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Potential Catch in Sport Beach Seines On the Upper Texas Coast

by William B. Kittrell, Gary E. Saul, Roy B. Johnson
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Management Data Series Number 74
1985

Texas Parks and Wildlife Department
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ACKNOWLEDGMENTS

We appreciate the efforts of Bill Baker, Lynn Benefield, Glen Cordova, Art Crowe, Jim Dailey, Karen Gilligan, George Guillen, Paul Hammerschmidt, Tom Heffernan, Ed Hegen, Joe Kana, John Key, Steve Marwitz, David Simmons, Lex Sutton, Tom Teague, David Turowski and Mike Weixelman of the Coastal Fisheries staff and volunteer Dennis Myers for their assistance in sampling. Charles Wilkes, in addition to field duties, was especially helpful with the sampling gear.

We wish to express our appreciation to Larry McEachron and Al Green for their assistance in the project design and data analysis, and to the editorial committee who provided valuable criticism of the manuscript.

ABSTRACT

Mean monthly catch rates of animals in a 91.4 m seine pulled at six randomly selected sites between Sea Rim State Park and Bolivar Roads were determined. The potential catch in sport beach seines was then determined by multiplying mean catch rates by the estimated sport seining effort. The estimated annual sport beach seine catch of the 45 species captured in this study ranged from 463,000 to 89,000,000 animals. The harvest by 1,800 net fishermen could equal or exceed the harvest of 93,000 weekend sport-boat fishermen using hook and line in Galveston Bay.

INTRODUCTION

Beach seines are a historical method of harvesting fish on the Texas coast. Farley (1974) stated that an increase in commercial landings of spotted seatrout (Cynoscion nebulosus) from 118,752 kg in 1972 to 240,907 kg in 1973 "resulted largely from beach seine catches on the upper Texas coast." Beach seines were also used by sport fishermen to harvest fish prior to Legislative actions protecting overfished populations of red drum and spotted seatrout (Johnson et al. 1985). These actions prohibited the use of nets by sport and commercial fishermen (Anonymous 1983). Although the primary food fish caught by sport beach seiners was spotted seatrout (Johnson et al. 1985), a considerable by-catch of other finfish and shellfish could be expected because it typically occurs in net fisheries. McFarland (1963) found that striped mullet (Mugil cephalus), Atlantic threadfin (Polydactylus octonemus), Gulf kingfish (Menticirrhus littoralis), barred grunt (Conodon nobilis), and Florida pompano (Trachinotus carolinus) were the most abundant (by weight) of 47 species caught in beach seine collections at Mustang Island, Texas.

Johnson et al. (1985) determined the impacts of estimated catch of spotted seatrout in sport beach seines on the upper Texas coast. The objective of this study was to determine species composition and estimated catch of all species captured in sport beach seines operated by Texas Parks and Wildlife Department (TPWD).

MATERIALS AND METHODS

Beach seines used and methods of pulling the net were described by Johnson et al. (1985). From April 1983 to March 1984, a 91.4 m long seine with 3 meshes/15.2 cm was pulled each month at six randomly selected stations from Sea Rim State Park to the southwest tip of the Bolivar Peninsula (Figure 1). The seine was pulled parallel to the beach with one end on shore. All specimens collected were counted by species.

Mean monthly catch rates (No./drag) of marine organisms caught in > 6 samples were compared ($P < 0.05$) using a one-way analysis of variance (Sokal and Rohlf 1981). Catch rates (No./drag + 1) were transformed to \log_{10} prior to analysis to reduce variance heterogeneity. Comparisons among monthly means by species were made using the Duncan multiple range test (Sokal and Rohlf 1981).

Potential catch of marine organisms by sport seines with appropriate standard errors (Sokal and Rohlf 1981) was estimated by multiplying mean monthly catch/effort times effort. Assumptions regarding the fishery were the same as made by Johnson et al. (1985): 1) all 1854 people signing a petition opposing the prohibition of sport beach seining in 1982 were

seiners; 2) 3 people were required to operate a seine (TPWD used 3 people); 3) each drag required 1 hour (TPWD took 43.4 ± 2.3 minutes); 4) 2 hours/day were spent in non-seining activities; 5) there was no night seining; and 6) there was no illegal seining (i.e., no seines were pulled on weekends). The best estimate of effort was assumed to be from 100 to 600 seines operated annually with the same number of trips/year (18) and monthly distribution of trips (0.5 to 2.8 trips/month) as that of saltwater boat anglers (Ferguson and Green in preparation). The average trip length of 3.5 hours equals the average trip length of saltwater boat anglers (McEachron et al. 1981). Data for months with statistically similar catches/effort were combined to estimate a single mean prior to multiplying by the fishing effort for those months.

RESULTS

The best estimate of the annual sport beach seine catch ranges from 463,000 to 2,780,000 animals (Table 1). Potential annual catch in 600 sport beach seines could exceed 89,000,000 organisms including 37,000,000 striped mullet, 22,000,000 blue crabs (Callinectes sapidus), 7,000,000 Atlantic threadfin, 5,000,000 hardhead catfish (Arius felis), 4,000,000 spotted seatrout, 3,000,000 spot (Leiostomus xanthurus) and 3,000,000 cabbagehead (Stomolophus meleagris) (Table 2). The catch of black drum (Pogonias cromis), red drum (Sciaenops ocellatus), sheepshead (Archosargus probatocephalus), Atlantic croaker (Micropogonias undulatus), sand seatrout (C. arenarius), Florida pompano, and southern kingfish (M. americanus) could be 500,000 to 1,600,000 organisms.

Our beach seine catch consisted of 4,242 fish and shellfish representing 45 species (Table 3). Seven species (striped mullet, blue crab, Atlantic threadfin, hardhead catfish, spotted seatrout, cabbagehead and spot) were represented by ≥ 100 specimens. Of the 17 most frequently caught species, 13 had catch rates which varied significantly among months (Table 4). Nine species (Atlantic croaker, Atlantic threadfin, black drum, blue crab, Florida pompano, hardhead catfish, sand seatrout, southern kingfish and spotted seatrout) had highest catch rates during summer (Table 2, Figure 2). Red drum, spot and striped mullet had high catch rates during fall (Table 2, Figure 2).

DISCUSSION

Projected best estimates of fishes caught in beach seines indicate that harvest of some species by a relatively small net fishery could equal or exceed the landings by weekend sport-boat fishermen in Galveston Bay. In 1982-83, 93,000 sport-boat fishermen (Ditton and Fedler 1983) spent 788,000 man-hours on weekends alone to harvest 14,700 red drum and 34,500

black drum (McEachron and Green 1984). This compares to an estimated catch of 15,548 red drum and 47,533 black drum in 600 seines (1800 fishermen) fished 113,400 man-hours. A similar result was found for spotted seatrout (Johnson et al. 1985). Therefore, prohibition of beach seining has distributed the available resource to the greatest number of users.

Impacts of the estimated catch on animals depends on existing population levels, fisherman compliance with bag, possession and size limits and differential survival rates of released animals. The 1983-84 red drum limit of 10 fish per fisherman per day, for instance, would not be exceeded by estimated beach seine catches. However, since only 42% of the red drum caught would be of the 1983 legal size limit, it would be necessary to return fish to the water. Not all fishes (and presumably other animals) would survive after release. Survival rates vary among species (Hegen et al. 1984). Colura (1974) found no difference in survival of netted and control black drum in pond studies, but Hegen et al. (1982) reported that return rates of net-caught spotted seatrout were too low for use in tagging studies. The mortality of organisms caught in beach seines will vary according to species, handling procedures, exposure during netting activities, and physical stress and damage to the organism (such as that caused when fish are gilled).

The impacts of overfishing (Matlock 1982) and the loss of over 15 million animals during the freeze of December 1983 (McEachron et al. 1984) have resulted in fewer fish being available for capture. The prohibition of the use of nets by sport beach seiners has distributed the available catch to the greatest number of users.

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Table 1. Best estimate of potential sport beach seine catches by species in 100 to 600 seines in 18 annual fishing trips at 3.5 hours per trip^{a, b}. Months with statistically similar ($P > 0.05$) catch rates were combined.

| Species | Period | Seines | | |
|--------------------|-------------------|--------|---------|---------|
| | | 100 | 300 | 600 |
| <u>FISH</u> | | | | |
| Atlantic croaker | Jul | 2,377 | 7,132 | 14,263 |
| | Aug-Jun | 2,239 | 6,716 | 13,432 |
| | Annual | 4,616 | 13,848 | 27,695 |
| Atlantic threadfin | Jun-Jul | 43,186 | 129,559 | 259,119 |
| | Aug-May | 1,276 | 3,827 | 7,654 |
| | Annual | 44,462 | 133,386 | 266,773 |
| Black drum | Jun-Jul | 4,993 | 14,978 | 29,956 |
| | Aug-May | 2,929 | 8,788 | 17,577 |
| | Annual | 7,922 | 23,766 | 47,533 |
| Florida pompano | Jul | 2,243 | 6,728 | 13,457 |
| | Aug-Jun | 1,420 | 4,259 | 8,518 |
| | Annual | 3,663 | 10,987 | 21,975 |
| Hardhead catfish | Jun-Jul | 21,262 | 63,787 | 127,575 |
| | Aug-May | 5,103 | 15,309 | 30,618 |
| | Annual | 26,365 | 79,096 | 158,193 |
| Red drum | Sep | 1,117 | 3,352 | 6,703 |
| | Oct-Aug | 1,474 | 4,423 | 8,845 |
| | Annual | 2,591 | 7,775 | 15,548 |
| Sand seatrout | Jun-Jul | 3,544 | 10,631 | 21,262 |
| | Aug-May | 472 | 1,417 | 2,835 |
| | Annual | 4,016 | 12,048 | 24,097 |
| Sheepshead | Annual | 4,095 | 12,285 | 24,570 |
| Southern flounder | Annual | 1,512 | 4,536 | 9,072 |
| Southern kingfish | Jul | 3,503 | 10,508 | 21,017 |
| | Aug-Jun | 764 | 2,293 | 4,586 |
| | Annual | 4,267 | 12,801 | 25,603 |
| Spot | Jul/Oct | 12,474 | 37,422 | 74,844 |
| | Remainder of year | 2,315 | 6,946 | 13,891 |
| | Annual | 14,789 | 44,368 | 88,735 |
| Spotted seatrout | Jun-Jul | 17,057 | 51,171 | 102,343 |
| | Aug-May | 4,252 | 12,757 | 25,515 |
| | Annual | 21,309 | 63,928 | 127,858 |

