in East Bay, subarea 12 in North Bay, subarea 29 and 30 in West Bay, and subarea 59 in St. Andrew Bay. Both public and private beds were harvested by the commercial fishermen.

The seasonal pattern and level of oyster fishing effort are shown in Figure 25 and transit boats in Figure 26. In Florida the taking of oysters is prohibited by law during June, July, and August. A small effort during the closed season was revealed in North and West Bays by the survey, however. The level of effort in season probably resulted from several factors including, but not limited to, the price of oysters, their condition (size, quality), and competing opportunities for the fishermen. The availability of scallops in September and October provides the fishermen with an optional fishery. The specially built flat-bottom, wooden boats used in the oyster fishery are also adaptable to the scallop fishery.

The fishermen in the St. Andrew Bay system relied on individually operated oyster tongs as the method of harvesting oysters commercially. The only observed exception was a single commercial fisherman using a dip net to reach oysters in shallow water.

Finfish Fishing Effort

The finfish fishery of the St. Andrew Bay system and adjacent coastal waters was third in importance to commercial fishermen as measured by the estimated fishing effort. That effort amounted to 22.0% of the sum of the estimated effort for all fisheries. By area 44.1% of the effort was in coastal waters, 25.5% in North and West Bays, 20.5% in St. Andrew Bay, and 9.9% in East Bay (Table 11). The daily and monthly estimated number of fishermen and boats engaged in commercial finfish fishing is shown in Figure 27; transit finfish fishermen and boats are shown in Figure 28.

Of the finfish fishing effort, 68.9% was classified as seine fishing for bait and 31.1% as gill net fishing for food fish. Since circumstances did not permit personal interviews or inspection of the catch, the percentage figures may be in error. Most seine boats that operated along the coastal beaches and in the passes carried nets of various mesh sizes for fishing for both bait and food fishes. The target species of that fishery generally were the round scad, *Decapterus punctatus*; scaled sardine, *Harengula pensacolatae*; and ladyfish, *Elops saurus*. These species are used extensively as bait by recreational and commercial fishermen. Food fishes, however, were sought when seasonally available; mixed catches of bait and food fishes were common to that fishery.

In the bay system, beach seines were used primarily to catch food fish and secondarily to capture bait fishes. The shallow draft boats especially built to operate along the ocean beaches serve equally well in shallow bay, bayou, and lagoon waters.

All observed gill net fishing was judged to be for food fish, although low-quality food fishes that were caught by gill netters undoubtedly entered the bait fish market. The preferred fishes were chiefly mullet, *Mugil* sp.; spotted seatrout, *Cynoscion nebulosus*; and pompano, *Trachinotus carolinus*. The mullet and seatrout fisheries were essentially limited to late fall and winter, when they became relatively abundant in marketable size. The pompano is generally available from spring to late fall.

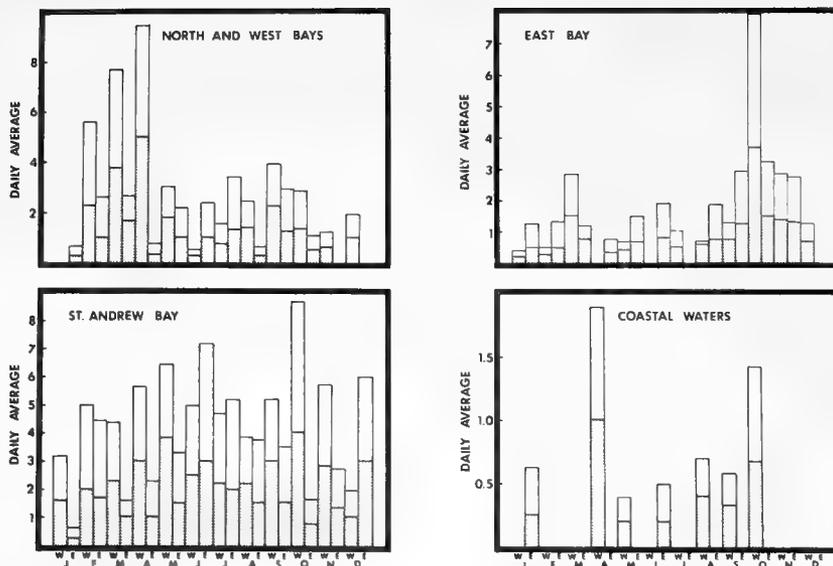


Figure 24.—Estimated average daily instantaneous numbers of transit commercial shrimp fishing boats (dark) and occupants (light) by areas, weekdays (W), and weekend-days (E) each month in 1973.

Since these fishes occur in protected waters of the bay system, they attract the attention of many full- and part-time commercial fishermen, as a comparatively small expenditure for gear or labor is required to participate in the fishery. One- and two-man operations were commonly observed. A similar fishery was described in detail by Irby (1974) for Okaloosa and Walton Counties in northwest Florida.

Commercial Scallop Fishery

The scallop fishery was fourth in importance to commercial fishermen in the area; it accounted for 22.0% of the estimated effort for all fisheries. According to the distribution of effort, scallops occurred in commercial quantity only in lower St. Andrew Bay (subareas 44, 51, 52) and in East Pass (subarea 50). A minor fishing effort with a dredge was observed in East Bay. Since scallops are not known to occur in the East Bay area, the effort possibly was exploratory in nature or misclassified. The latter seems more likely for a limited amount of dredging of leased oyster beds is permitted by the State of Florida.

The estimated numbers of scallop fishermen and boats are shown in Figure 29 for weekdays and weekend-days each month in 1973. The numbers of transit scallop boats and occupants are shown in Figure 30.

The flat-bottom, wooden boat mentioned in the section on commercial oyster fishing also served as the primary platform for scallop fishing. The method most employed to harvest the scallops was to tow a sled-type dredge through the grass beds inhabited by scallops. State laws limit the mechanical harvest of scallop to the period from 15 October to June 1. An occasional commercial fisherman was seen gathering scallops by hand with the aid of scuba gear.

Commercial Crab Fishing

Commercial crabbing was ranked fifth and least important among the commercial fisheries in the areas as measured by fishing effort. That effort involved only 1.2% of the sum of the estimated effort for the five fisheries. By area 85.2% of the crabbing effort was in East Bay, 9.1% in North and West Bays, 5.7% in St. Andrew Bay, and 0.0% in coastal waters (Table 11).

The estimated numbers of commercial crabbers and crab boats are shown in Figure 31 for areas, weekdays, and weekend-days each month in 1973. No transit crab boats were observed.

All observed crab fishing was by baited lift traps that were set and hauled from small boats. Large quantities of crabs are harvested by shrimpers, however, incidental to their shrimp catches.

DISCUSSION

The need for reasonably accurate statistics on social and economic value of recreational fishing and related activities in marine-estuarine waters is well recognized by resource managers, environmentalists, scientists, and others. While commercial, industrial, municipal, and residential uses of these waters and resources are generally accepted by the public as being in the public interest, to optimize their social, economic, and biological benefits the recreational user necessarily has to be considered.

The waters of the coastal zone offer a great variety of recreational opportunities. Fishing, boating, and swimming are examples. A complete and reliable survey of all recreational activities in St. Andrew Bay and adjacent coastal waters would involve such enormous effort and

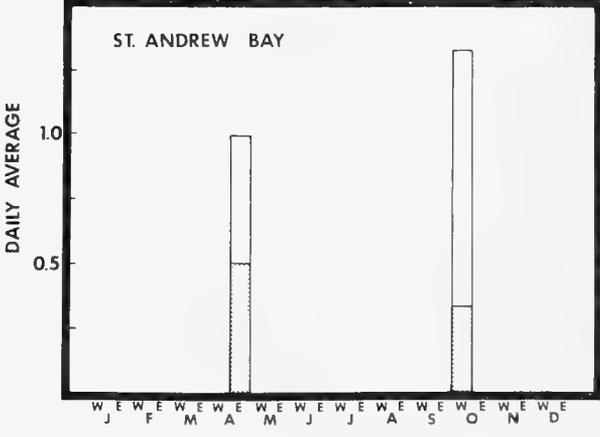
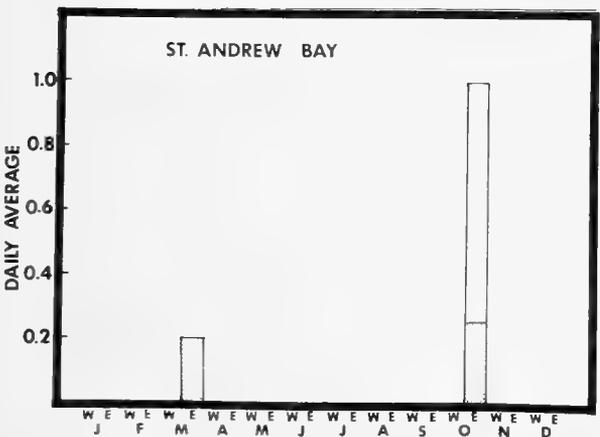
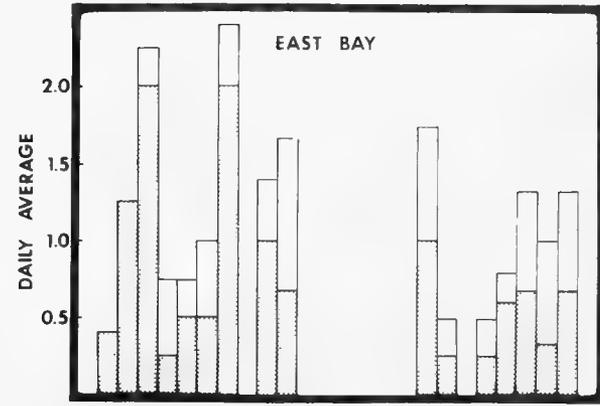
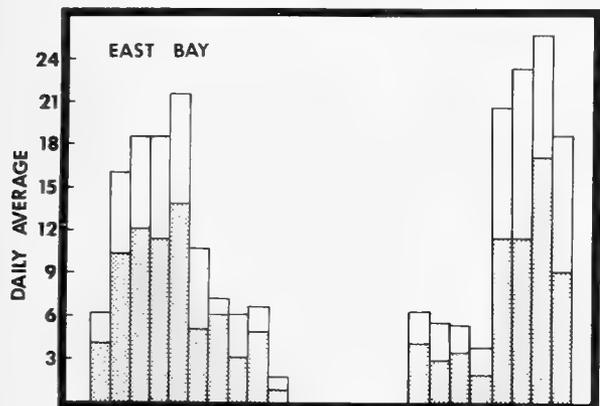
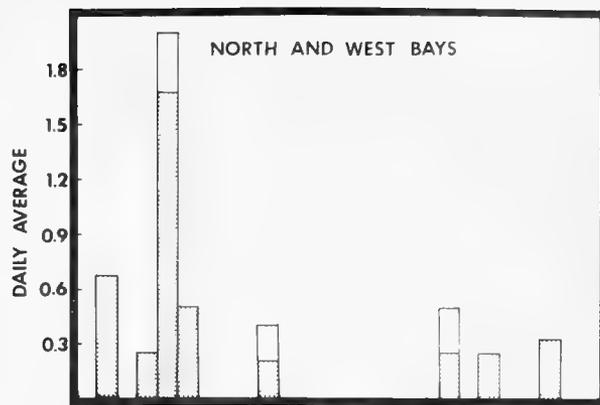
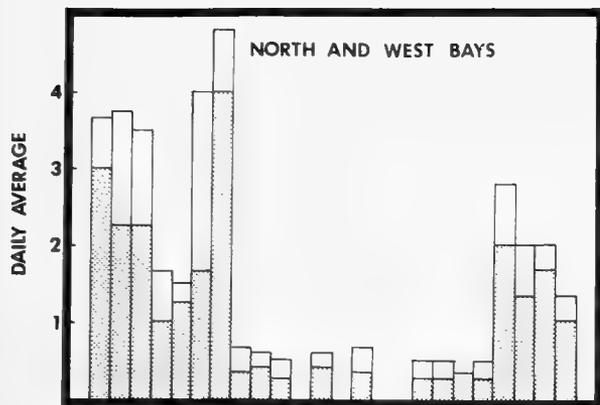


Figure 25.—Estimated average daily instantaneous numbers of commercial oyster fishermen (light) and boats (dark) by areas, weekdays (W), and weekend-days (E) each month in 1973. None was observed in coastal waters.

Figure 26.—Estimated average daily instantaneous numbers of transit commercial oyster fishing boats (dark) and occupants (light) by areas, weekdays (W), and weekend-days (E) each month in 1973. None was observed in coastal waters.

expense as to preclude such an undertaking. For the same reasons no attempt was made to obtain an estimate of the total participation in a single activity. Still, the need by management for statistical data on public utilization of the area's living resources and space prevails. The fishery biologist often has to conduct relatively inexpensive surveys for short-term solutions to management problems. The results are not always reliable. This survey might best be regarded as explora-

tory in that the results are reasonably accurate, although not totally comprehensive, and were not overly expensive to obtain.

In this survey, estimates of the number of recreational and commercial fishermen and boaters were obtained by methods that permit direct comparison of expended effort for each fishery resource and boating activity in each of the major areas on weekdays, weekend-days, and months in 1973. The estimates were also made by type of

fishing platform and method of fishing. From these estimates the resource manager can appraise the competitive effort between recreational and commercial fishermen for the same resource, the time when the greater or lesser competition occurs, and where and how it occurs. The estimates also provide the manager with possible solutions to competitive problems by manipulating the time, place, and method of harvest.

Estimates of the economic benefits of daytime recreational angling were computed for two primary

reasons: one, for the public awareness of the monies spent by anglers for their recreation; and two, for managerial consideration in matters relating to an equitable allocation of the natural resources among user groups.

ACKNOWLEDGMENTS

I thank F. W. Bell and C. R. Futch for reviewing this manuscript, and the following laboratory staff members

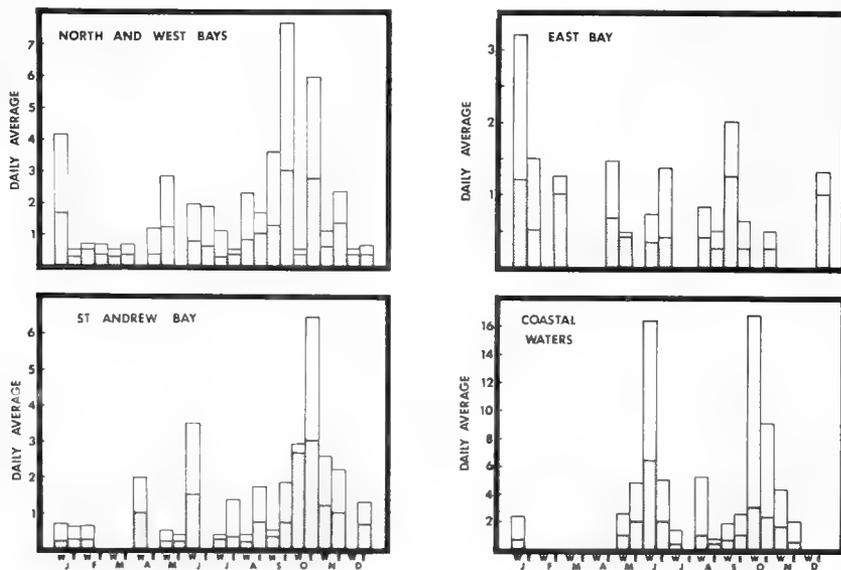


Figure 27.—Estimated average daily instantaneous numbers of commercial finfish fishermen (light) and boats (dark) by areas, weekday (W), and weekend-days (E) each month in 1973.

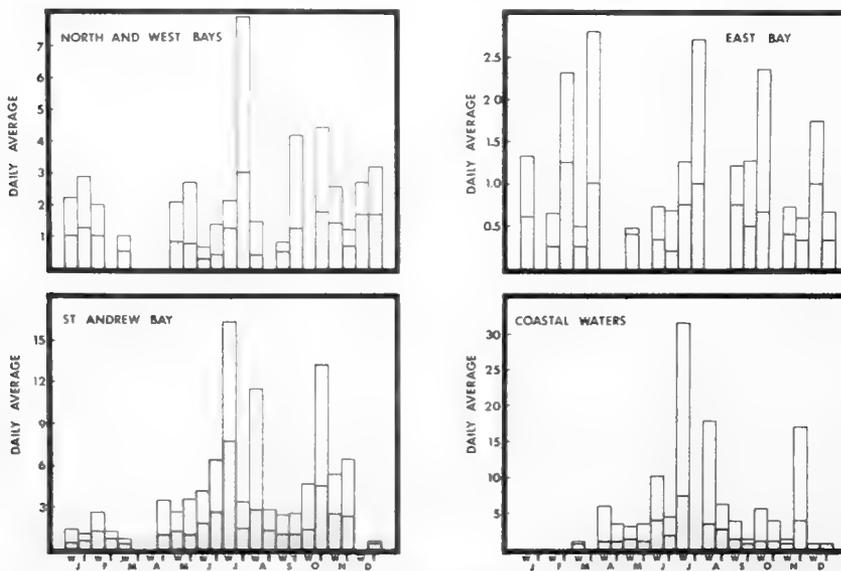


Figure 28.—Estimated average daily instantaneous numbers of commercial finfish fishing boats (dark) and occupants (light) by areas, weekdays (W), and weekend-days (E) each month in 1973.

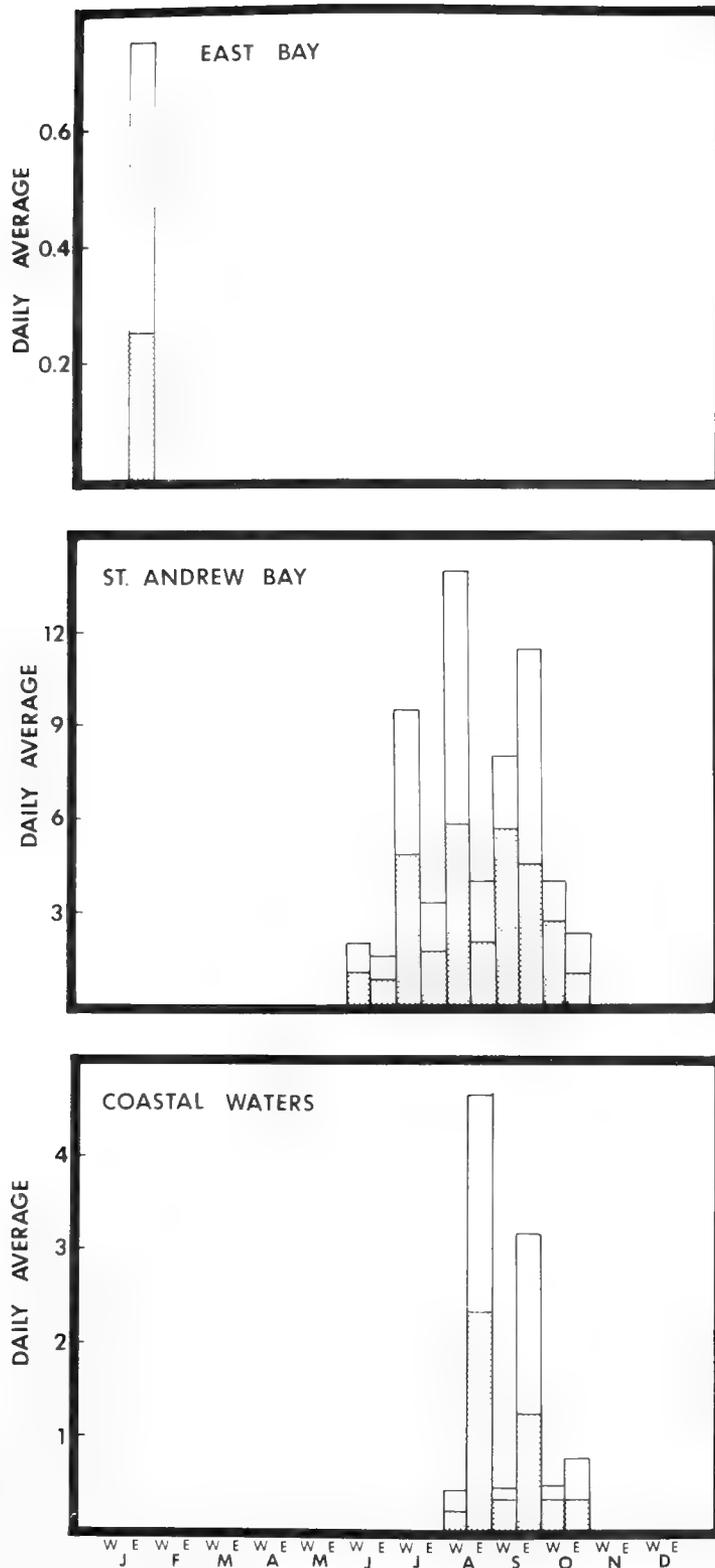


Figure 29.—Estimated average daily instantaneous numbers of transit commercial scallop fishermen (light) and boats (dark) by areas, weekdays (W), and weekend days (E) each month in 1973. None was observed in North and West Bays.

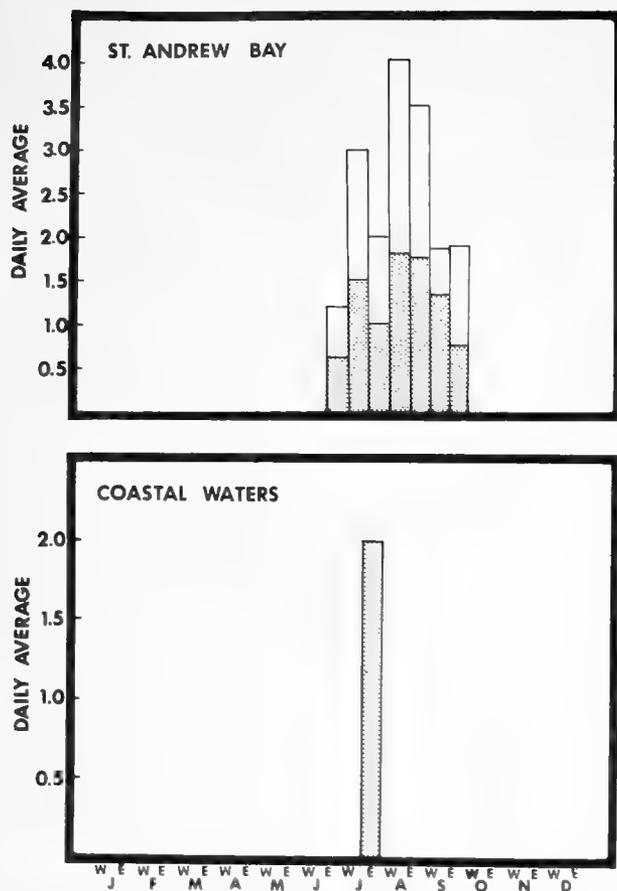


Figure 30.—Estimated average daily instantaneous numbers of transit commercial scallop fishing boats (dark) and occupants (light) by areas, weekdays (W), and weekend-days (E) each month in 1973. None was observed in North, West, and East Bays.

who helped conduct the survey: Dennis F. Anderson, Harold A. Brusher, Nelson L. May, David C. Muenzel, Leslie W. Touart, and W. Lee Trent.

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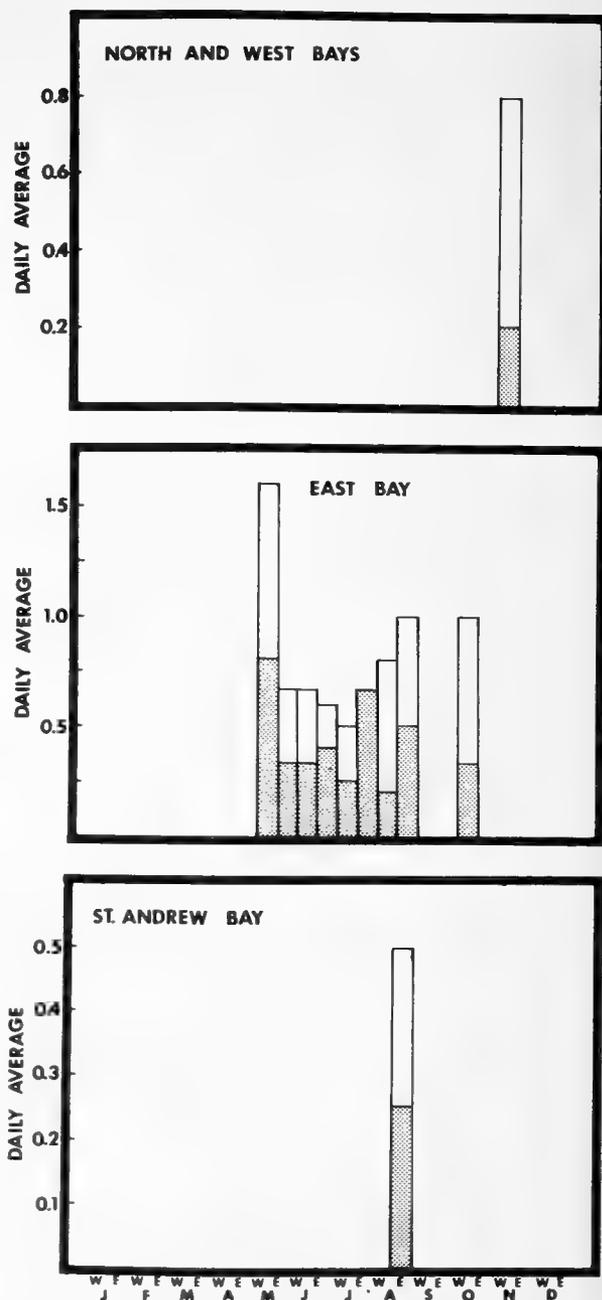


Figure 31.—Estimated average daily instantaneous numbers of commercial crab fishermen (light) and boats (dark) by areas, weekdays (W), and weekend-days (E) each month in 1973. None was observed in coastal waters.

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May 1978

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Seasonal Bottom-Water Temperature Trends in the Gulf of Maine and on Georges Bank, 1963-75

Clarence W. Davis

May 1978

U.S. DEPARTMENT OF COMMERCE

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Seasonal Bottom-Water Temperature Trends in the Gulf of Maine and on Georges Bank, 1963-75

CLARENCE W. DAVIS¹

ABSTRACT

Spring (1968-75) and autumn (1963-75) bottom-water temperatures in the Gulf of Maine and on Georges Bank were analyzed to investigate a suspected warming trend in the region. During the spring the mean temperature in the Gulf of Maine increased rather steadily from a low of 5.4°C in 1968 to a high of 6.4°C in 1974. Various subareas of the Gulf had more frequent and greater oscillations but exhibited the same overall warming trend. Mean spring temperatures on Georges Bank fluctuated from 3.8°C in 1968 to 6.3°C in 1974 and declined by nearly 2°C in 1975 with similar characteristics in eastern, central, and western subareas of the Bank.

During the autumn in the Gulf, bottom-water temperatures reached a minimum of 5.4°C in 1966, increased to a maximum of 8.4°C in 1973 and 1974, but declined to 8.0°C in 1975. Subareas of the Gulf generally showed the same temperature trends from 1963 to 1968; especially notable are the cooling trend west of long. 69°W which commenced in 1971, and a decrease in all five subareas in 1975. Georges Bank temperatures in autumn declined from a maximum of 13.1°C in 1965 to a minimum of 10.4°C in 1969, reached another peak of 12.6°C in both 1973 and 1974, but declined to 11.6°C in 1975. Subareas of Georges Bank generally followed the same pattern with the eastern third of the Bank usually 2°C or colder than either of the other subareas in the autumn.

The average bottom-water temperatures during spring were 5.0°C on Georges Bank and 6.1°C in the Gulf of Maine; temperatures in the autumn were 11.7°C and 7.2°C, respectively, for these areas.

INTRODUCTION

This study summarizes variations in bottom-water temperatures observed during spring (1968-75) and autumn (1963-75) groundfish surveys conducted by the Gulf of Maine-Georges Bank area by the National Marine Fisheries Service, Woods Hole, Mass. Relatively high temperatures were observed during 1973 and 1974 and raised the question of whether there had been a significant upward trend in average temperatures or simply a couple of anomalous years since the surveys began in 1963.

Recent papers by Colton and Stoddard (1973), Colton (1968a), and Schopf (1967) have summarized the distribution of bottom-water temperatures from 1940 to 1967 in the Gulf of Maine and contiguous waters. A contemporary paper by Karaulovsky and Sigaev² summarizes similar data for 1962-72 and provides an intermediate comparison between the earlier papers and this present study. These previous studies are not strictly comparable with the present study because of the variability of the data bases and different analytical methods; nevertheless, comparisons are useful for the identification of long-term trends, and the analyses are considered adequate for approximating annual changes in spring and autumn bottom temperatures in the Gulf of Maine and on Georges Bank.

Numerous authors, including Dow (1966, 1969) and Sutcliffe et al. (1977) for Gulf of Maine waters, have used surface-water temperatures to correlate fish catch with environmental factors. Flowers and Saila (1972) used both surface and bottom temperatures to estimate yield of American lobsters, *Homarus americanus*, and found the latter parameter considerably more accurate.