Table 1. (Cont'd.).

| Species | Period | Seines | | |
|----------------------------|-------------------|---------|-----------|-----------|
| | | 100 | 300 | 600 |
| Striped mullet | May/Oct | 126,844 | 380,533 | 761,065 |
| | Remainder of year | 40,673 | 122,018 | 244,037 |
| | Annual | 167,517 | 502,551 | 1,005,102 |
| White mullet | Annual | 1,638 | 4,914 | 9,828 |
| <u>INVERTEBRATES</u> | | | | |
| Blue crab | Jul-Aug | 116,025 | 348,075 | 696,150 |
| | Sep-Jun | 18,726 | 56,179 | 112,358 |
| | Annual | 134,751 | 404,254 | 808,508 |
| Cabbagehead | Jun/Sep | 16,411 | 49,234 | 98,469 |
| | Remainder of year | 1,654 | 4,961 | 9,922 |
| | Annual | 18,065 | 54,195 | 108,391 |
| Speckled crab | Annual | 1,638 | 4,914 | 9,828 |
| Other species ^c | Annual | 504 | 1,512 | 3,024 |
| Total annual catch | | 463,720 | 1,391,164 | 2,782,333 |

^aNumber of trips per year and seasonality from Ferguson and Green (In preparation).

^bMean trip length from McEachron et al. (1981)

^cOther species includes 28 species (see Table 3).

Table 2. Potential annual catch of species in 100 to 600 seines in 10 drags per day, 22 days fished per month. A seine is a 91.4 m beach seine operated by 3 persons.

| Species | Periods ^a | Days fished ^b | Catch/drag | Seines | |
|--------------------|----------------------|--------------------------|------------|-----------|-----------|
| | | | | 100 | 600 |
| FISH | | | | | |
| Atlantic croaker | Jul | 22 | 2.83 | 62,260 | 373,560 |
| | Aug-Jun | 242 | 0.41 | 99,220 | 595,320 |
| | Annual | 264 | | 161,480 | 968,880 |
| Atlantic threadfin | Jun-Jul | 44 | 27.42 | 1,206,480 | 7,238,880 |
| | Aug-May | 220 | 0.27 | 59,400 | 356,400 |
| | Annual | 264 | | 1,265,880 | 7,595,280 |
| Black drum | Jun-Jul | 44 | 3.17 | 139,480 | 836,880 |
| | Aug-May | 220 | 0.62 | 136,400 | 818,400 |
| | Annual | 264 | | 275,880 | 1,655,280 |
| Florida pompano | Jul | 22 | 2.67 | 58,740 | 352,440 |
| | Aug-Jun | 242 | 0.26 | 62,920 | 377,520 |
| | Annual | 264 | | 121,660 | 729,960 |
| Hardhead catfish | Jun-Jul | 44 | 13.50 | 594,000 | 3,564,000 |
| | Aug-May | 220 | 1.08 | 237,600 | 1,425,600 |
| | Annual | 264 | | 831,600 | 4,989,600 |
| Red drum | Sep | 22 | 1.33 | 29,260 | 175,560 |
| | Oct-Aug | 242 | 0.27 | 65,340 | 392,040 |
| | Annual | 264 | | 94,600 | 567,600 |
| Sand seatrout | Jun-Jul | 44 | 2.25 | 99,000 | 594,000 |
| | Aug-May | 220 | 0.10 | 22,000 | 132,000 |
| | Annual | 264 | | 121,000 | 726,000 |
| Sheepshead | Annual | 264 | 0.65 | 171,600 | 1,029,600 |
| Southern flounder | Annual | 264 | 0.24 | 63,360 | 380,160 |
| Southern kingfish | Jul | 22 | 4.17 | 91,740 | 550,440 |
| | Aug-Jun | 242 | 0.14 | 33,880 | 203,280 |
| | Annual | 264 | | 125,620 | 753,720 |
| Spot | Jul/Oct | 44 | 7.92 | 348,480 | 2,090,880 |
| | Remainder of year | 220 | 0.49 | 107,800 | 646,800 |
| | Annual | 264 | | 456,280 | 2,737,680 |
| Spotted seatrout | Jun-Jul | 44 | 10.83 | 476,520 | 2,859,120 |
| | Aug-May | 220 | 0.90 | 198,000 | 1,188,000 |
| | Annual | 264 | | 674,520 | 4,047,120 |

Table 2. (Cont'd.).

| Species | Periods ^a | Days fished ^b | Catch/drag | Seines | |
|----------------------|----------------------|-----------------------------|------------|------------|------------|
| | | | | 100 | 600 |
| Striped mullet | May/Oct | 44 | 100.67 | 4,429,480 | 26,576,880 |
| | Remainder of year | 220 | 8.07 | 1,775,400 | 10,652,400 |
| | Annual | 264 | | 6,204,880 | 37,229,280 |
| White mullet | Annual | 264 | 0.26 | 68,640 | 411,840 |
| <u>INVERTEBRATES</u> | | | | | |
| Blue crab | Jul-Aug | 44 | 63.75 | 2,805,000 | 16,830,000 |
| | Sep-Jun | 220 | 4.18 | 919,600 | 5,517,600 |
| | Annual | 264 | | 3,724,600 | 22,347,600 |
| Cabbagehead | Jun/Sep | 44 | 10.42 | 458,480 | 2,750,880 |
| | Remainder of year | 220 | 0.35 | 77,000 | 462,000 |
| | Annual | 264 | | 535,480 | 3,212,880 |
| Speckled crab | Annual | 264 | 0.26 | 68,640 | 411,840 |
| Other species | Annual | 264 | 0.08 | 21,120 | 126,720 |
| Total annual catch | | | | 14,986,840 | 89,921,040 |

^aMonths with significantly different catch rates ($P \leq .05$) are presented separately.

^bDays fished calculated according to the methods used by Johnson et al. 1985.

Table 3. Number, frequency of catch, and annual catch per drag of species captured in beach seines during April 1983-March 1984.

| Common name | Species | Number caught | Samples | Catch/drag \pm 1 SE |
|-----------------------|------------------------------------|---------------|----------------------|-----------------------|
| | Scientific name | | containing organisms | |
| FISH | | | | |
| Atlantic bumper | <u>Chloroscombrus chrysurus</u> | 71 | 3 | 0.99 \pm 0.90 |
| Atlantic croaker | <u>Micropogonias undulatus</u> | 44 | 13 | 0.61 \pm 0.20 |
| Atlantic needlefish | <u>Strongylura marina</u> | 1 | 1 | 0.01 \pm 0.01 |
| Atlantic spadefish | <u>Chaetodipterus faber</u> | 9 | 5 | 0.12 \pm 0.06 |
| Atlantic stingray | <u>Dasyatis sabina</u> | 3 | 3 | 0.04 \pm 0.02 |
| Atlantic threadfin | <u>Polydactylus octonemus</u> | 345 | 13 | 4.79 \pm 2.28 |
| Bay anchovy | <u>Anchoa mitchilli</u> | 2 | 2 | 0.03 \pm 0.02 |
| Bighead searobin | <u>Prionotus tribulus</u> | 1 | 1 | 0.01 \pm 0.01 |
| Black drum | <u>Pogonias cromis</u> | 75 | 31 | 1.04 \pm 0.19 |
| Blackcheek tonguefish | <u>Symphurus plagiusa</u> | 1 | 1 | 0.01 \pm 0.01 |
| Blacktip shark | <u>Carcharhinus limbatus</u> | 22 | 1 | 0.30 \pm 0.30 |
| Bluefish | <u>Pomatomus saltatrix</u> | 3 | 1 | 0.04 \pm 0.04 |
| Bluntnose jack | <u>Hemicaranx amblyrhynchus</u> | 2 | 2 | 0.03 \pm 0.02 |
| Crevalle jack | <u>Caranx hippos</u> | 1 | 1 | 0.01 \pm 0.01 |
| Florida pompano | <u>Trachinotus carolinus</u> | 33 | 12 | 0.46 \pm 0.15 |
| Gizzard shad | <u>Dorosoma cepedianum</u> | 4 | 3 | 0.05 \pm 0.03 |
| Gulf butterflyfish | <u>Peprilus burti</u> | 1 | 1 | 0.01 \pm 0.01 |
| Gulf kingfish | <u>Menticirrhus littoralis</u> | 2 | 2 | 0.03 \pm 0.02 |
| Gulf menhaden | <u>Brevoortia patronus</u> | 9 | 4 | 0.12 \pm 0.08 |
| Hardhead catfish | <u>Arius felis</u> | 227 | 25 | 3.15 \pm 1.03 |
| Harvestfish | <u>Peprilus alepidotus</u> | 3 | 2 | 0.04 \pm 0.03 |
| Lookdown | <u>Selene vomer</u> | 7 | 1 | 0.10 \pm 0.10 |
| Pigfish | <u>Orthopristis chrysoptera</u> | 2 | 2 | 0.03 \pm 0.02 |
| Pinfish | <u>Lagodon rhomboides</u> | 1 | 1 | 0.01 \pm 0.01 |
| Red drum | <u>Sciaenops ocellatus</u> | 26 | 12 | 0.36 \pm 0.15 |
| Sand seatrout | <u>Cynoscion arenarius</u> | 33 | 11 | 0.46 \pm 0.17 |
| Sheepshead | <u>Archosargus probatocephalus</u> | 47 | 16 | 0.65 \pm 0.21 |
| Skipjack herring | <u>Alosa chrysochloris</u> | 3 | 1 | 0.04 \pm 0.04 |
| Southern flounder | <u>Paralichthys lethostigma</u> | 17 | 11 | 0.24 \pm 0.08 |
| Southern kingfish | <u>Menticirrhus americanus</u> | 34 | 9 | 0.47 \pm 0.30 |
| Southern stargazer | <u>Astroscopus y-graecum</u> | 1 | 1 | 0.01 \pm 0.01 |
| Spanish sardine | <u>Sardinella aurita</u> | 3 | 1 | 0.04 \pm 0.04 |
| Spot | <u>Leiostomus xanthurus</u> | 125 | 21 | 1.74 \pm 0.51 |
| Spotted seatrout | <u>Cynoscion nebulosus</u> | 184 | 31 | 2.55 \pm 0.18 |
| Star drum | <u>Stellifer lanceolatus</u> | 9 | 2 | 0.12 \pm 0.10 |
| Striped mullet | <u>Mugil cephalus</u> | 1692 | 61 | 23.50 \pm 7.42 |
| Tripletail | <u>Lobotes surinamensis</u> | 1 | 1 | 0.01 \pm 0.01 |
| White mullet | <u>Mugil curema</u> | 19 | 8 | 0.26 \pm 0.10 |

Table 3. (Cont'd.).

| Species | | Number caught | Samples containing organisms | Catch/drag \pm 1 SE |
|----------------------|-------------------------------------|------------------|------------------------------------|-----------------------|
| Common name | Scientific name | | | |
| <u>INVERTEBRATES</u> | | | | |
| Blue crab | <u>Callinectes</u> <u>sapidus</u> | 1003 | 39 | 14.1 \pm 4.96 |
| Cabbagehead | <u>Stomolophus</u> <u>meleagris</u> | 146 | 14 | 2.03 \pm 1.08 |
| Lesser blue crab | <u>Callinectes</u> <u>similis</u> | 1 | 1 | 0.01 \pm 0.01 |
| Speckled crab | <u>Arenaeus</u> <u>cribrarius</u> | 19 | 12 | 0.26 \pm 0.09 |
| Spider crab | <u>Libinia</u> <u>emarginata</u> | 1 | 1 | 0.01 \pm 0.01 |
| Stone crab | <u>Menippe</u> <u>mercenaria</u> | 3 | 3 | 0.04 \pm 0.02 |
| * White shrimp | <u>Penaeus</u> <u>setiferus</u> | 6 | 2 | 0.08 \pm 0.05 |

Table 4. Summary of one-way analyses of variance of mean monthly catches (catch/drag + 1, \log_{10} transformed) for the most frequently caught species during April 1983-March 1984.

| Group | Source of variation | Degrees of freedom | Mean square | F |
|--------------------|---------------------|--------------------|-------------|-------|
| <u>FISH</u> | | | | |
| Atlantic croaker | Total | 71 | | |
| | Months | 11 | 0.109 | 2.14* |
| | Error | 60 | 0.051 | |
| Atlantic threadfin | Total | 71 | | |
| | Months | 11 | 0.793 | 6.43* |
| | Error | 60 | 0.123 | |
| Black drum | Total | 71 | | |
| | Months | 11 | 0.217 | 4.47* |
| | Error | 60 | 0.048 | |
| Florida pompano | Total | 71 | | |
| | Months | 11 | 0.133 | 4.50* |
| | Error | 60 | 0.030 | |
| Hardhead catfish | Total | 71 | | |
| | Months | 11 | 0.562 | 4.32* |
| | Error | 60 | 0.130 | |
| Red drum | Total | 71 | | |
| | Months | 11 | 0.065 | 2.31* |
| | Error | 60 | 0.028 | |
| Sand seatrout | Total | 71 | | |
| | Months | 11 | 0.136 | 4.68* |
| | Error | 60 | 0.029 | |
| Sheepshead | Total | 71 | | |
| | Months | 11 | 0.064 | 1.08 |
| | Error | 60 | 0.048 | |
| Southern flounder | Total | 71 | | |
| | Months | 11 | 0.028 | 1.35 |
| | Error | 60 | 0.021 | |
| Southern kingfish | Total | 71 | | |
| | Months | 11 | 0.080 | 2.36* |
| | Error | 60 | 0.034 | |

Table 4. (Cont'd.).

| Group | Source of variation | Degrees of freedom | Mean square | F |
|----------------------|---------------------|--------------------|-------------|-------|
| Spot | Total | 71 | | |
| | Months | 11 | 0.390 | 4.30* |
| | Error | 60 | 0.091 | |
| Spotted seatrout | Total | 71 | | |
| | Months | 11 | 0.546 | 5.85* |
| | Error | 60 | 0.093 | |
| Striped mullet | Total | 71 | | |
| | Months | 11 | 1.001 | 3.17* |
| | Error | 60 | 0.316 | |
| White mullet | Total | 71 | | |
| | Months | 11 | 0.032 | 1.18 |
| | Error | 60 | 0.027 | |
| <u>INVERTEBRATES</u> | | | | |
| Blue crab | Total | 71 | | |
| | Months | 11 | 1.320 | 5.22* |
| | Error | 60 | 0.253 | |
| Cabbagehead | Total | 71 | | |
| | Months | 11 | 0.250 | 2.38* |
| | Error | 60 | 0.105 | |
| Speckled crab | Total | 71 | | |
| | Months | 11 | 0.025 | 1.06 |
| | Error | 60 | 0.024 | |

*P < 0.05

Figure 1. Area in which beach seine samples were collected, April 1983-March 1984.