Although a study of bottom-water temperatures alone represents only a partial analysis of the temperature structure of the region, they are sufficient to reveal major changes in the thermal environment and are particularly relevant to the distribution of benthic organisms. The remainder of the temperature profile, from surface to near bottom, is not included in this study. Salinity profiles are also excluded since only surface and bottom data were routinely obtained until the most recent years. For these reasons, specific identification of subsurface water masses is speculative. It is known, however, that the major source of subsurface water in the Gulf of Maine is the inflow of relatively warm slope water through the Northeast Channel (Bigelow 1927; Colton 1968b). Therefore, major changes in the average bottom-water temperatures in much of the Gulf may be closely related to changes in the volume and extent of this inflow.

Georges Bank water is derived largely from the Gulf of Maine, but it is also sporadically influenced by intrusions of slope water along its southern boundary (Bumpus³). In the spring a counterclockwise (cyclonic) eddy is

¹Northeast Fisheries Center, National Marine Fisheries Service, NOAA, Woods Hole, MA 02543.

²Karaulovsky, V. P., and I. K. Sigaev. 1976. Long-term variations in heat content of the waters on the Northwest Atlantic Shelf. Int. Comm. Northwest Atl. Fish. Res. Doc. 76/2, 9 p.

³Bumpus, D. F. 1975. Review of the physical oceanography of Georges Bank. Int. Comm. Northwest Atl. Fish. Res. Doc. 75/107, 32 p.

present in the Gulf of Maine and may either divert into Cape Cod Bay or turn eastward along the northern edge of Georges Bank. Similarly a clockwise (anticyclonic) eddy over Georges Bank causes a persistent westerly drift along the southern edge of the Bank which continues across Great South Channel. During autumn the southern portion of the Gulf eddy breaks down into a drift across the Bank, thus affecting temperatures there (Bumpus and Lauzier 1965). Since the Bank is well mixed vertically by tidal and wind forces throughout most of the year, subsurface temperatures there are influenced largely by air-sea interactions and by advection of deeper waters.

The identification of temperature anomalies on an areal and seasonal basis, along with other supportive data, is useful for interpreting changes in biological phenomena observed during these years. Examples of such changes are discussed in this paper.

METHODS

Bottom temperature data are based on mechanical or expendable bathythermograph observations obtained randomly during spring and autumn groundfish surveys (Grosslein⁴). During each cruise approximately 75-100 observations were made in the Gulf of Maine, mostly in water depths of 100-275 m, and 50-60 observations on Georges Bank (Fig. 1). Only those waters shallower than

⁴Grosslein, M. D. 1974. Bottom trawl survey methods of the Northeast Fisheries Center, Woods Hole, Massachusetts, USA. Int. Comm. Northwest Atl. Fish. Res. Doc. 74/96, 27 p.

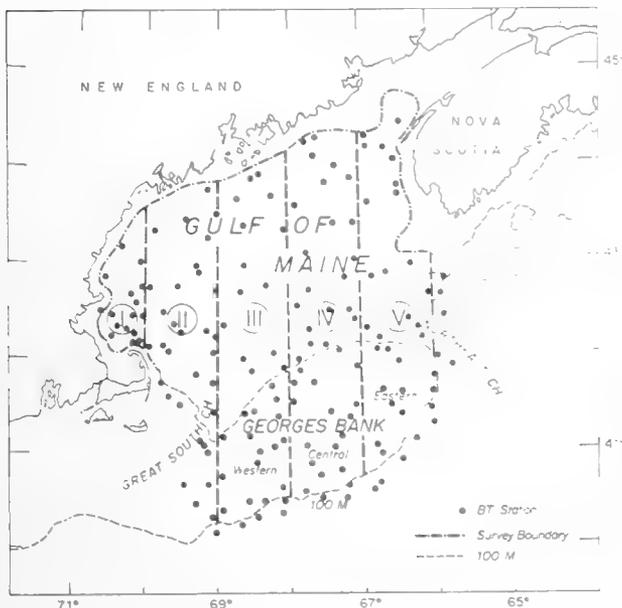


Figure 1.—Gulf of Maine-Georges Bank and subarea boundaries used in analysis of bottom-water temperature data. (Dots represent typical distribution of BT stations).

100 m on Georges Bank are considered in this report because of high temperature variability of greater depths caused by sporadic excursions of warm slope water along the Bank's southern edge. Raw temperature observations are assumed to be actual bottom temperatures because only a few stations in the inner Gulf of Maine exceeded the maximum depth capability of 275 m of mechanical bathythermographs. Since temperatures below 250 m in most of the Gulf are generally isothermal with depth, 275-m temperatures are representative of bottom temperatures. Expendable bathythermographs, capable of reaching the greatest depths encountered, were used after 1969.

Both the Gulf of Maine and Georges Bank were analyzed in their entirety and by subareas which are bands of one degree of longitude in width (Fig. 1). Subareas in the Gulf are identified by Roman numerals I-V and Georges Bank subareas are termed Western, Central, and Eastern Georges Bank. Analysis by one-degree segments of longitude was chosen as they define rather distinct physiographic regions of the Gulf and Bank (Table 1) and also this was a convenient arbitrary method of establishing segment boundaries to show suspected temperature differences and trends in various parts of the study area. Analysis of temperatures by latitude was not attempted, but latitudinal variability has been documented for both the shoal and deep waters of the Gulf of Maine (Bigelow 1927) and Georges Bank (Sigaev⁵).

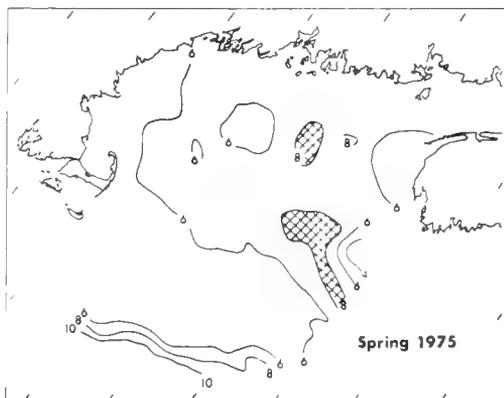
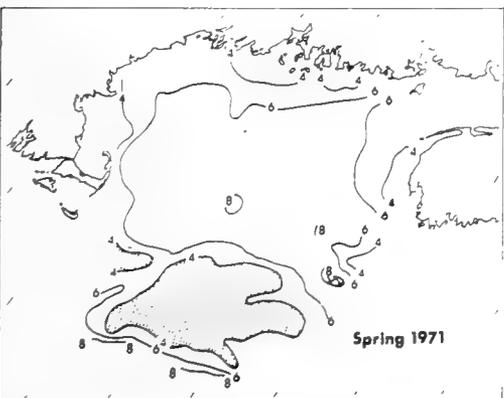
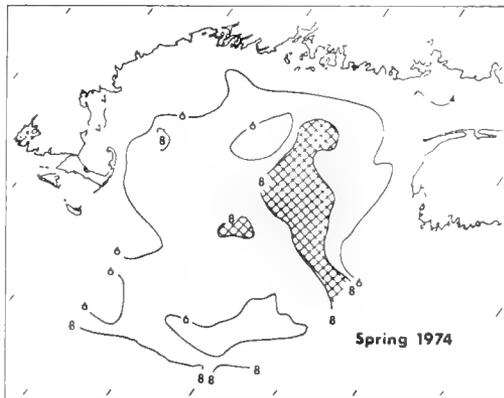
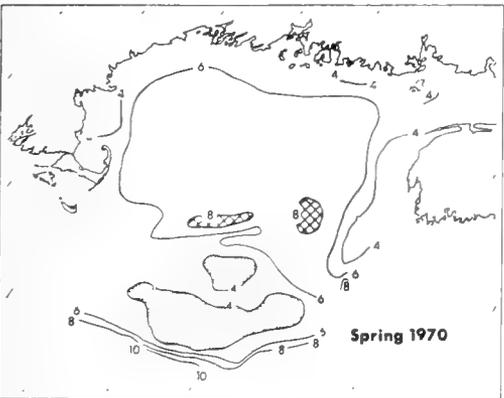
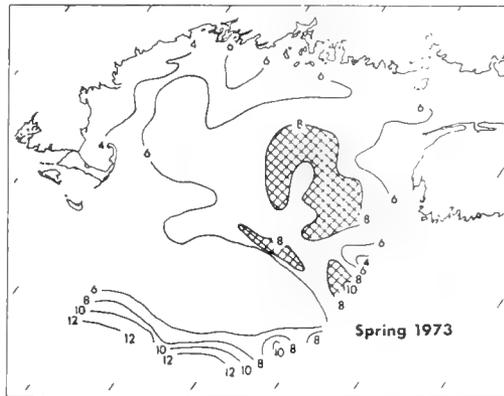
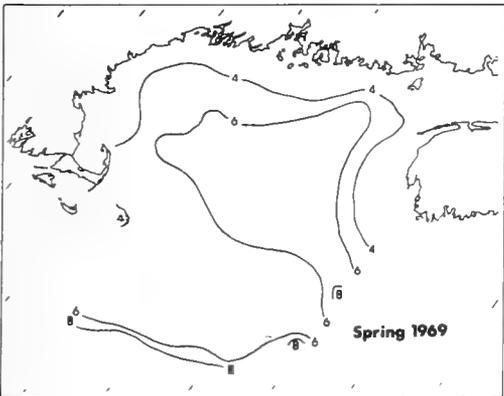
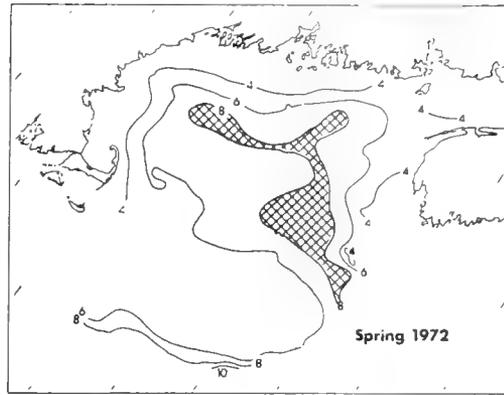
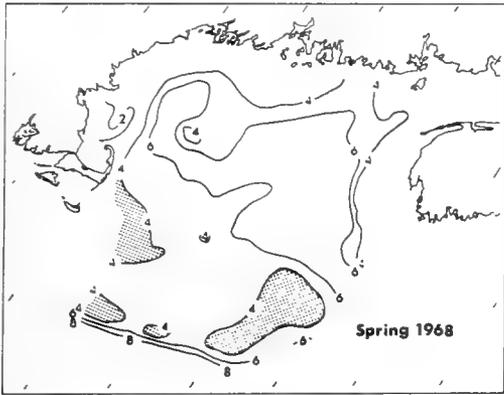
Contoured isotherms at 1°C intervals were overlaid on 5-min grid charts and the number of units counted to determine the percentage area represented by each 2°C temperature class interval (TCI) (Figs. 2, 3). An index of the mean seasonal bottom temperature was then calculated by multiplying the midtemperature of each

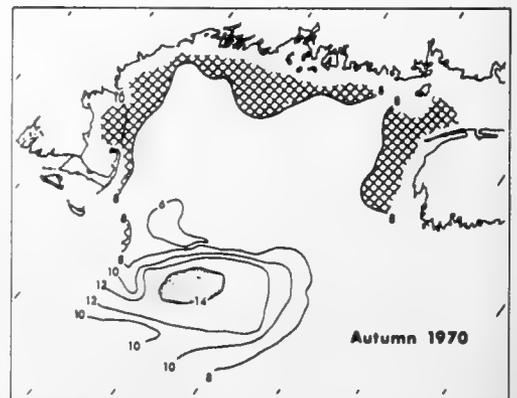
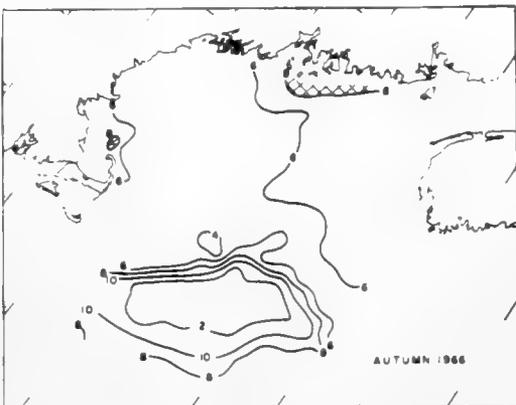
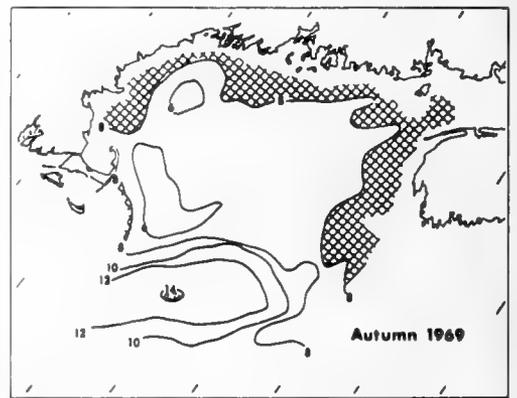
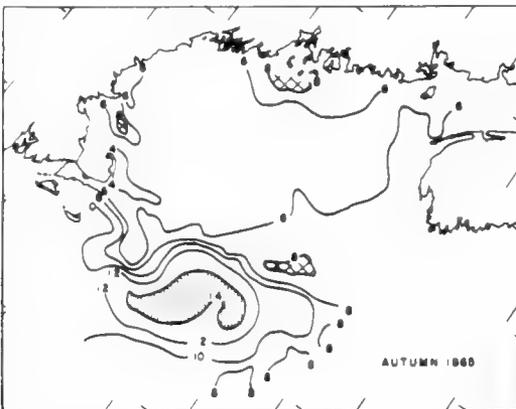
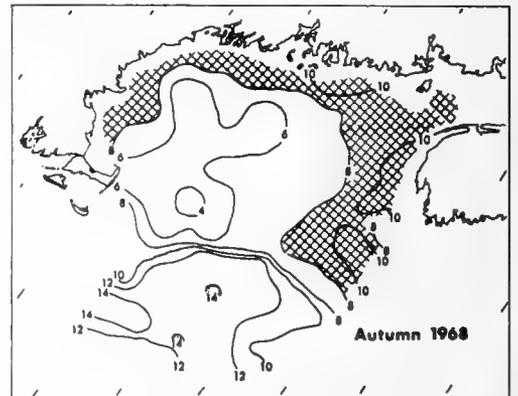
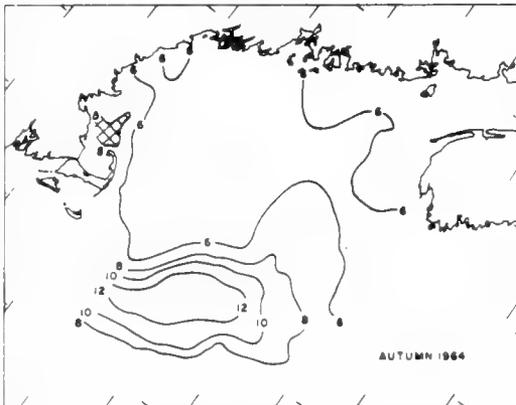
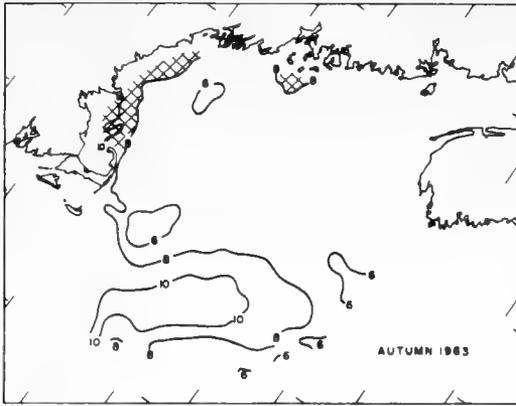
⁵Sigaev, I. K. 1974. Characteristic features of the hydrological conditions on the Nova Scotia Shelf and Georges Bank, 1972. Int. Comm. Northwest Atl. Fish. Res. Doc. 74/51, 7 p.

Table 1.—Gulf of Maine and Georges Bank subarea characteristics.

Area	Subarea	Characteristics
Gulf of Maine:	I	Coastal, < 200 m, Jeffreys Ledge and Stellwagen Bank
	II	Western Basin, some banks and ledges
	III	Intermediate between II & IV
	IV	Eastern Basin, mostly > 200 m
	V	Coastal western Nova Scotia, entrance Northwest Channel
Georges Bank:	Western	Cultivator Shoal, adjacent Great South Channel
	Central	Georges Shoal, no adjacent channels
	Eastern	Mostly > 60 m, adjacent Northeast Channel

Figure 2.—Distribution of spring bottom-water temperatures, 1968-75. (Dotted areas represent Georges Bank temperatures less than 4°C; gridded areas represent Gulf of Maine temperatures greater than 8°C.)





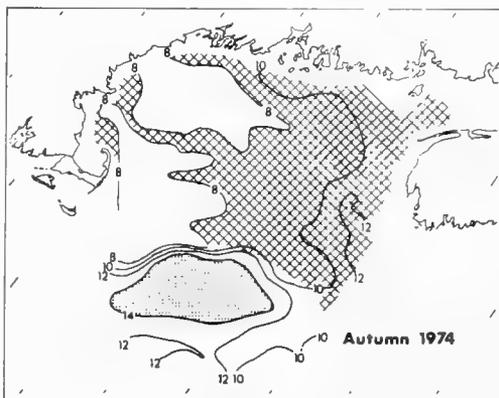
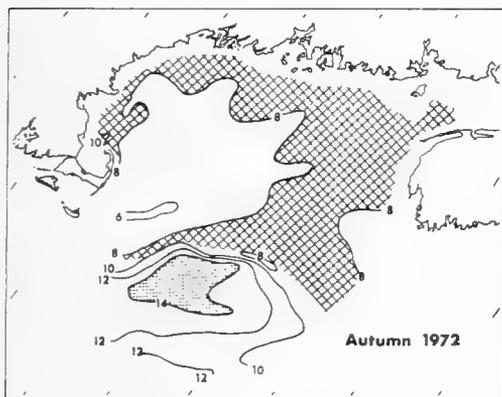
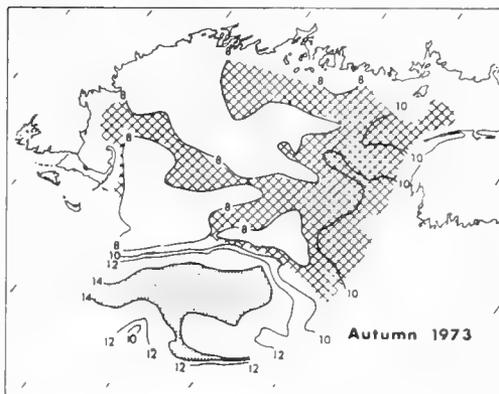
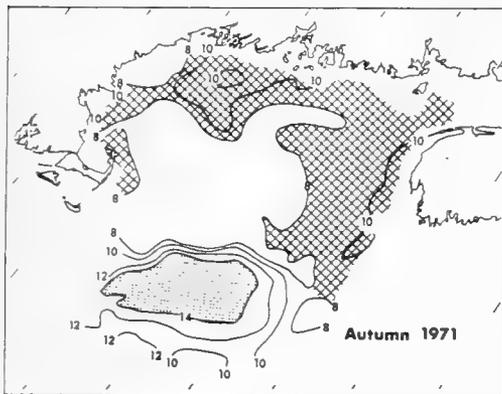
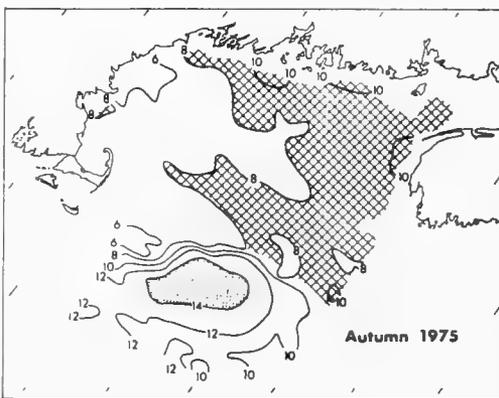


Figure 3.—Distribution of autumn bottom-water temperatures, 1963-75. (Dotted areas represent Georges Bank temperatures greater than 14°C; gridded areas represent Gulf of Maine temperatures greater than 8°C.)



TCI by the percentage area within that interval and dividing the total by 100. This method was chosen as it was not possible to make direct year-to-year comparisons of station data because randomly located stations were sampled during each cruise. The stratified random sampling scheme did, however, result in representative sampling by depth and geographic subareas. This method also eliminates bias associated with depth variability as the indices derived are based solely on an areal basis and the same geographic areas are used to compare relative annual differences in bottom-water temperatures. Since no attempt is made to determine absolute temperature indices, the method chosen for

data analysis seems justified. For illustrative purposes, portions of the histograms of TCI distributions have been shaded to emphasize temperature extremes. For Georges Bank TCI's <4° and >8°C in spring (Figs. 7, 9) and <6° and >10°C in autumn (Figs. 15, 17) are shaded. For the Gulf of Maine TCI's <4° and >6°C in spring (Figs. 11, 13) and <8° and >14°C in autumn (Figs. 19, 21) are shaded. The shaded portions of the histograms generally lie outside expected mean bottom temperature conditions.

Dates for the collection of temperature data are shown in Figure 4. The effects of irregular seasonal sampling are difficult to interpret, especially for shoal areas like Georges Bank where seasonal cycles of bottom-water

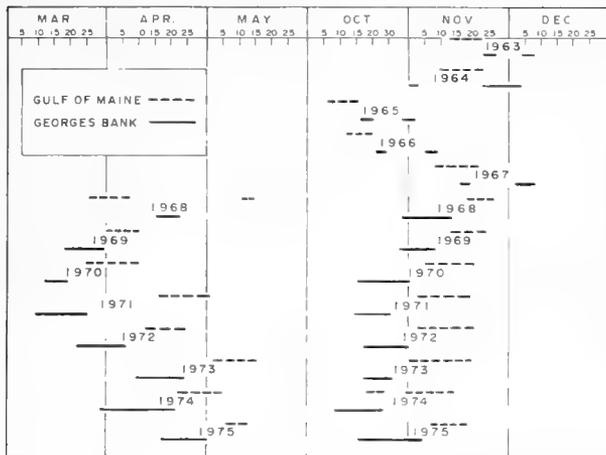


Figure 4.—Dates of spring and autumn cruises in the Gulf of Maine and Georges Bank, 1963-75.

temperatures are largely influenced by highly variable surface conditions. The dates of cruises on Georges Bank were fairly consistent in autumn, but spring cruises had two rather distinct groupings—March dates for 1969-72 and April dates for the remaining 4 yr. In the Gulf autumn cruise dates nearly all overlapped temporally and spring cruises occurred mostly when the bottom-water temperatures remain virtually stable and isolated from surface effects (Bigelow 1927; Colton and Stoddard 1973). It was assumed in an earlier report (Davis⁶) that timing of the cruises was not critical to the estimation of major temperature trends because most of the data were collected during or close to the seasonal maxima or minima in temperatures (Colton and Stoddard 1972). In this report, however, the cruises have been adjusted to common reference dates (April 20 and November 9 for the Gulf; April 4 and November 7 for the Bank). Average bottom temperatures by 10-day intervals at Portland and Nantucket Lightships (Fig. 5) were used to calculate adjusted values for the Gulf of Maine and Georges Bank, respectively. The mean temperatures observed on each cruise for the whole area and its subareas were adjusted by adding or subtracting the differences in the mean temperatures at the appropriate lightship on the reference dates and on the middates of the cruise and subarea samplings. Magnitude of the adjustments was mostly less than 0.4°C in the Gulf of Maine, but was 1°C or more on Georges Bank, especially in the autumn (Figs. 6, 10, 14, 18; Tables 2-5). Finally an annual index for both the Gulf of Maine and Georges Bank was obtained by averaging the spring and autumn indices (Fig. 22).

The reader is alerted to keep in mind which index—observed or adjusted—is used in the text. Adjusted values are intended primarily for examining trends and observed values for comparing habitat conditions, i.e., TCI distributions.

⁶Davis, D. W. 1976. Spring and autumn bottom-water temperatures in the Gulf of Maine and Georges Bank, 1968-1975. Int. Comm. Northwest Atl. Fish. Res. Doc. 76/85, 14 p.

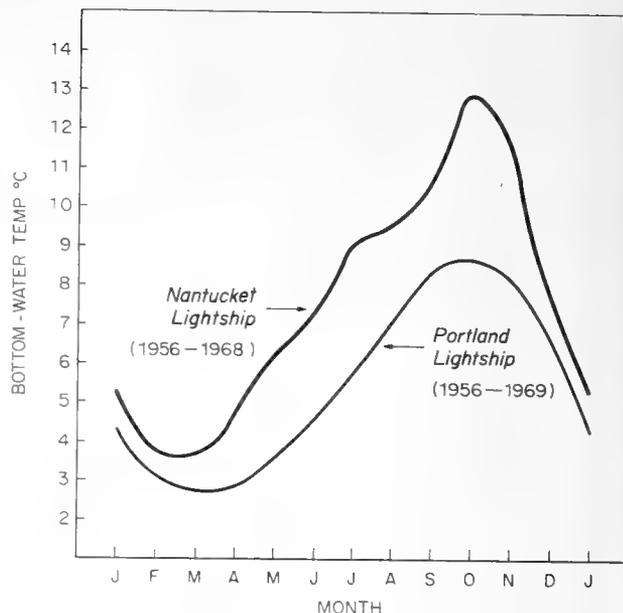


Figure 5.—Mean annual cycles of bottom-water temperatures at Nantucket (1956-68) and Portland (1956-69) Lightships (data from J. Chase, Woods Hole Oceanographic Institution).

RESULTS

Spring Temperatures, 1968-75

Gulf of Maine—Spring.—Adjusted mean bottom-water temperatures for the Gulf of Maine showed a warming trend after the coldest year, 1968, with peak temperatures of 6.5°C in 1970 and 6.4°C in 1974 (Fig. 6). Annual decreases of 0.3°C were observed in 1971 and 1975, while the largest annual increase of 0.8°C occurred in 1970 and accounted for over 70% of the total 8-yr range of 1.1°C (5.4-6.5°C). The 1968-75 mean index of 6.1°C was about 1°C colder than in 1955 and 1956, but 1°C warmer than in 1965 and 1966 as reported by Schopf (1967), and also 1°C warmer than the 1962-72 long-term

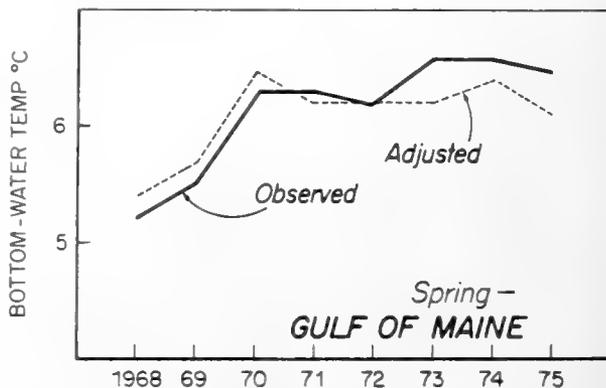


Figure 6.—Observed and adjusted mean bottom-water temperatures in the Gulf of Maine during the spring, 1968-75.

mean reported by Karaulovsky and Sigaev (see footnote 2). From these earlier reports, it appears that the temperature peaked at 7°C in 1955, declined to a low of 4.3°C in 1966, and has fluctuated between 6.1° and 6.5°C since 1970.

Figure 7 illustrates the changes in proportions of bottom water covered by various TCI's for the entire Gulf. Although some years had the same or nearly the same mean observed temperature, the TCI's were often quite variable. For example, during the spring cruises of 1970-72, the observed means varied by only 0.1°C, but the percentage of water in the coldest and warmest TCI's (solid bars in histogram) varied by factors of about 2 and 13, respectively). The 6°-8°C TCI dominated in all years while the 4°-6°C TCI remained the most consistent during the study period. The general warming trend is characterized by a rather progressive decrease of water <4°C near shore with a corresponding increase of water >8°C mostly in the eastern basin of the Gulf (Fig. 2). No water <4°C was evident in 1974, while a small amount of water <2°C contributed to the coldest index which was observed in 1968.

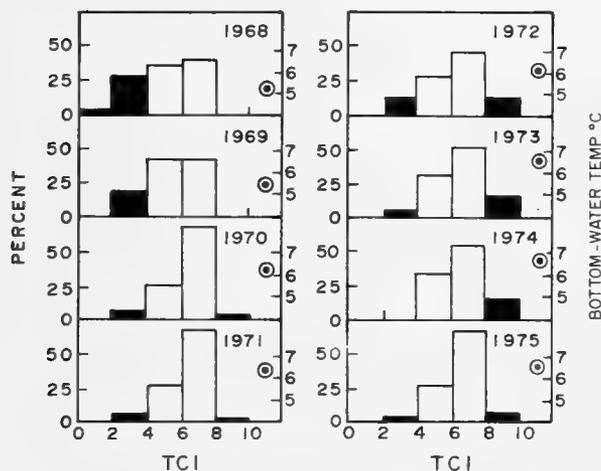


Figure 7.—Percentages of temperature-class intervals (TCI's) in the Gulf of Maine during the spring, 1968-75. (Dotted circles represent the observed mean bottom-water temperatures; solid bars emphasize temperature extremes.)