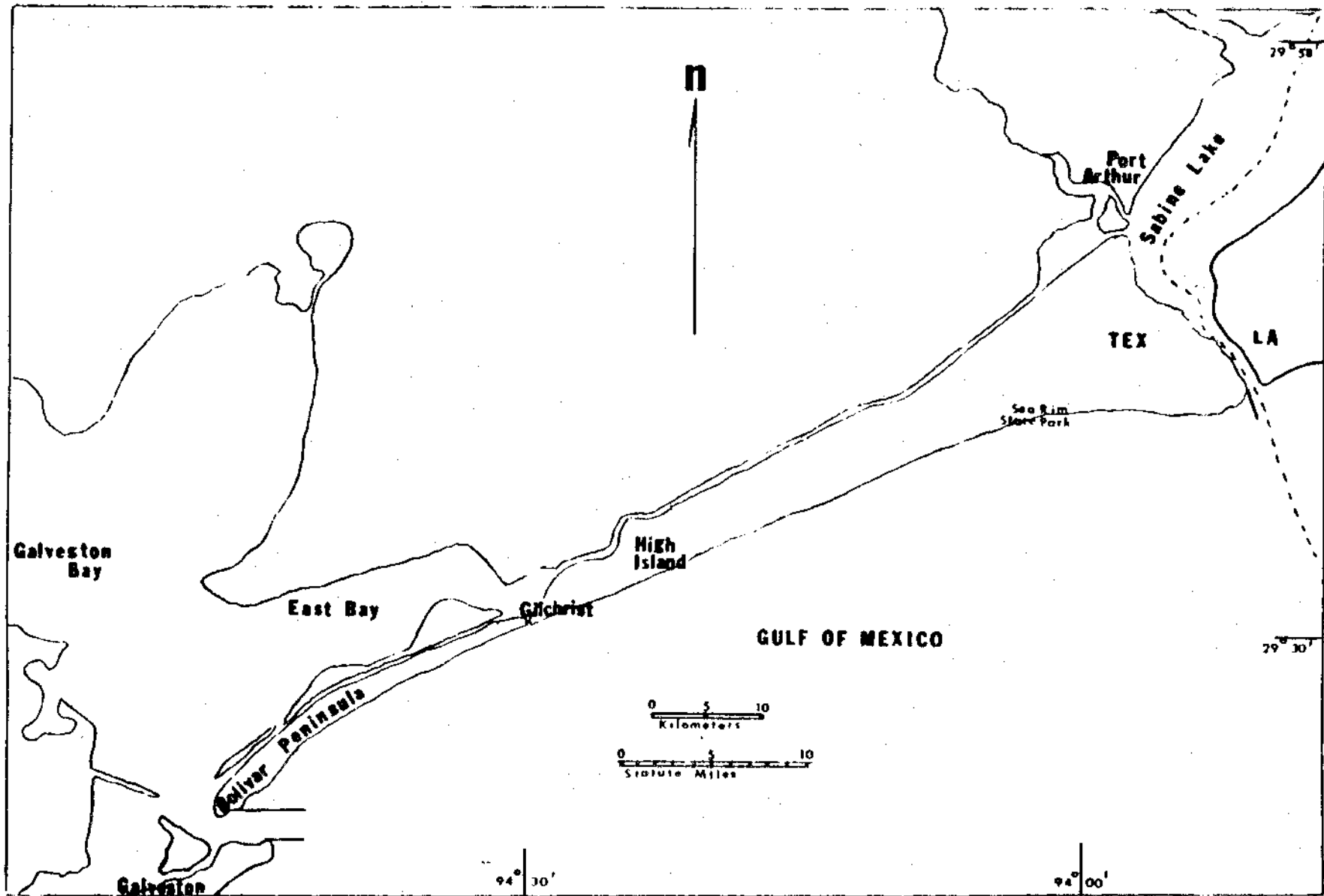
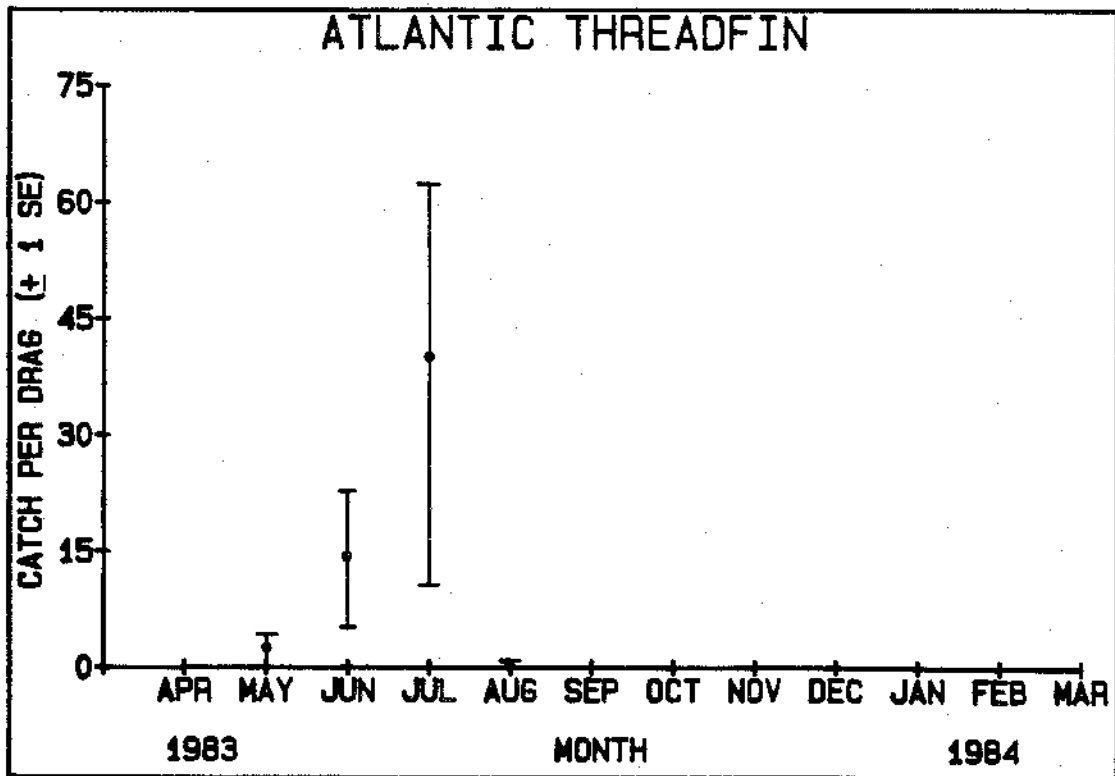
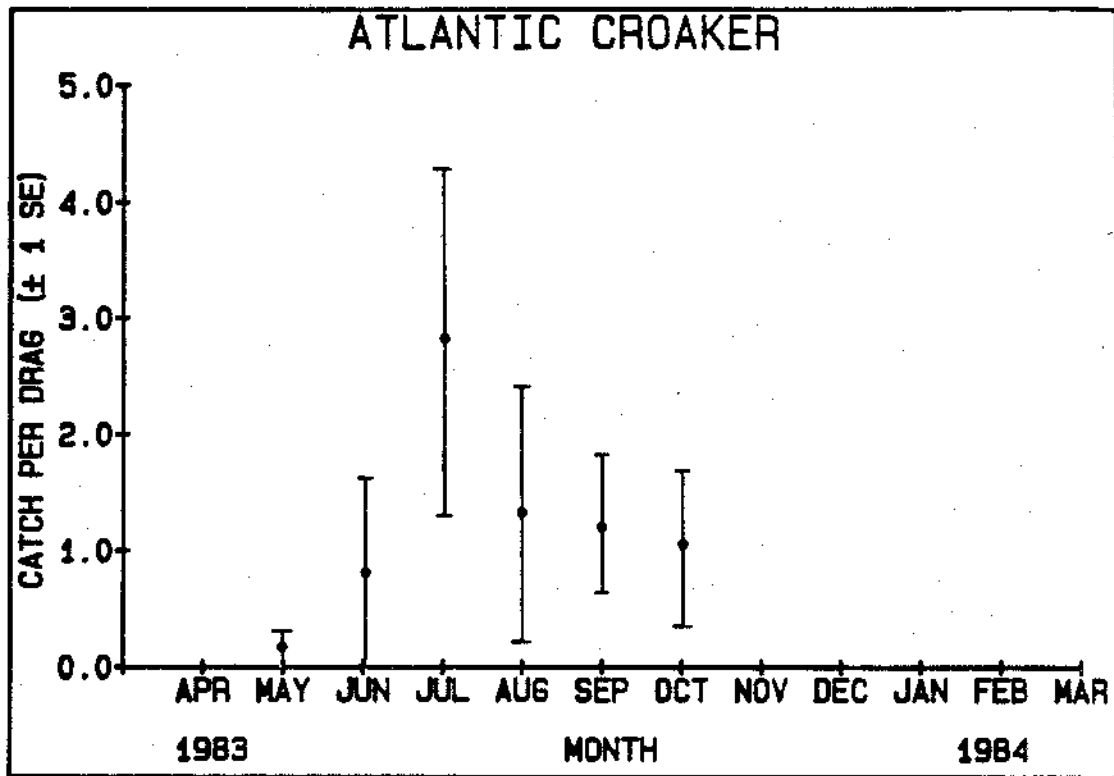
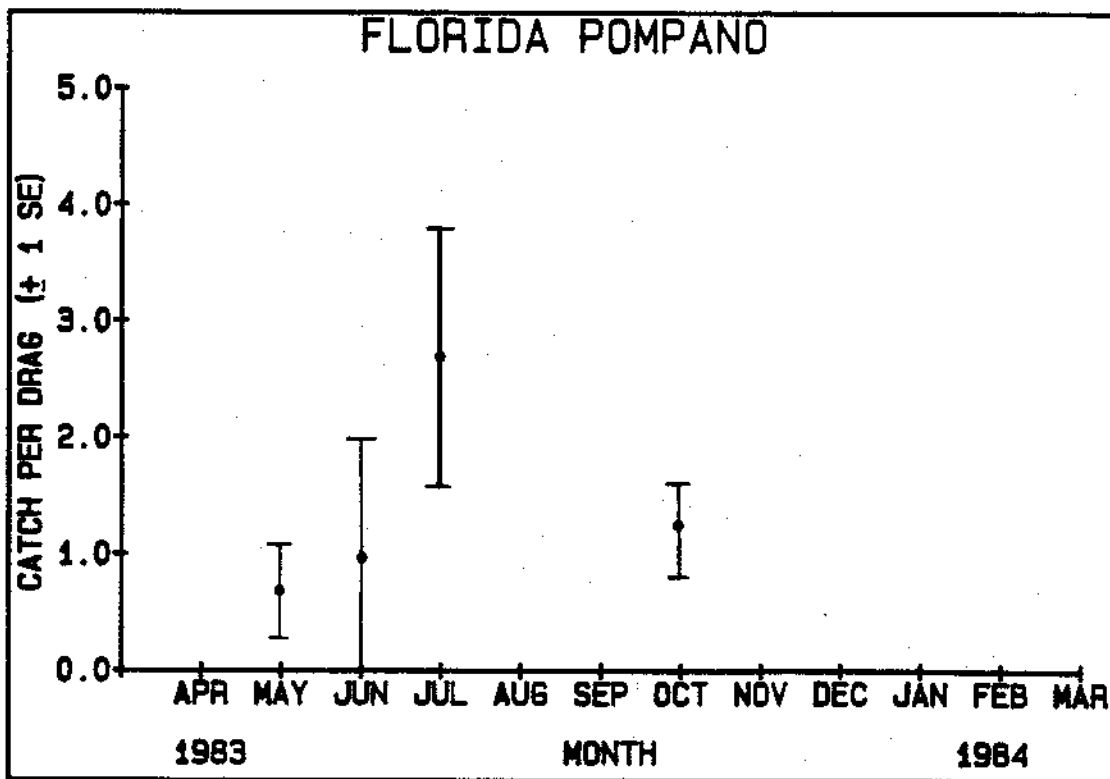
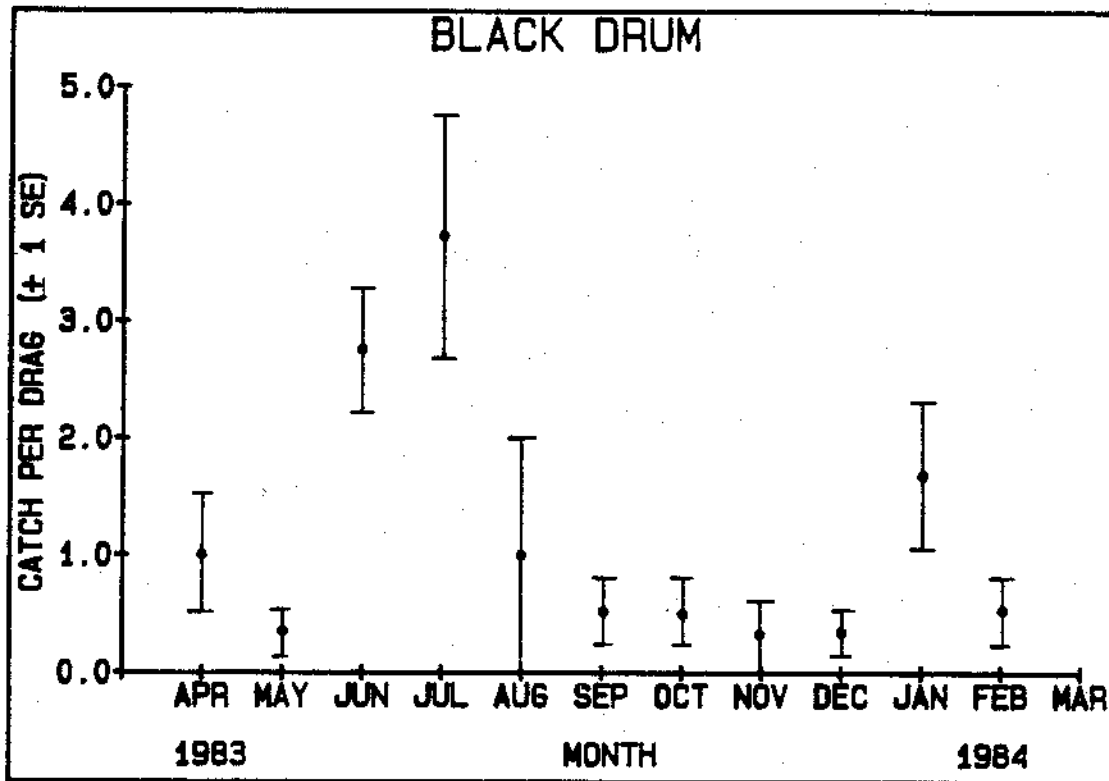
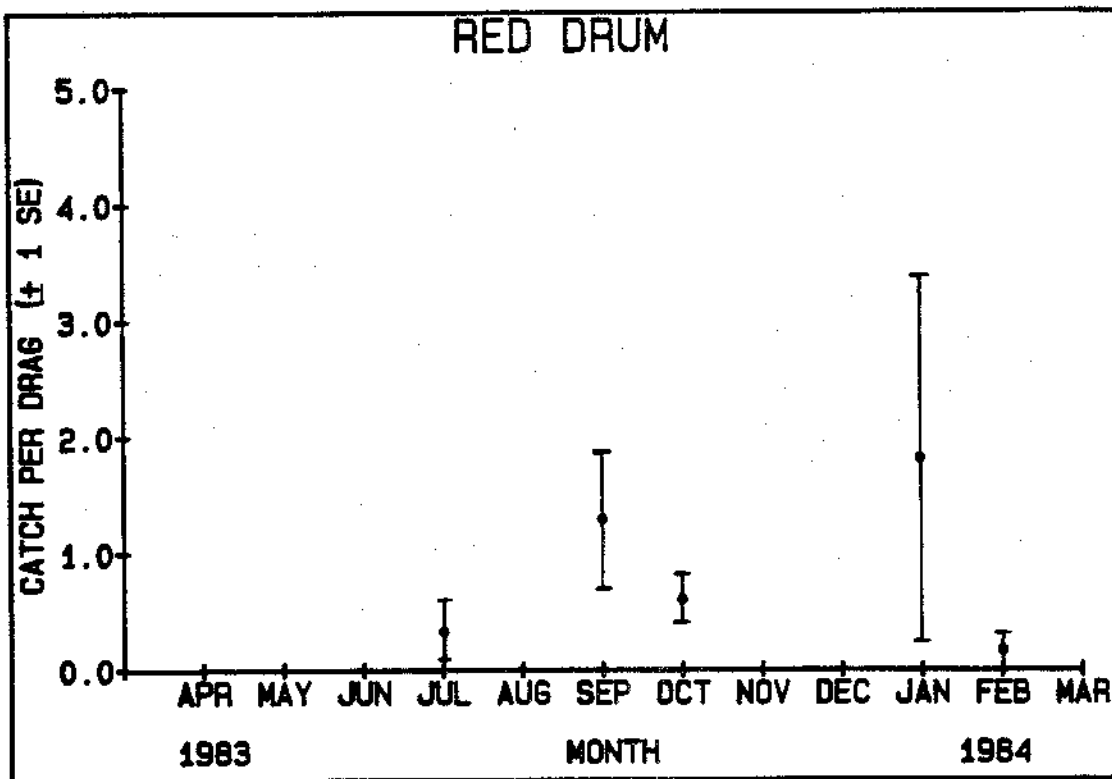
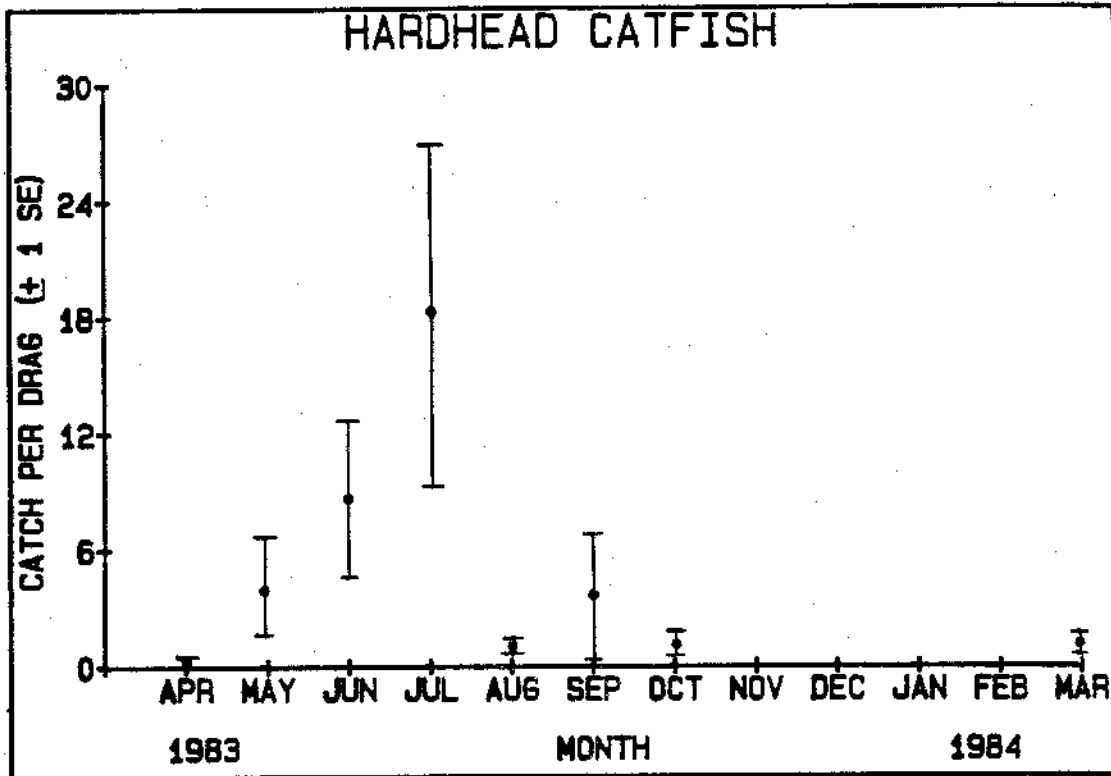
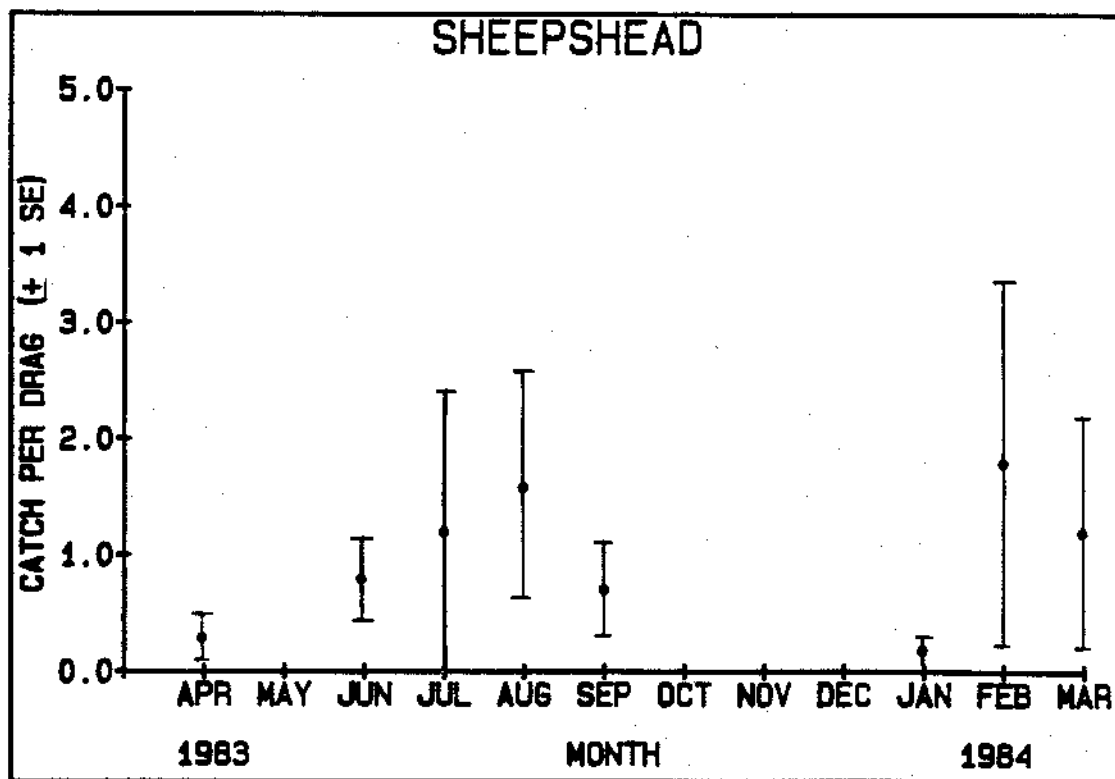
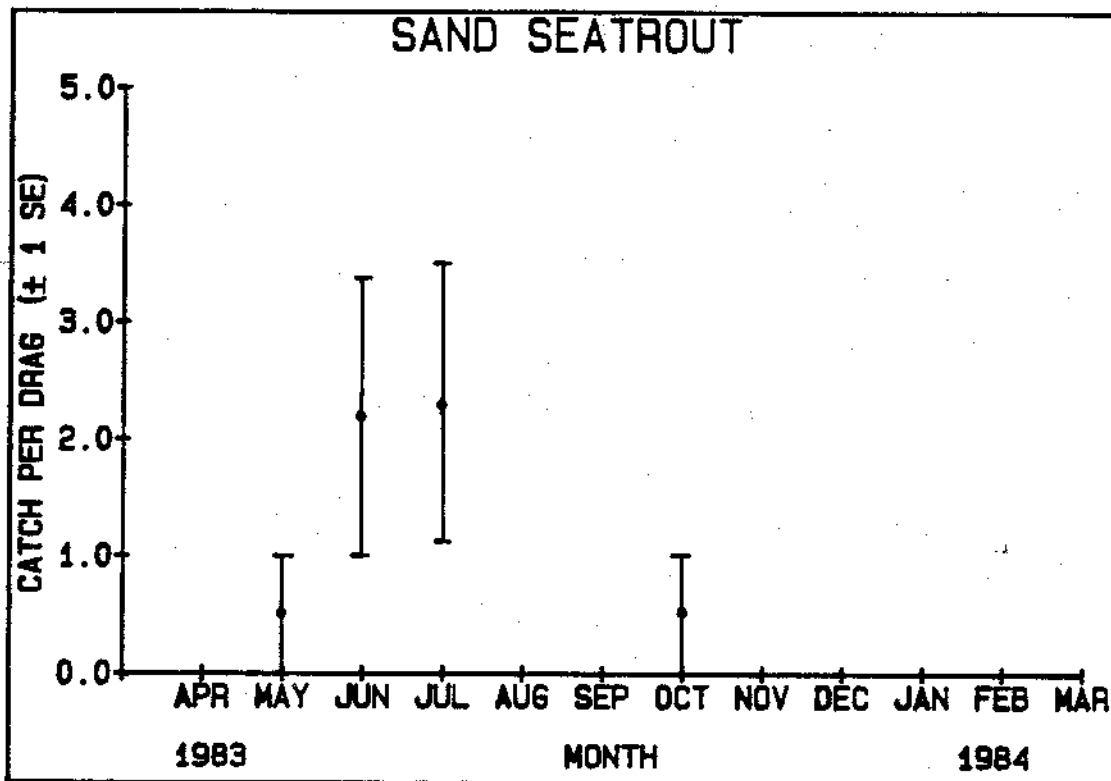


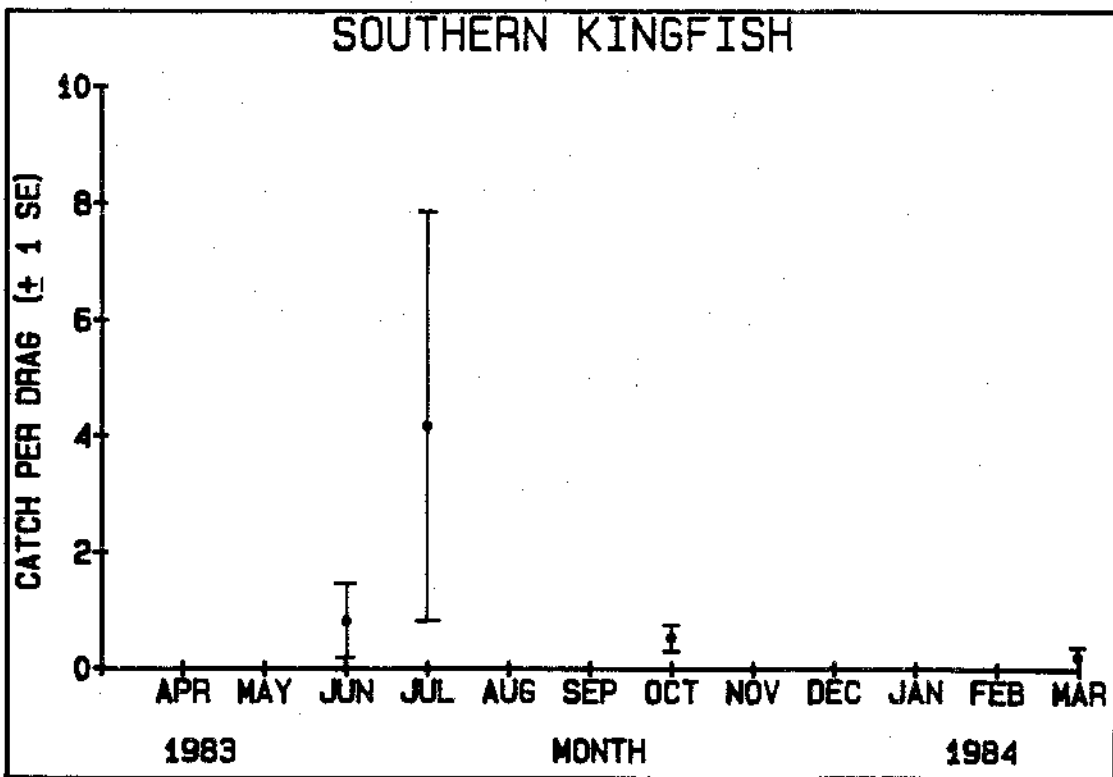
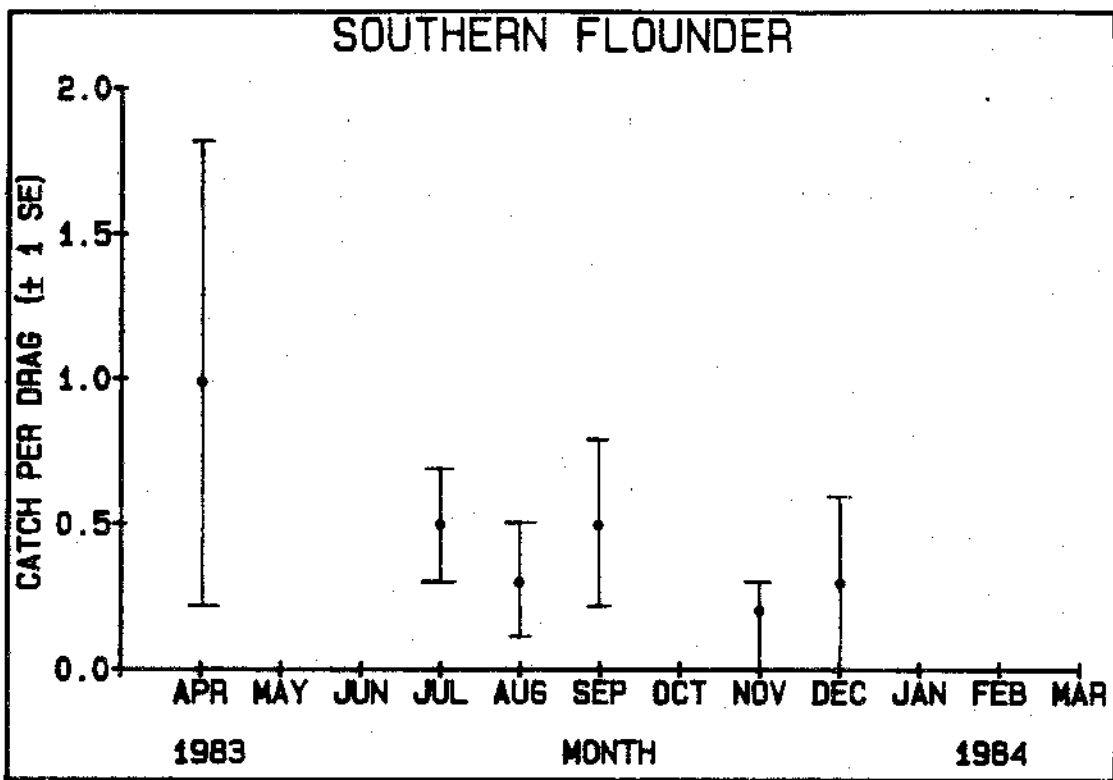
Figure 2. Mean monthly catch rates (No./drag \pm 1 SE) of 17 most frequently caught species in beach seines during April 1983-March 1984.