Subareas of the Gulf of Maine—Spring.—Adjusted indices of the annual mean bottom-water temperature for the Gulf by subareas of one-degree longitude are summarized in Figure 8. Analysis by subareas reveals an increase in the frequency and magnitude of oscillations between years with an overall warming trend indicated for each subarea. Subareas I and IV had the lowest and highest bottom temperatures, respectively, during all years. This is associated with differences in bathymetry as Subarea I has the most shoal water and nearly all of Subarea IV is greater than 200 m deep. The relative shoalness of Subarea I is also reflected in the large temperature variability between years, especially the increases between 1969 and 1970 (+1.5°C), and between

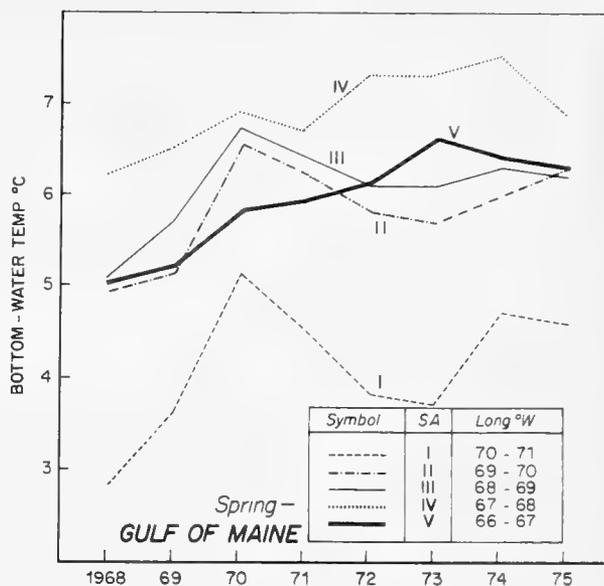


Figure 8.—Adjusted mean bottom-water temperatures in the Gulf of Maine in subareas I-V during the spring, 1968-75.

1973 and 1974 (+1.0°C), and the decreases between 1970 and 1971 (-0.6°C) and between 1971 and 1972 (-0.7°C). A temperature increase was noted in all subareas in 1968-70 with the sharpest rise between 1969 and 1970. In no year was a decrease observed for all five subareas.

The 8-yr means and annual anomalies are summarized in Table 2 and show that all subareas had negative values in 1968 and 1969 and positive values in 1974 and 1975, but a mixture of values in the intervening years.

Comparison of the Gulf by subarea again shows how years of similar mean temperatures can have vastly different TCI's (Fig. 9). In Subarea I the observed means were all 5°C in 1970, 1974, and 1975, but the TCI's in 1970 were about 20% each for the 2°-4°C and 6°-8°C intervals, and 60% for the 4°-6°C interval, while 1974 and 1975 were both nearly 100% for the 4°-6°C interval. Conversely, a deep stable subarea like IV had very similar TCI percentages when the spring means were similar and clearly shows the decrease in coldest and increase in warmest TCI's as the warming trend progressed.

Table 2.—Mean bottom-water temperatures and anomalies for Gulf of Maine, spring 1968-75. Adjusted values are shown in parentheses.

Subarea	Mean	1968	1969	1970	1971	1972	1973	1974	1975
I	4.2 (4.1)	-1.5 (-1.3)	-.7 (-.5)	+.8 (1.0)	+.2 (+.5)	-.5 (-.3)	-.2 (-.4)	+.8 (+.6)	+.8 (+.5)
II	5.9 (5.8)	-1.0 (-.9)	-.8 (-.7)	+.6 (+.7)	+.3 (+.4)	-.1 (.0)	+.1 (-.1)	+.3 (+.2)	+.4 (+.5)
III	6.2 (6.1)	-1.1 (-1.0)	-.5 (-.4)	+.5 (+.6)	+.3 (+.3)	-.1 (.0)	+.2 (.0)	+.3 (+.2)	+.3 (+.1)
IV	7.0 (6.9)	-.7 (-.7)	-.5 (-.4)	-.1 (.0)	-.2 (-.2)	+.4 (+.4)	+.6 (+.4)	+.7 (+.6)	+.2 (.0)
V	6.0 (5.9)	-1.0 (-.9)	-1.0 (-.7)	-.3 (-.1)	0 (.0)	+.2 (+.2)	+.8 (.7)	+.5 (+.5)	+.5 (.4)
Entire Gulf	6.1 (6.1)	-.9 (-.7)	-.6 (-.4)	+.2 (+.4)	+.2 (+.1)	+.1 (+.1)	+.5 (+.1)	+.5 (+.3)	+.4 (.0)

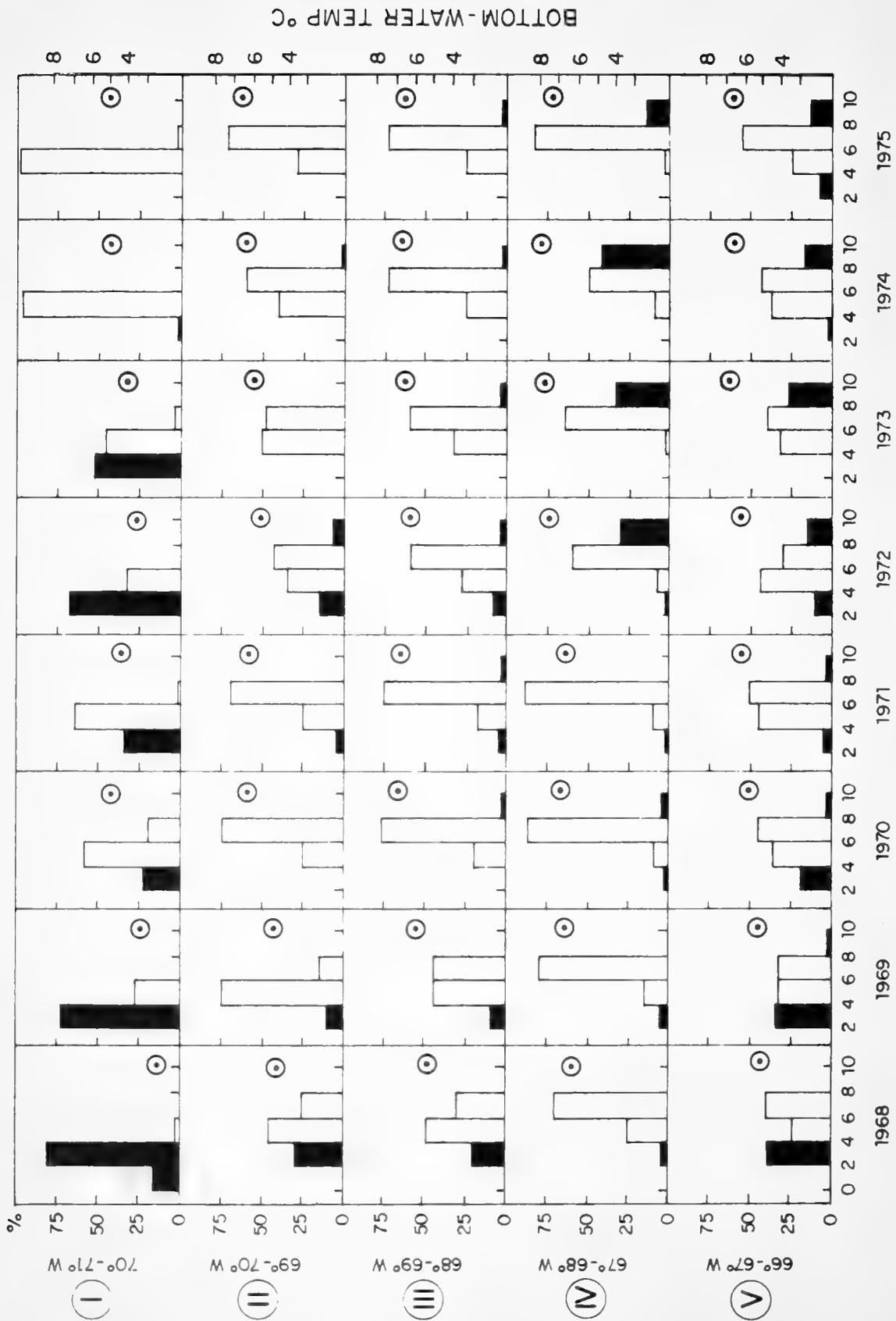


Figure 9.—Percentages of temperature-class intervals (TCI's) in the Gulf of Maine in subareas I - V during the spring, 1968-75. (Dotted circles represent the observed mean bottom-water temperatures.)

Georges Bank—Spring.—Adjusted spring bottom-water temperatures on Georges Bank (Fig. 10) are characterized by a low in 1971 of 3.8°C, followed by rather large annual increases to a peak of 6.3°C in 1974, and then a sharp decline of 1.9°C in 1975. The 8-yr mean of 5.0°C is 1°C lower than that reported by Karaulovsky and Sigaev (see footnote 2) for 1962-72, but their coverage included waters deeper than 100 m which probably accounts for much of the difference. Data from Schopf (1967) indicate a mean Georges Bank bottom-water temperature in the spring of approximately 6°C in 1955, 4.5°C in 1956, 3°C in 1965, and 3.5°C in 1966.

Georges Bank is usually dominated by the 4°-6°C TCI in the spring which in 1969 accounted for 90% of the area within the 100-m isobath (Fig. 11). The minimum (1971) and maximum (1974) observed means were influenced by a replacement of the 4°-6°C TCI with 2°-4°C and 6°-8°C water, respectively. Since the Bank waters are well

mixed vertically in the spring, these changes in TCI percentages in 1971 and 1974 reflect broad-scale differences from average habitat conditions.

Subareas of Georges Bank—Spring.—Unlike the Gulf of Maine, year-to-year changes in spring temperatures were similar in all the subareas of Georges Bank, which emphasizes the homogeneity of these shoal waters (Fig. 12). Central Georges Bank, which has the highest proportion of shoal water, was usually the coldest of the three subareas and reached a minimum of 4.0°C in 1971. Western and Eastern Georges Bank had very similar mean temperatures except in 1968 when Eastern Georges Bank reached the time-series minimum of 3.6°C for all subareas and had an anomaly of -1.7°C (Table 3).

Subarea TCI's for spring are shown in Figure 13. It is interesting to note that the warm years of 1973 and 1975 (observed means) were substantially influenced by water >8°C in all three subareas, but that the warmest year, 1974, had none of this water. The rather low observed mean for the entire Bank in 1968 was mainly the result of a 2°-4°C TCI covering 75% of the eastern subarea; water

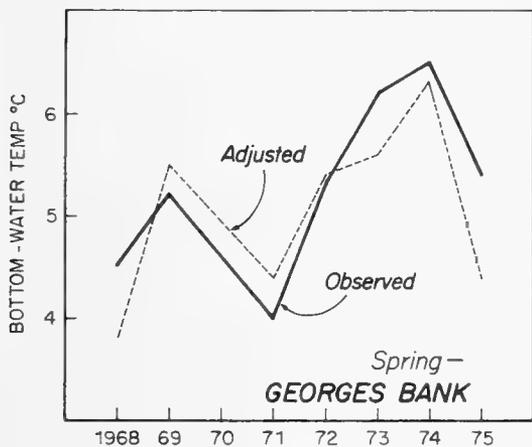


Figure 10.—Observed and adjusted mean bottom-water temperatures on Georges Bank during the spring, 1968-75.

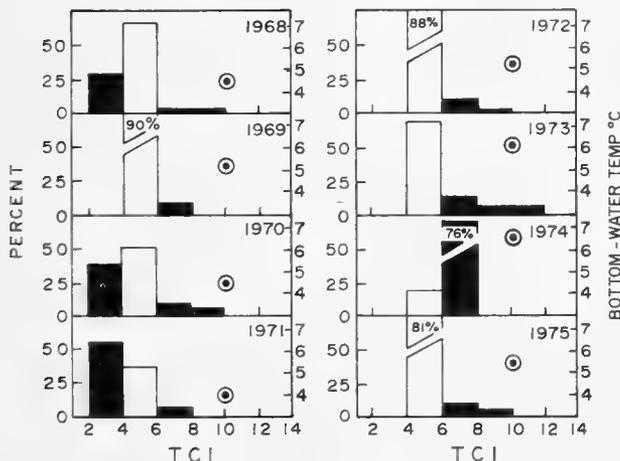


Figure 11.—Percentages of temperature-class intervals (TCI's) on Georges Bank during the spring, 1968-75. (Dotted circles represent the observed mean bottom-water temperatures.)

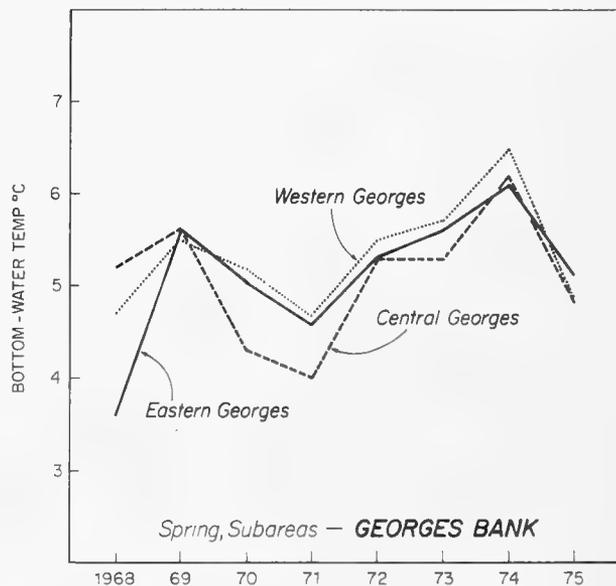


Figure 12.—Adjusted mean bottom-water temperatures on Georges Bank by subareas during the spring, 1968-75.

Table 3.—Mean bottom-water temperatures and anomalies for Georges Bank, spring 1968-75. Adjusted values are shown in parentheses.