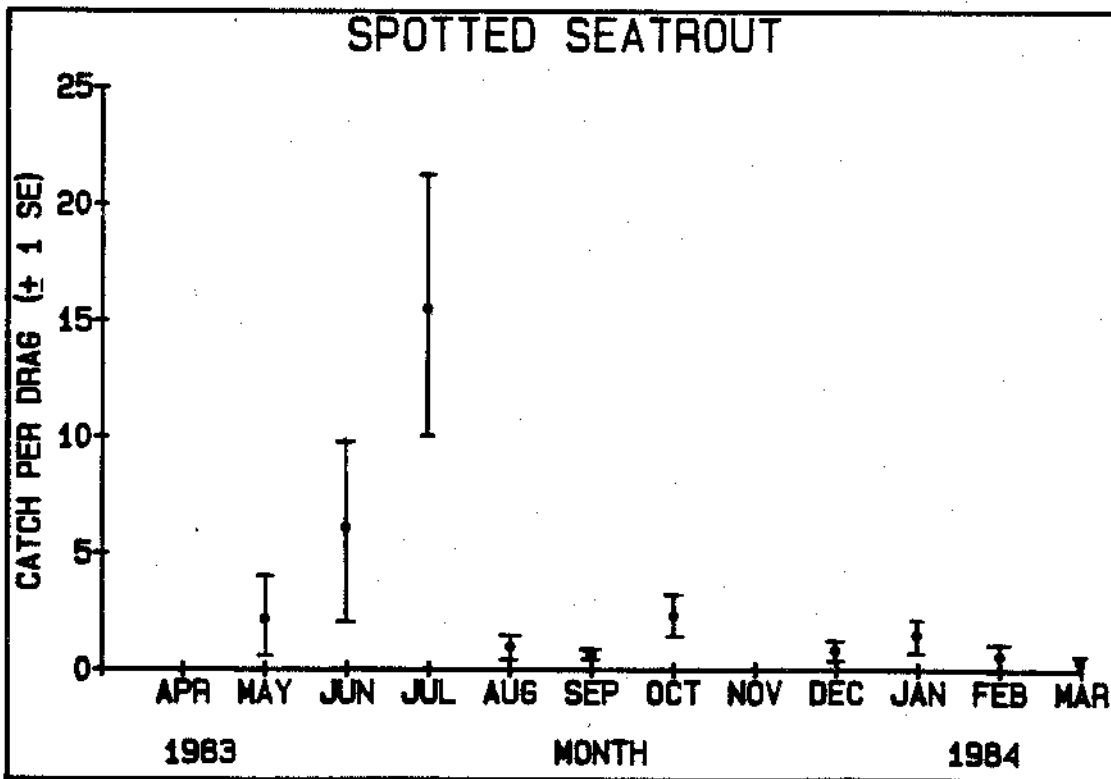
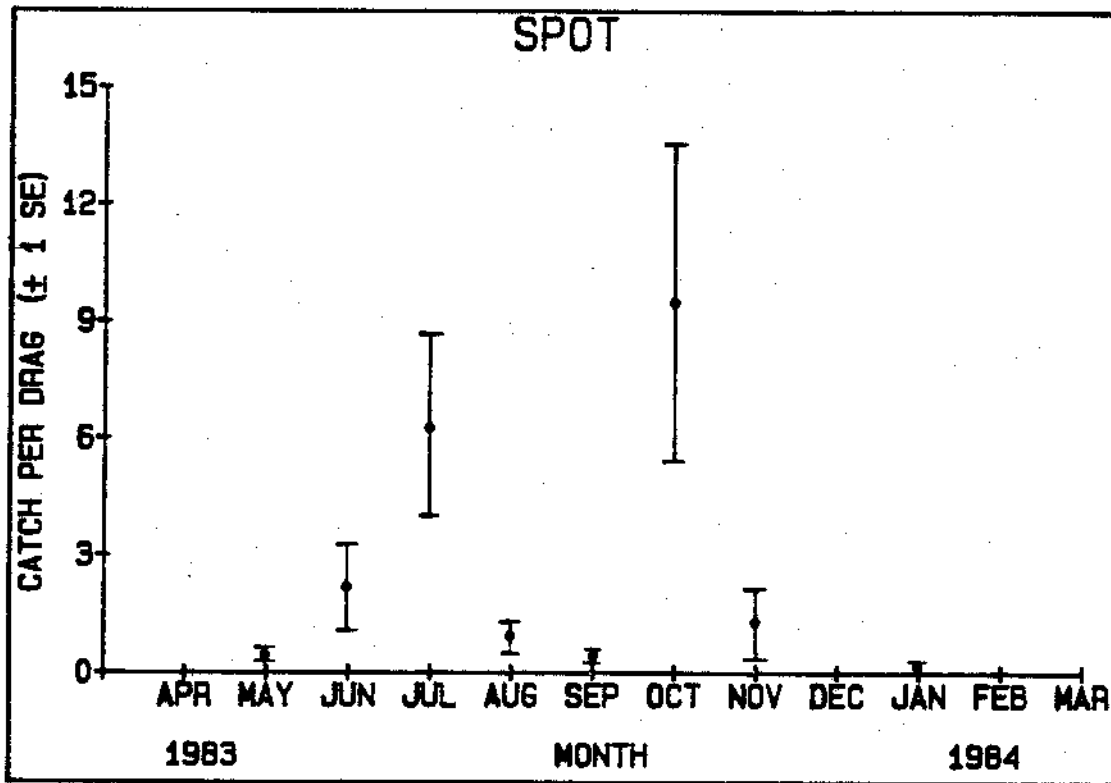