Subarea	Mean	1968	1969	1970	1971	1972	1973	1974	1975
Western	5.3	- .7 (5.3)	- .1 (+ .2)	- .3 (- .1)	- 1.1 (- .6)	0 (- .3)	+ .9 (+ .5)	+ 1.4 (+ 1.3)	+ .2 (- .4)
Central	5.1	0 (5.1)	+ .1 (+ .5)	- 1.0 (- .8)	- 1.5 (- 1.1)	+ .1 (+ .2)	+ .7 (+ .2)	+ 1.4 (+ 1.1)	+ .4 (- .3)
Eastern	5.2	- 1.7 (5.1)	0 (+ .5)	- .4 (- .1)	- 1.0 (- .5)	0 (+ .2)	+ 1.0 (+ .5)	+ 1.2 (+ 1.0)	+ .6 (0)
Entire Bank	5.2	- .7 (5.0)	0 (+ .5)	- .6 (0)	- 1.2 (- .6)	+ .1 (+ .4)	+ 1.0 (+ .6)	+ 1.3 (+ 1.3)	+ .2 (- .6)

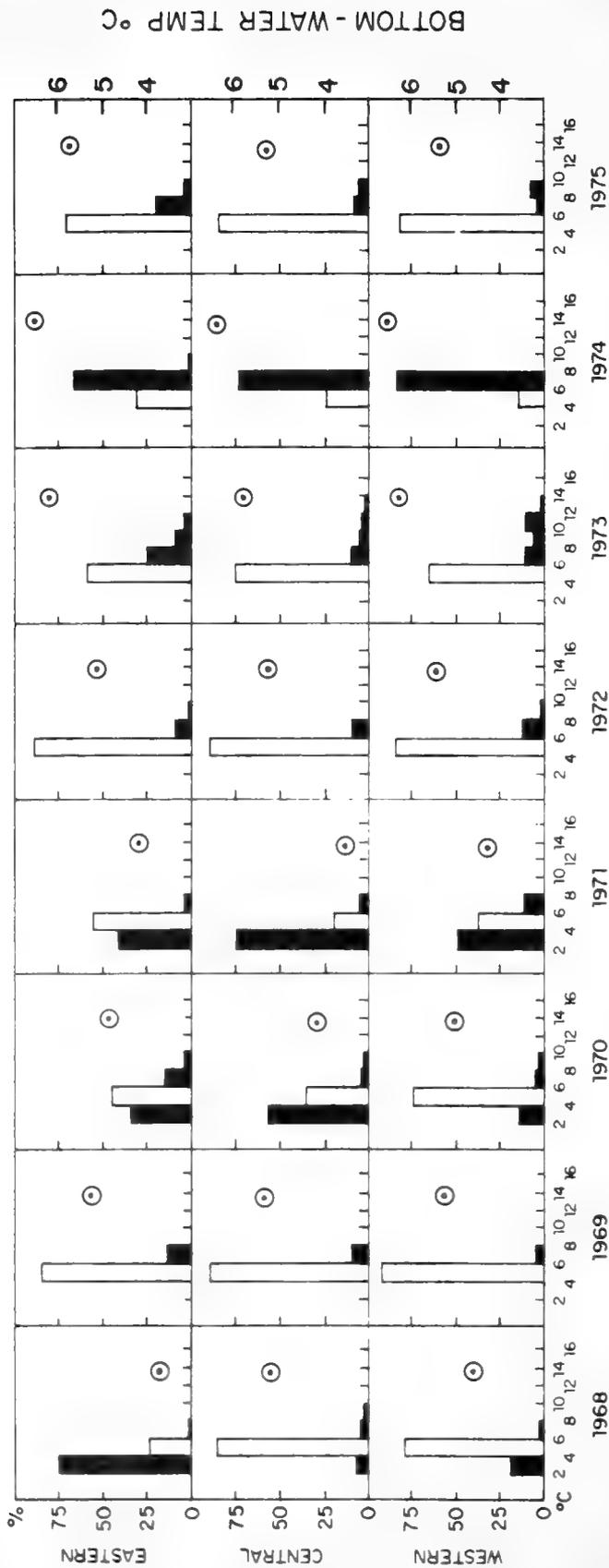


Figure 13.—Percentages of temperature-class intervals (TCI's) on Georges Bank by subareas during the spring, 1968-75. (Dotted circles represent the observed mean bottom-water temperatures.)

this cold occurred there in only two other years, 1970 and 1971.

Autumn Temperatures, 1963-75

Gulf of Maine—Autumn.—Adjusted bottom-water temperatures during autumn in the Gulf of Maine decreased from a mean of 7.2°C in 1963 to a time-series minimum of 5.4°C in 1966, and then increased to a maximum of 8.4°C in 1973 and 1974 (Fig. 14). The greatest changes were the 1.5°C decrease between 1963 and 1964 and the 1.5°C increase between 1967 and 1968. Every year after 1967 exceeded the 13-yr mean of 7.2°C, while all prior years had negative anomalies (Table 4). The 1963-75 mean was only 0.2°C warmer than that observed by Karaulovsky and Sigaev (see footnote 2) for 1962-72 and about 1°-1.5°C warmer than in 1964 and 1965 and the same as in 1955 as observed by Schopf (1967).

Temperature class intervals in the Gulf varied annually even though the observed mean temperatures varied only slightly between years (Fig. 15). Generally, water <6°C in the coldest years was partially “replaced” by water >10°C and dominance of the 6°-8°C TCI shifted to the 8°-10°C TCI to account for the changes in the warmest years. The observed decline in 1975 was a result of an increase in 4°-6°C water with a corresponding decrease of water >10°C.

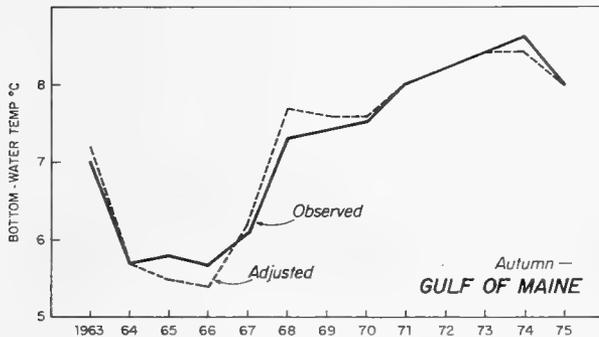


Figure 14.—Observed and adjusted mean bottom-water temperatures in the Gulf of Maine during the autumn, 1963-75.

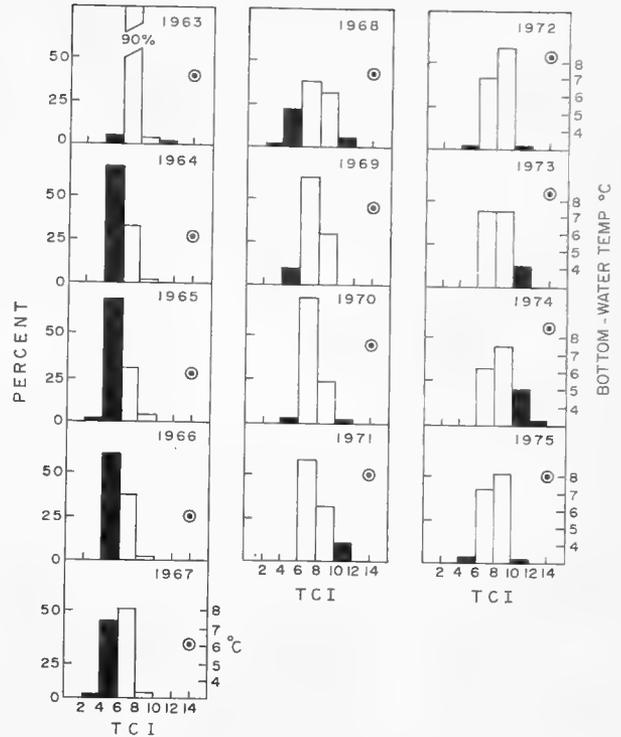


Figure 15.—Percentages of temperature-class intervals (TCI's) in the Gulf of Maine during the autumn, 1963-75. (Dotted circles represent the observed mean bottom-water temperatures.)

Subareas of the Gulf of Maine—Autumn.—Although the adjusted mean bottom-water temperatures fluctuated widely between years, the autumn warming trend which began in 1966 was evident in each of the five subareas (Fig. 16). Temperature peaked at 9.4°C in Subarea I in 1970 and declined quite consistently in subsequent years to a mean index of 7.3°C in 1975; Subarea II peaked at 8.3°C in 1971 and declined to 6.9°C in 1975.

The easternmost subarea (V) was usually the warmest with an adjusted maximum of 10.7°C in 1974 and Subarea II was the coldest with a minimum mean index of 4.6°C in 1966. The largest fluctuations occurred between 1963 and 1964 with decreases up to 2.2°C and between 1967 and 1968 with increases up to 3.2°C. Although Sub-

Table 4.—Mean bottom-water temperatures and anomalies for the Gulf of Maine, autumn 1963-75. Adjusted values are shown in parentheses.

Subarea	Mean	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
I	7.4 (7.5)	+ .9 (+1.0)	- .9 (- .9)	-1.8 (-2.1)	-1.9 (-2.2)	-1.8 (-1.8)	+1.0 (+1.4)	+ .9 (+1.3)	+1.9 (+1.9)	+ .7 (+ .7)	+1.0 (+1.0)	+ .4 (+ .4)	+ .6 (+ .4)	- .9 (-1.2)
II	6.6 (6.6)	+ .2 (+ .8)	-1.5 (-1.4)	-1.7 (-1.9)	-1.6 (-2.0)	-1.1 (- .9)	- .5 (+ .3)	+ .2 (+ .4)	+ .7 (+ .8)	+1.8 (+1.8)	+ .8 (+ .9)	+1.1 (+1.2)	+ .8 (+ .7)	+ .5 (+ .3)
III	6.8 (6.9)	- .1 (+ .5)	-1.7 (-1.2)	-1.0 (-1.3)	-1.5 (-1.8)	-1.1 (- .9)	- .5 (- .4)	+ .3 (+ .4)	+ .4 (+ .4)	+ .8 (+ .6)	+ .9 (+ .8)	+ .9 (+ .8)	+1.5 (+1.3)	+1.2 (+1.0)
IV	7.5 (7.6)	- .5 (0)	-1.5 (-1.2)	-1.7 (-2.0)	-1.1 (-1.4)	- .9 (- .8)	+ .3 (+ .4)	- .2 (- .1)	- .3 (- .3)	+ .2 (+ .1)	+1.3 (+1.2)	+1.1 (+1.0)	+1.8 (+1.6)	+1.2 (+1.0)
V	8.2 (8.2)	-1.3 (- .9)	-1.8 (-1.4)	-1.5 (-1.7)	-1.7 (-1.9)	-1.2 (-1.0)	+1.1 (+1.3)	+ .2 (+ .3)	- .4 (- .3)	+ .3 (+ .2)	+ .5 (+ .7)	+1.8 (+1.7)	+2.6 (+2.5)	+ .8 (+ .7)
Entire Gulf	7.2 (7.2)	- .2 (0)	-1.5 (-1.5)	-1.4 (-1.7)	-1.5 (-1.8)	-1.1 (-1.0)	+ .1 (+ .5)	+ .2 (+ .4)	+ .3 (+ .4)	+ .8 (+ .8)	+1.0 (+1.0)	+1.2 (+1.2)	+1.4 (+1.2)	+ .8 (+ .8)

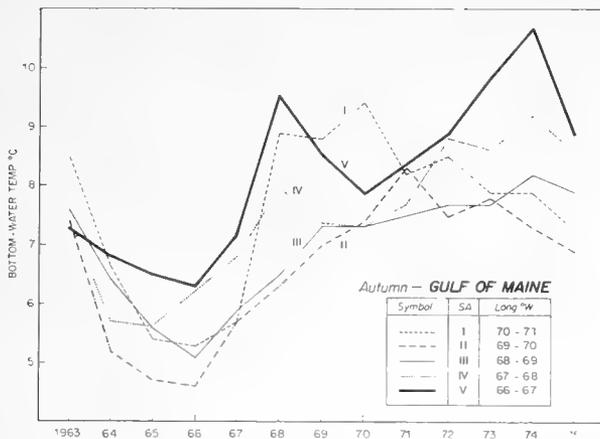


Figure 16.—Adjusted mean bottom-water temperatures in the Gulf of Maine in subareas I-V during the autumn, 1963-75.

area I is the smallest of the Gulf divisions, its large negative anomaly (-1.2°C) in 1975 (Table 4) accounted for much of the decline observed that year for the entire Gulf.

The subarea TCI's shown in Figure 17 are further evidence that years of similar mean temperatures do not necessarily have similar TCI distributions. A good example is shown in Subarea V where the observed means from 1963 to 1967 were all nearly 6.5°C , but the 1963 and 1967 TCI's were vastly different from the 1964-66 TCI distributions. The sharp temperature decline in 1975 in Subarea I was the result of a return of $4^{\circ}\text{--}6^{\circ}\text{C}$ water that had not occurred there since 1967. The absence of water $<8^{\circ}\text{C}$ in Subareas IV and V was the major factor contributing to the time-series maxima observed for those subareas and also for the entire Gulf of Maine during 1974.

Georges Bank—Autumn.—Autumn bottom-water temperature indices fluctuated widely between years on Georges Bank (Fig. 18) with the two highest adjusted temperatures observed in 1965 (13.1°C) and 1973 (12.7°C); lowest adjusted values were observed in 1967 (10.6°C) and in 1969 and 1970 (10.4° and 10.5°C). The largest annual variations were -2.0°C between 1966 and 1967 and $+1.5^{\circ}\text{C}$ between 1967 and 1968. The 13-yr mean of 11.7°C was about 0.5°C warmer than the 1962-72 long-term mean reported by Karaulovsky and Sigaev (see footnote 2). Data from Schopf (1967) indicate mean

autumn Georges Bank temperatures of about 12°C in 1955 and 1961 and 10°C in 1964.

Based on observed means, the two coldest years (1963 and 1967) each had about 20% coverage with $4^{\circ}\text{--}6^{\circ}\text{C}$ water, but this was the only similarity of TCI distribution in these years (Fig. 19). The two warmest years (1973 and 1974) and several of the intermediate years had very nearly the same TCI distribution. No water $>14^{\circ}\text{C}$ nor $<8^{\circ}\text{C}$ was found in the coldest and warmest years, respectively.

Subareas of Georges Bank—Autumn.—Adjusted bottom-water temperatures clearly show that during the autumn Eastern Georges Bank was consistently colder than the remainder of the Bank by as much as 4°C while Western and Central Georges Bank alternated as the warmest subarea (Fig. 20). A warming trend for the latter two subareas since 1966 is indicated, but is not obvious until 1969 on Eastern Georges Bank. All three subareas exhibited similar increases or decreases of varying magnitude except when only Eastern Georges Bank increased between 1971 and 1972, and only Western Georges Bank increased between 1973 and 1974. Positively adjusted anomalies for each subarea were recorded in 1968 and from 1972 to 1975 (Table 5).

Distributions of TCI's for the subareas of Georges Bank partially explain why the eastern portion was consistently colder than the western or central portions (Fig. 21). A large proportion of water $<8^{\circ}\text{C}$ occurred in the eastern subarea in most years from 1963 to 1971, while very little water $>14^{\circ}\text{C}$ was found there in any year. Conversely, relatively small amounts of this cold water were found in the western or central subareas in any year, but water $>14^{\circ}\text{C}$ predominated there in many of the warmest years.

As with the other subareas and other seasons in the study area, the distributions of TCI's were not always similar during years of similar observed temperature means.

DISCUSSION

Annual fluctuations in spring and autumn bottom-water temperatures in the Gulf of Maine and Georges Bank are obviously related to variations in the volume of relatively cold or warm water which denote change in the composition of these waters. Bigelow (1927) and Colton (1968b) concluded that the volume and composition of

Table 5.—Mean bottom-water temperatures and anomalies for Georges Bank, 1963-75. Adjusted values are shown in parentheses.

Subarea	Mean	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
Western	12.0 (12.3)	-2.2 (+ .2)	-1.2 (- .5)	+ .6 (+ .3)	-1.5 (-1.8)	-3.2 (-1.3)	+ .9 (+ .7)	- .9 (-1.1)	- .2 (- .7)	+1.9 (+1.3)	+1.3 (+ .8)	+1.5 (+ .9)	+2.2 (+1.5)	+ .6 (0)
Central	11.9 (12.3)	-2.7 (- .3)	-1.4 (- .6)	+ .2 (- .5)	- .5 (- .9)	-3.0 (-1.3)	+ .6 (+ .3)	- .2 (- .5)	+ .3 (- .3)	+1.3 (+ .6)	+ .8 (+ .1)	+2.2 (+2.5)	+2.0 (+1.3)	+ .9 (+ .2)
Eastern	9.7 (10.0)	-1.8 (+ .5)	-1.6 (-1.1)	+ .1 (- .5)	- .5 (- .8)	-1.3 (+ .3)	+ .4 (+ .3)	-1.0 (-1.2)	- .7 (-1.1)	+ .3 (- .3)	+ .6 (0)	+2.1 (+1.5)	+2.1 (+1.4)	+1.0 (+ .4)
Entire Bank	11.3 (11.7)	-2.3 (- .5)	-1.3 (+ .4)	+ .6 (+1.4)	- .9 (+ .9)	-2.5 (-1.1)	+ .8 (+ .4)	- .7 (-1.3)	- .2 (-1.2)	+1.1 (0)	+ .9 (- .1)	+2.1 (+1.0)	+1.9 (+ .8)	+ .8 (- .1)

BOTTOM-WATER TEMP °C

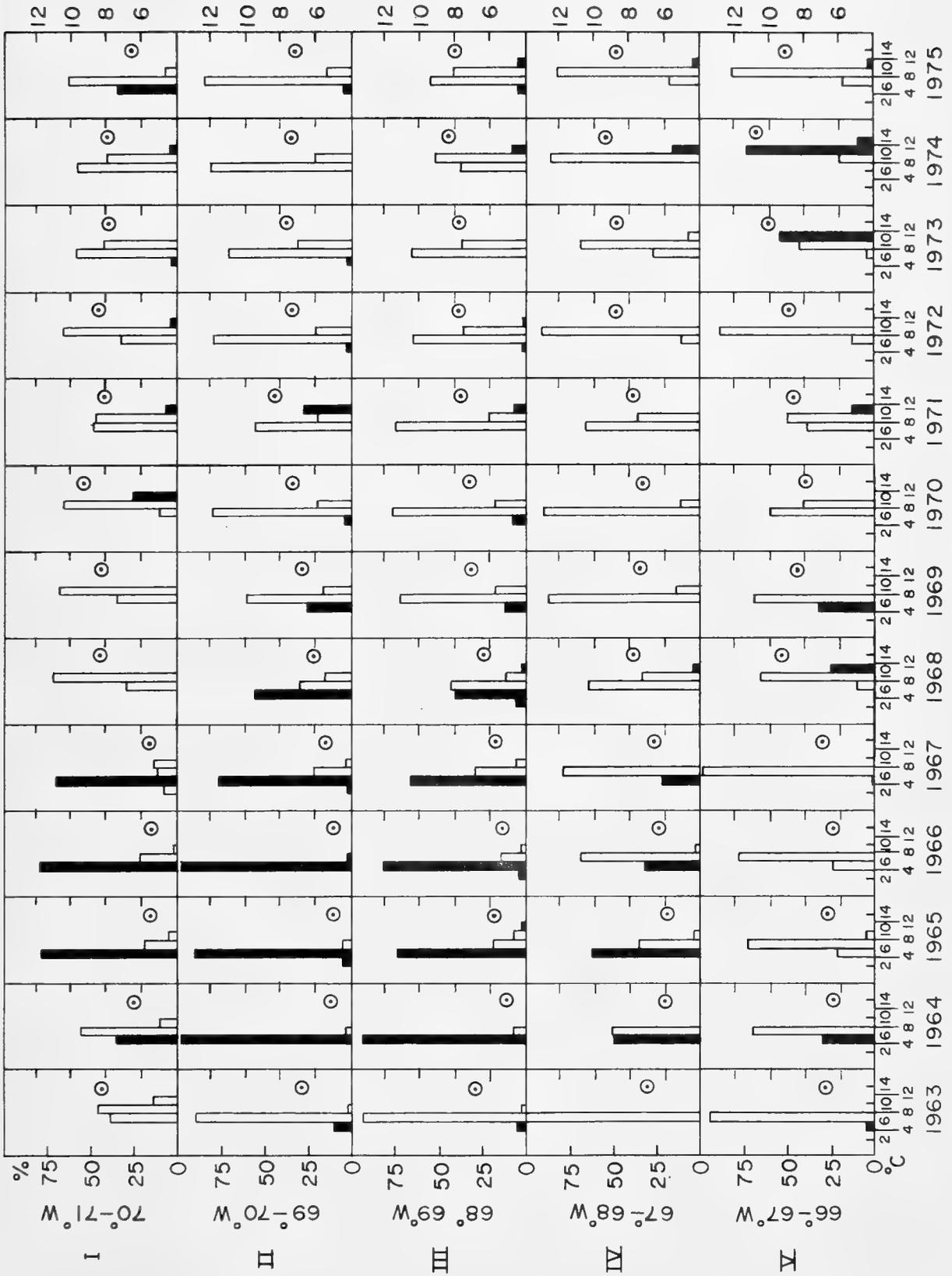


Figure 17. -- Percentages of temperature-class intervals (TCI's) in the Gulf of Maine by subareas in the autumn, 1963-75. (Dotted circles represent the observed mean bottom-water temperatures.)

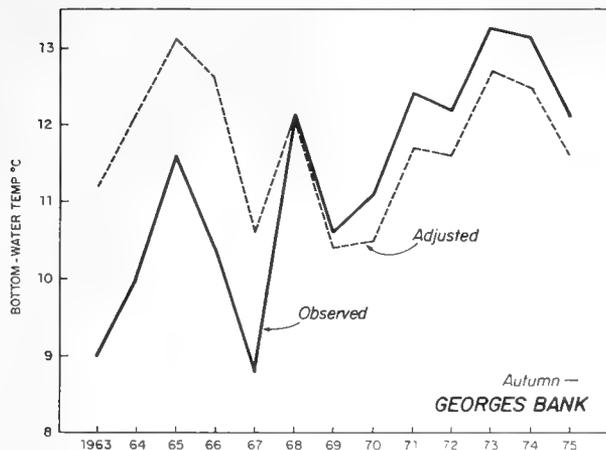


Figure 18.—Observed and adjusted bottom-water temperatures on Georges Bank in the autumn, 1963-75.

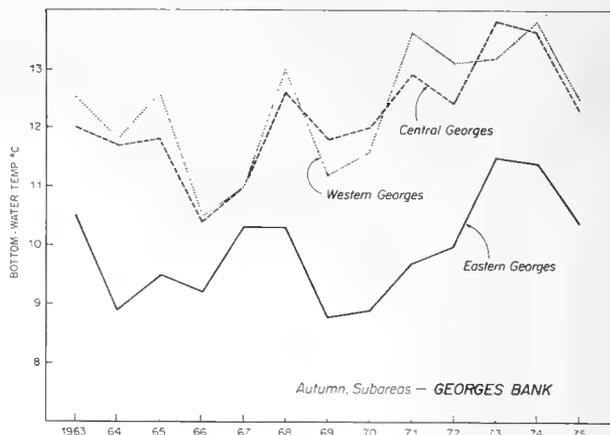


Figure 20.—Adjusted mean bottom-water temperatures on Georges Bank by subareas in the autumn, 1963-75.

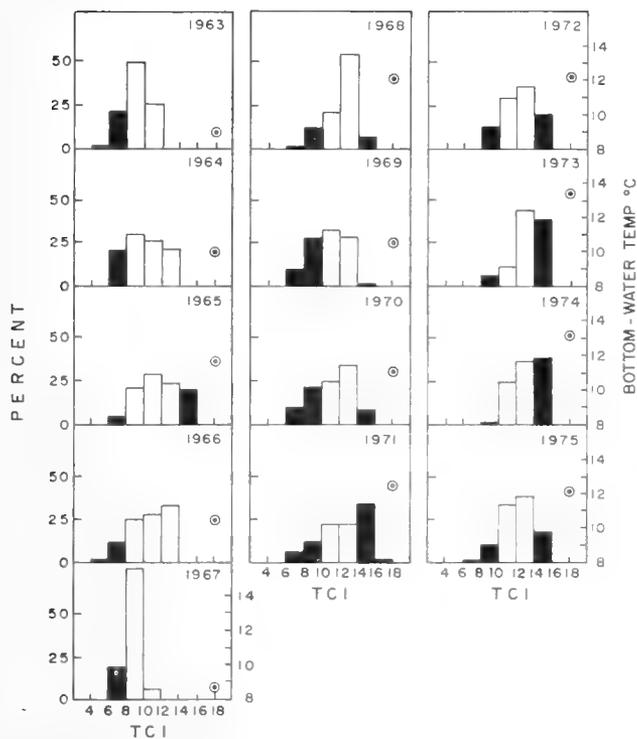


Figure 19.—Percentages of temperature-class intervals (TCI's) on Georges Bank in the autumn, 1963-75. (Dotted circles represent the observed mean bottom-water temperatures.)

offshore waters entering the Gulf of Maine via the Northeast Channel principally determine these variations, at least in deeper basins of the Gulf. Although salinity observations were not analyzed in this study, it can be assumed that fluctuations in the volume of slope water entering the Gulf through the Northeast Channel were mainly responsible for the general temperature trend observed in much of the Gulf and partially affected tem-

perature changes on Georges Bank. Examination of the continuity of the 8°C bottom isotherm for the spring cruises supports this assumption. The high spring temperatures observed in 1972-75 in Subareas IV and V (Fig. 7) were probably the result of an inflow through the Northeast Channel each year as indicated by the 8°C isotherm (Fig. 2). The high mean temperature observed in Subarea III in 1970 was the result of one of two rather large pockets of water >8°C.

It seems clear that anomalous temperature conditions occurred, commencing in the spring of 1970 and autumn of 1971, and persisted through 1975. In order to understand the dynamics of such changes the National Marine Fisheries Service initiated in 1977 a program of continuous monitoring of temperature, salinity, and currents in the Northeast Channel and contiguous waters. As stated by Bigelow (1927) this channel is the most striking feature of the Gulf of Maine affecting the hydrography of the region. Also, an examination of available data on the volume and location of slope waters (such as Wright 1976) for waters south of Cape Cod would provide a better understanding of the observed conditions in the Gulf of Maine and on Georges Bank during this period.

The trend of increasing spring temperatures since 1968 is much smoother in the Gulf of Maine (Fig. 6) than on Georges Bank (Fig. 10) when each area is analyzed as an entire unit, but on Georges Bank the subareas are much more similar within a given year (Figs. 8, 12). This is to be expected as the waters of Georges Bank are well mixed by tides and winds as indicated by the homogeneity of TCI's in years of very comparable mean temperatures such as in the spring of 1969 and 1972 (Fig. 11). This condition was not observed in the autumn because Eastern Georges Bank was consistently 2°C or more colder than the rest of the Bank. This can partially be explained because Eastern Georges Bank, being the deepest of the three subareas, is least affected by solar heating and mixing. Also, a buffering effect is probably from the indraft of cooler slope water through the adjacent Northeast Channel during the autumn.

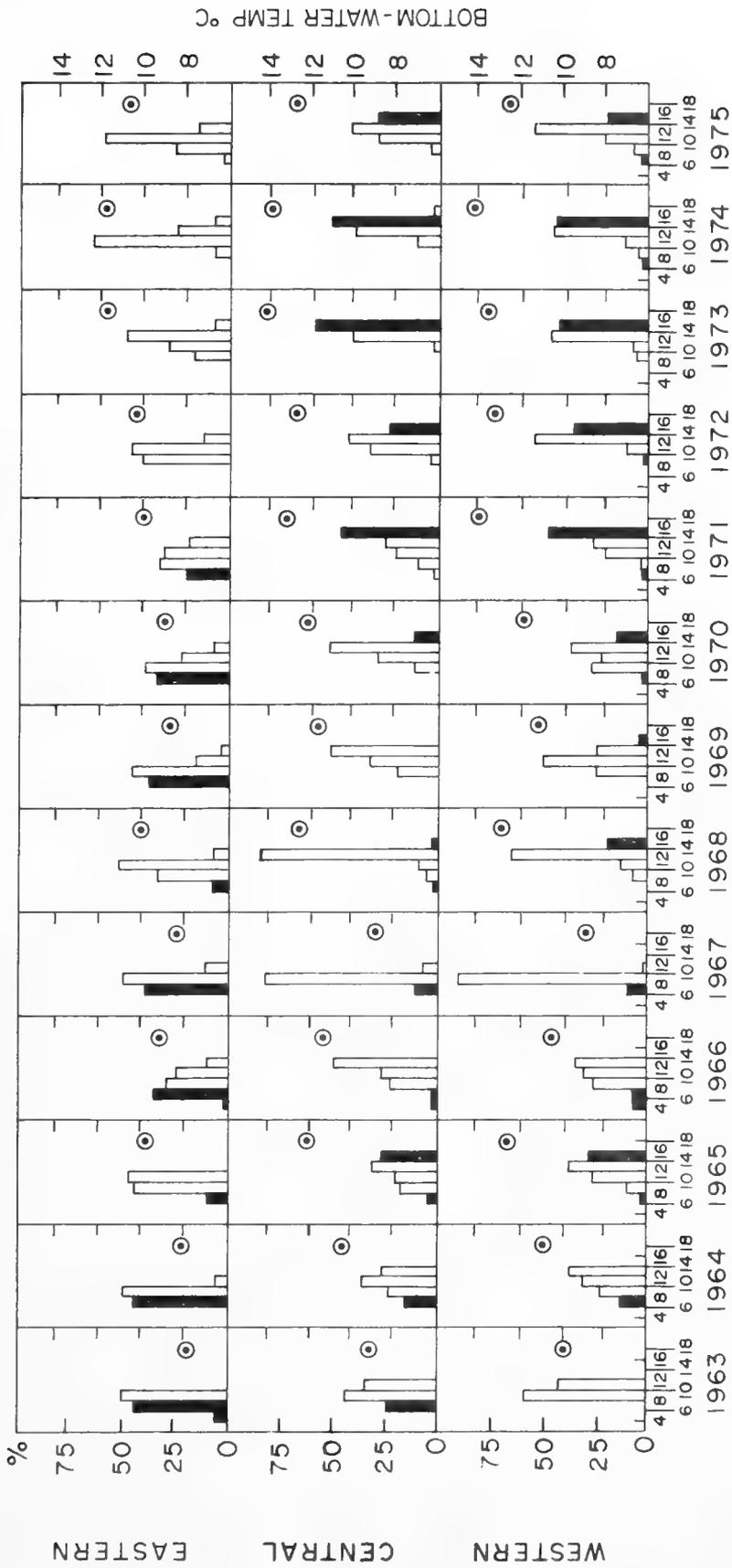


Figure 21.—Percentages of temperature-class intervals (TCL's) on Georges Bank by subareas in the autumn, 1963-75. (Dotted circles represent the observed mean bottom-water temperatures.)