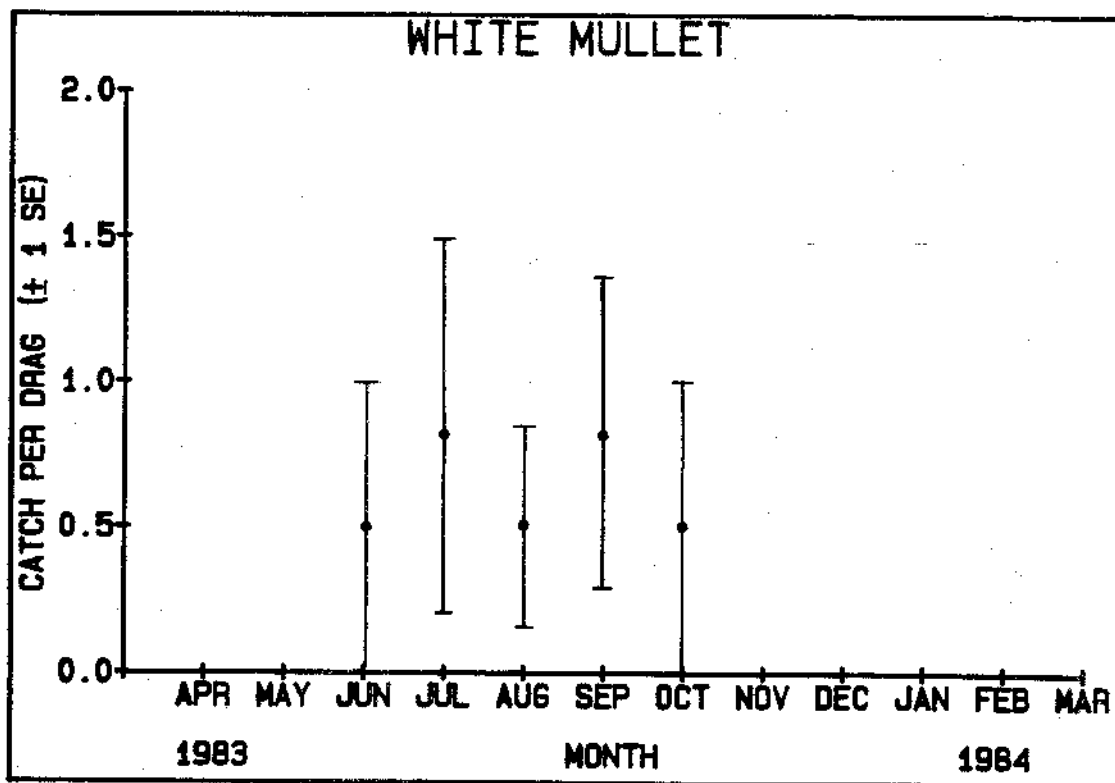
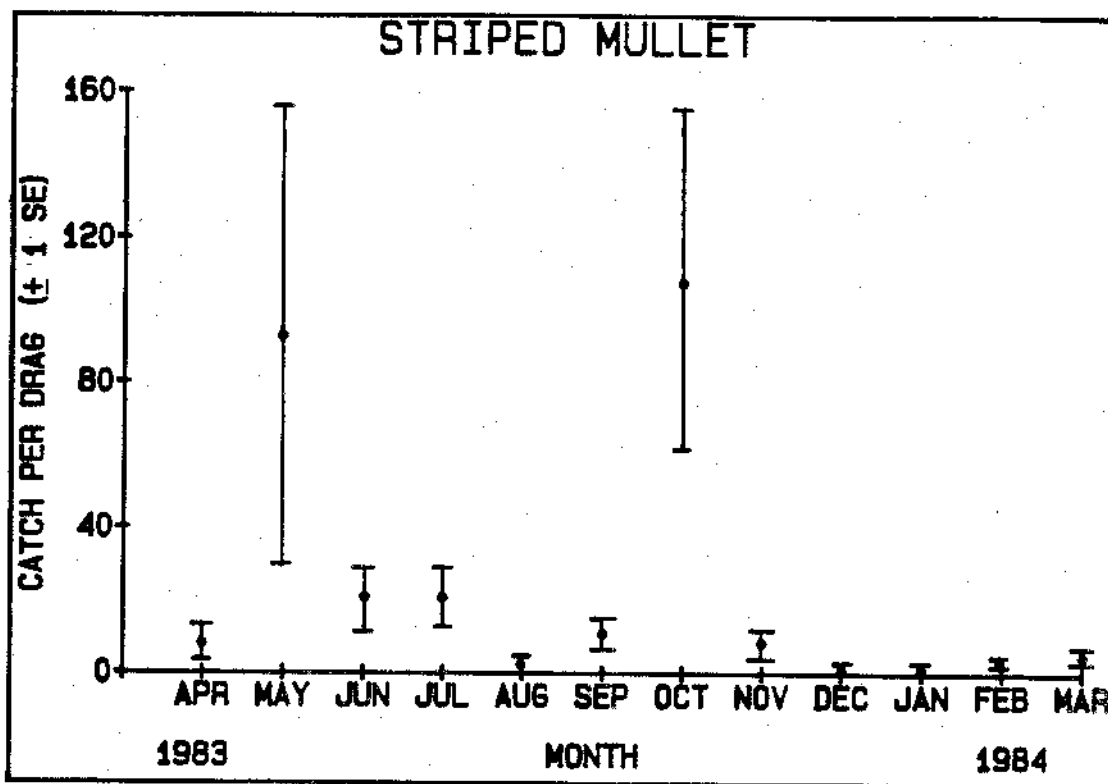