With respect to biological changes, it is perhaps more important to note changes in percentages of certain temperature class intervals rather than variations in temperature means or extremes since the TCI's can be considered areal estimates of suitable habitat for any given species. The reader should again be cautioned that the TCI analysis is intended primarily for comparing habitat conditions at the time of sampling and should not be considered changes between stable annual conditions. Since cruises of some years differed by over a month, and the TCI percentages represent relatively transient phenomena, the value of this analysis is in interpreting how a species may be affected by the observed TCI percentages. For example, during the autumn cruises of 1964-68, relatively large amounts of 4°-6°C water were present in the Gulf of Maine (Fig. 15). These cold conditions were probably quite favorable for northern shrimp, *Pandalus borealis*, in the southern limits of their normal distribution in the western North Atlantic. Both commercial and research cruise indices of shrimp abundance have declined abruptly since 1969 coincident with the rapid decrease and disappearance of 4°-6°C water.

Providing that temperature tolerances or preferences are known for various species, such as that of haddock, *Melanogrammus aeglefinus*, embryos surviving best at about 6°C (Laurence and Rogers 1976), some relationships can be examined. It appears from Clark's⁷ data that the year-class strength of 2-yr-old haddock may be related to spawning season temperatures. Since 1968 extremely small year classes have been produced in 2 of the 3 yr that spawning temperatures averaged less than 4.8°C; the two largest year classes were progeny of 5°-6°C temperatures, and temperatures of 6.2°-6.4°C produced intermediate-sized year classes. Unfortunately, these comparisons are available only during a period when the haddock stock and recruitment has been relatively small due to overfishing.

It is unlikely that a simple linear relationship between temperature and spawning success exists, but temperature trends of the magnitude encountered during the past decade undoubtedly influenced certain biological phenomena including changes in spawning time, growth rates, and distributional characteristics of several species. Some notable changes that occurred in this latest warming trend include increased populations of green crabs, *Carcinides maenas*, along the Maine coast (University of Rhode Island⁸); northerly extended seasonal distribution of Atlantic mackerel, *Scomber scombrus*, (Anderson⁹); increased growth rates in the 1970's of Atlantic herring, *Clupea harengus*, (Anthony¹⁰);

and a general shift of juvenile silver hake, *Merluccius bilinearis*, since 1971 from Cape Cod and westward to Georges Bank and the Gulf of Maine (Davis¹¹).

Taylor et al. (1957) and Colton (1972) concluded that there were no general changes in the faunal composition of the Gulf of Maine during the warming trend of the early 1950's nor the cooling period ending in 1966, but that distributional and spawning habits of several species, including haddock, were significantly altered. Although a more complete understanding of the net effects of temperature is required, other gross effects such as those stated might be evident if available biological data for the last decade are closely scrutinized. Certainly, there could be significant value in such correlation analyses of time-series data, especially after we have better measures of the dynamics involved with temperature variations in the Gulf of Maine and on Georges Bank.

Because of the high variability of bottom-water temperatures between the two major areas and within their respective subareas during the seasons under study, it is important that references to temperature trends be identified to specific localities and seasons. Contrary to such references, annual indices of mean bottom-water temperatures for Georges Bank and the Gulf of Maine from 1968 to 1975 are shown in Figure 22. Since only spring and autumn data were available, the annual index must be considered a gross estimate of average conditions observed during these years, but the generalized warming trend shown is nevertheless of value in revealing the changes that have taken place.

Subsequent to the preparation of most of this manuscript, bottom-water temperature data for 1976 became available. Preliminary analysis of the data indicates record high adjusted mean temperatures during the autumn for both Georges Bank (13.4°C) and the Gulf of Maine (9.3°C) and also during the spring in the Gulf of Maine (7.2°C). A relatively large inflow of 8°-10°C water

¹¹Davis, C. W. Demersal distribution of juvenile silver hake (*Merluccius bilinearis*) from Cape Hatteras to western Nova Scotia, 1963-1975, Unpubl. manusc.

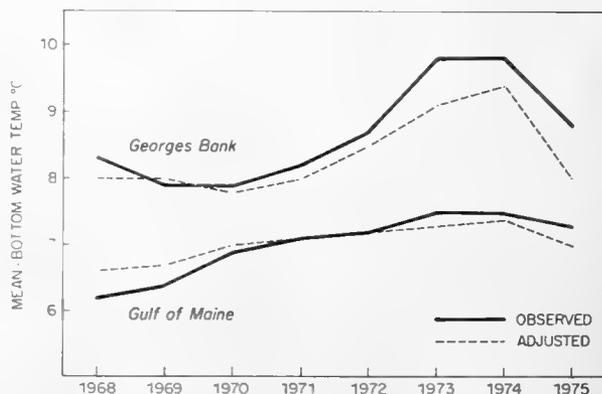


Figure 22.—Annual mean bottom-water temperatures in the Gulf of Maine and on Georges Bank, 1968-75.

⁷Clark, S. 1976. Georges Bank (Subdiv. 5Ze) haddock status report. Int. Comm. Northwest Atl. Fish. Res. Doc. 76/35, 8 p.

⁸University of Rhode Island. 1975. NEMRIP monthly newsletter, August 1975. Narragansett Bay Campus, Narragansett, R.I.

⁹Anderson, E. D. 1975. The effects of a combined assessment for mackerel in ICNAF Subareas 3, 4, and 5, and Statistical Area 6. Int. Comm. Northwest. Atl. Fish. Res. Doc. 75/14, 14 p.

¹⁰Anthony, V. C. Growth rates of Atlantic herring (*Clupea harengus*) in the Gulf of Maine and Georges Bank. Northeast Fisheries Center, Woods Hole, Mass. Unpubl. manusc.

apparently entered the Gulf through the Northeast Channel during the spring of 1976.

ACKNOWLEDGMENTS

I thank the many biologists and technicians of the Northeast Fisheries Center (NEFC), National Marine Fisheries Service, Woods Hole, Mass., who collected, analyzed, and plotted much of the raw temperature data; Joe Chase of the Woods Hole Oceanographic Institution for providing much of the lightship data; and J. B. Colton, M. D. Grosslein, R. Schlitz, and R. Wright of the NEFC for reviewing this manuscript.

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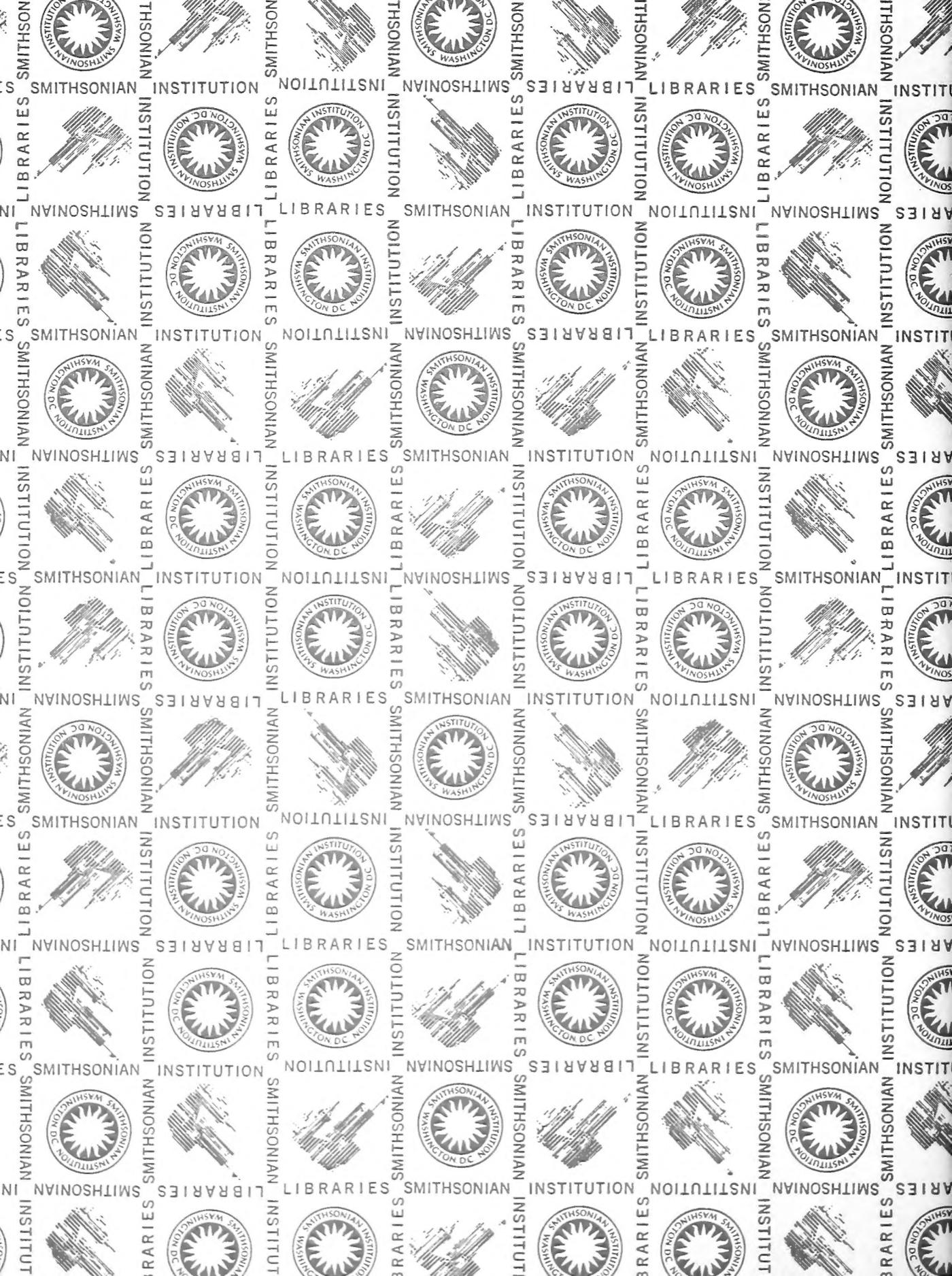
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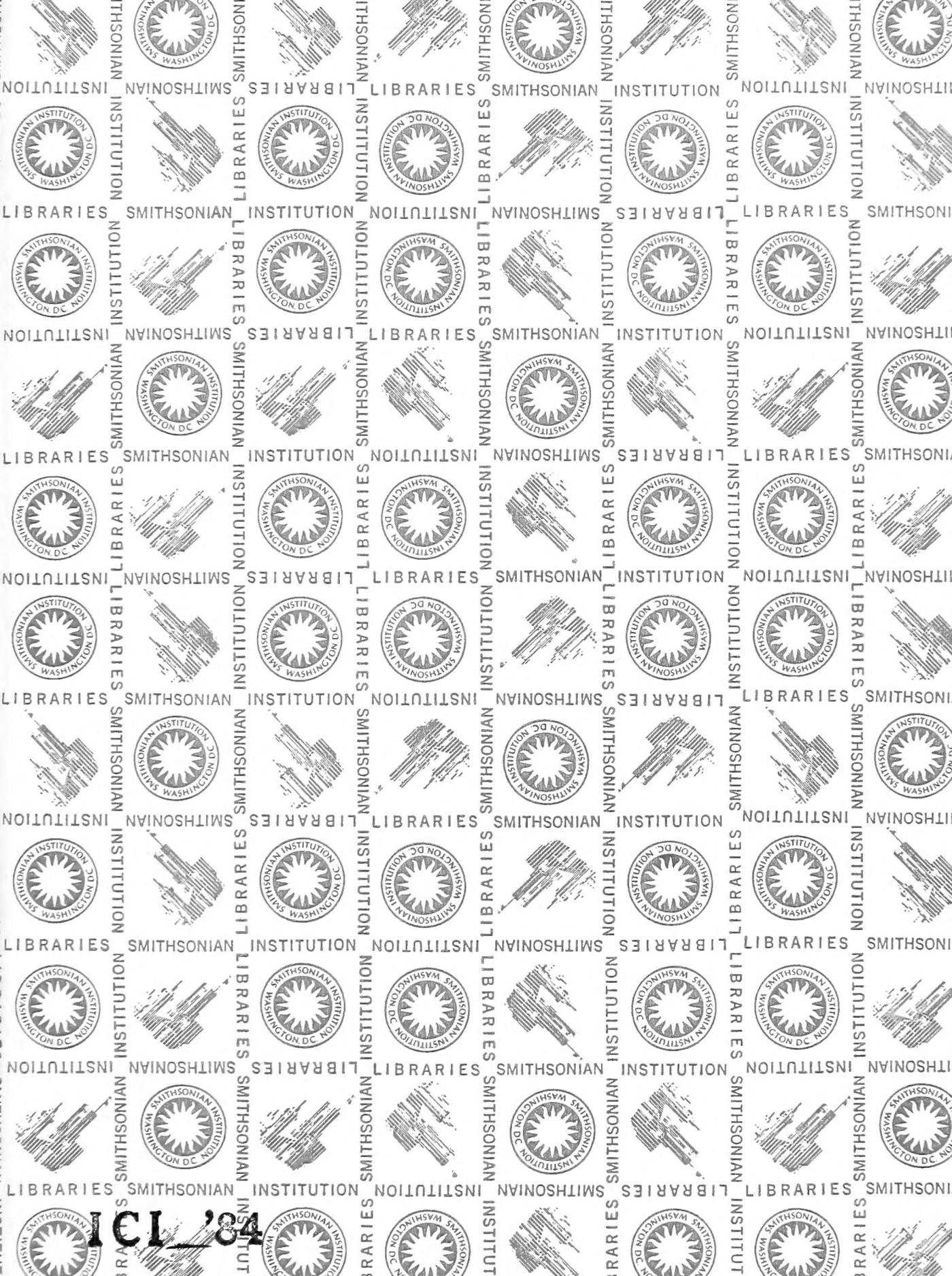


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