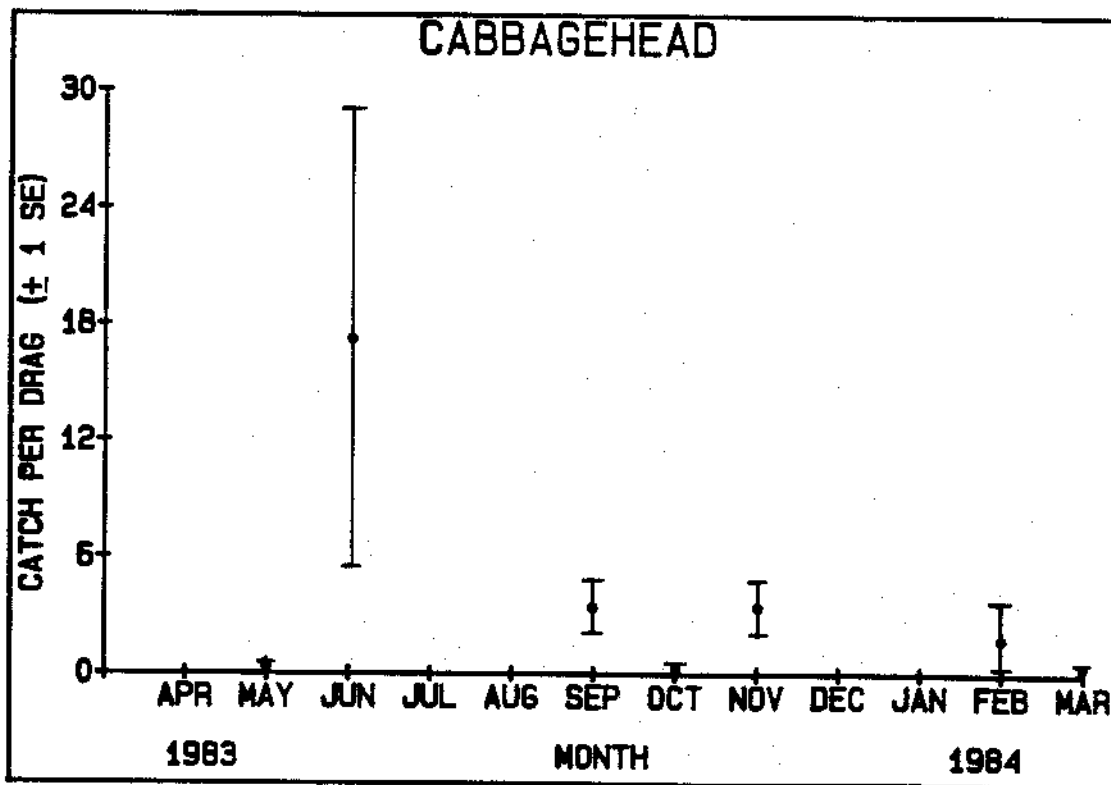
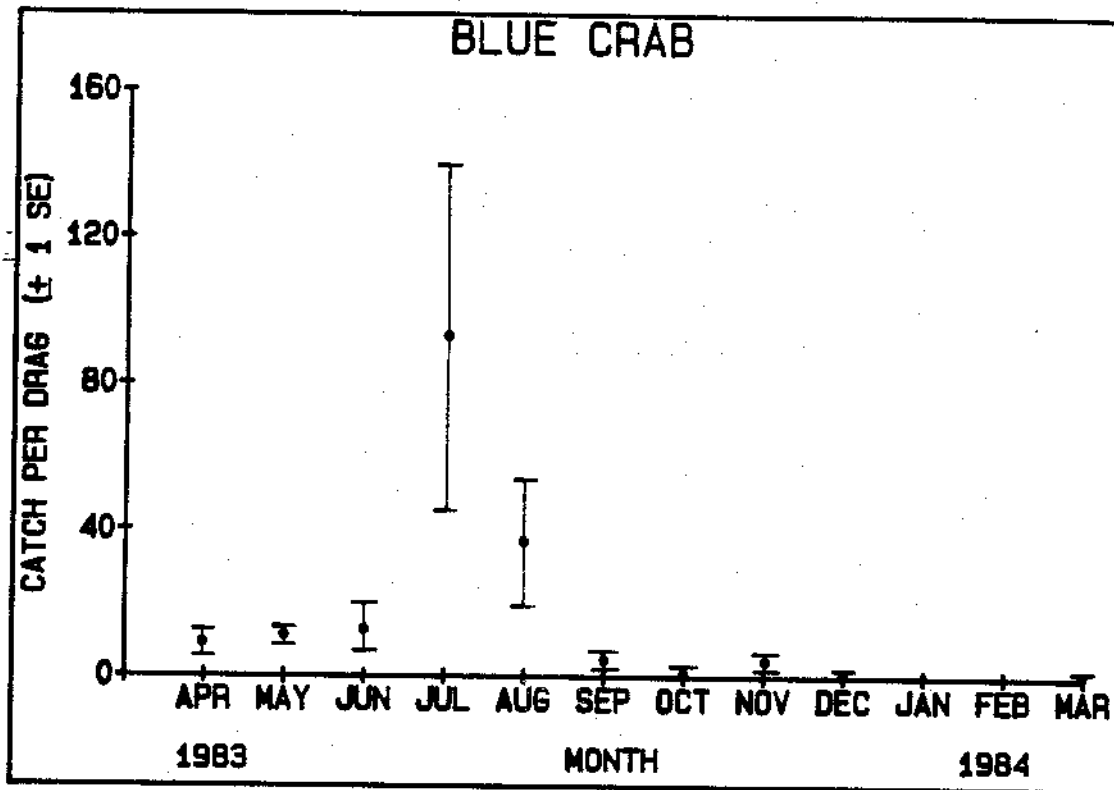


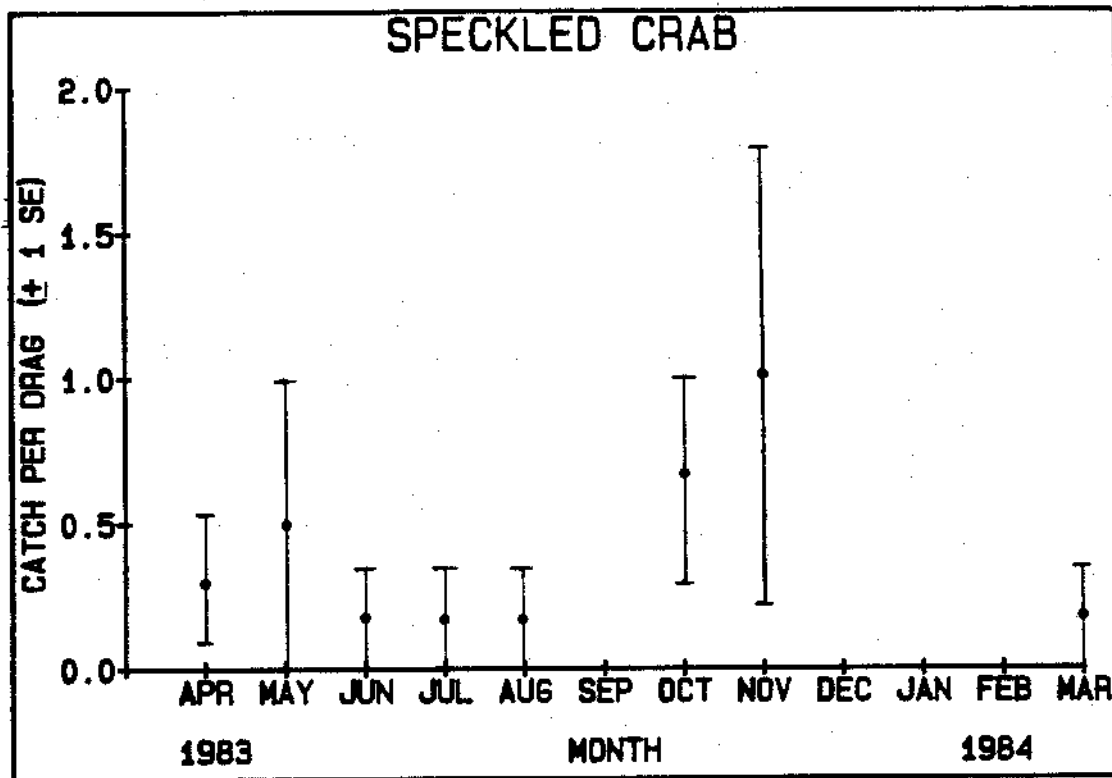


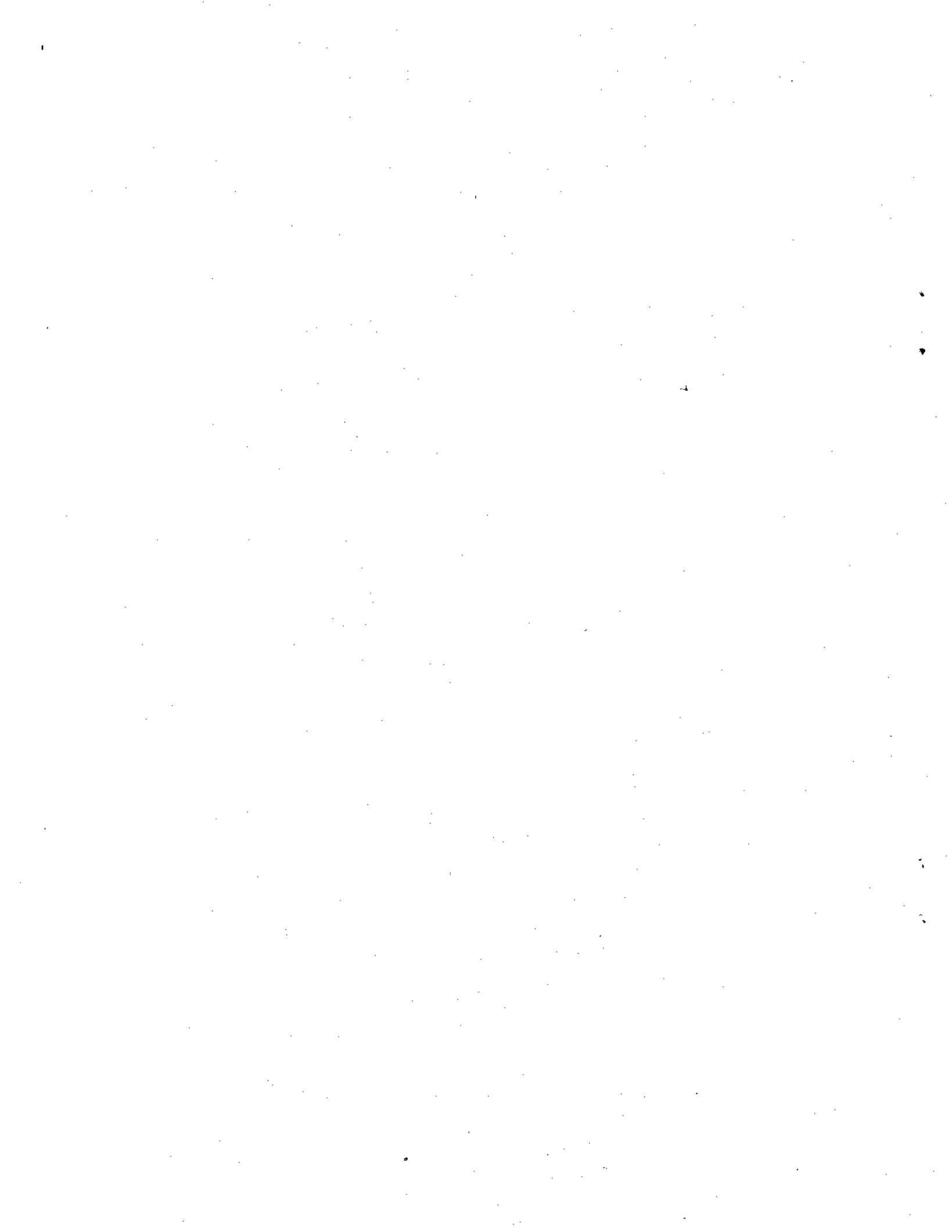














PWD Rpt 3000-196
April 1985