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DIURNAL VARIATIONS IN CATCHES OF SELECTED SPECIES OF ICHTHYONEUSTON BY THE BOOTHBAY NEUSTON NET OFF CHARLESTON, SOUTH CAROLINA[1, 2]

The Boothbay neuston net is becoming a standard gear for collection of ichthyoneuston. Sherman and Lewis (1967) reported using this gear for collection of lobster larvae. Personnel participating in Cooperative Investigations of the Caribbean and Adjacent Regions (CICAR) activities have prepared a "Plan for Sampling the Early Development Stages of Pelagic Fish during CICAR Operations" which describes the use of the neuston net (FAO[3]). The Boothbay neuston net, initially adopted as the standard for the Marine Resources Monitoring, Assessment and Prediction Program (MARMAP), consists of a pipe frame 2 m wide by 1 m deep with an 8.5-m long net.[4] Because little was known concerning the sampling performance of this gear, an experiment was designed to test the operating characteristics of two types of frame (galvanized pipe and aluminum pipe) and two lengths of net (4.9 m and 8.5 m with ratios of mouth to open mesh aperture areas of 1:6 and 1:11, respectively). The nets were of 0.947-mm Nitex[5] mesh.

The results of the experiment defining the operating characteristics of the two types of frame and two lengths of net were described by Eldridge et al. (1977). The present report will describe mainly diurnal variations in catches of ichthyoneuston during the latter experiment, which was conducted during 9-15 July 1973 utilizing the RV *Dolphin*.

Materials and Methods

The neuston net was towed from a boom extending 3 m from the starboard side of the RV *Dolphin*, and the ship was ordered in an arc of radius 1 n.mi. or less to starboard to keep the net mouth out of the ship's wake. The net was towed so that one-half the height (0.5 m) was in the water.

Towing speeds of 1, 2, and 3 m/s were employed with a total of 48 tows being conducted. Twenty-four daylight tows were made between 1107 and 1627 EST and 24 night tows between 2206 and 0432 EST. After setting (which took an average of 29 s), nets were towed 10 min and then retrieved

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[2]Contribution No. 451 from the Southeast Fisheries Center, National Marine Fisheries Service, NOAA, Miami, Fla.

[3]FAO-UNDP Fisheries Program, Mexico City. 1970. A plan for sampling the eggs and larvae of the fishes of Mexican waters. Unpubl. manuscr.

[4]MARMAP is now using a 0.5 × 1 m neuston net.

[5]Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

(average time of retrieval was 32 s). After each tow, the catch was drained on a 0.85-mm mesh sieve and preserved in 5% buffered Formalin. Sorting and identification of ichthyoplankton occurred at the Marine Resources Research Institute (MRRI). Fork lengths were measured in forked tail species; total lengths in all others. Relative volume of water strained was determined by the formula: Relative volume strained = (Speed)(Total tow time)(Average fraction of net in water). The reader should consult Eldridge et al. (1977) for further details concerning material and methods as well as the experimental design.

Results

The 4.9-m net was superior to the 8.5-m net in both ease of handling and minimizing damage to specimens after capture. There was no significant difference in catching ability of the two nets although the 4.9-m net actually caught more specimens during the experiment (Eldridge et al. 1977). The galvanized pipe frame was superior to the aluminum.

A total of 10,621 specimens of ichthyoneuston were collected. The 20 most abundant taxa made up 85.6% (9,088) of the total number of specimens. The remaining 92 taxa composed 14.4% (1,533) of the total (see Table 1 for most numerous taxa collected).

Analyses of variance and covariance tests revealed that total tow duration, speed, and relative volume strained did not vary significantly between day and night tows (Eldridge et al. 1977). Thus, catches between diurnal periods did not appear biased by the conduct of the experiment.

TABLE 1.—Numbers of individuals of selected ichthyoneuston collected in neuston experiment (+ = significantly more abundant for day or night, or no significant difference in catch between day and night at 5% level of significance).

Taxon	Total number caught	Number in night catches	Number in day catches	Day	Night	Both	Range total length (mm)	Number of tows present
Auxis sp.	3,576	3,573	3		+		2-16	26
Exocoetidae	1,245	700	545		+		4-83	45
Scombridae	907	906	1		+		4-15	8
Gerreidae	513	229	284			+	5-14	43
Tetraodontidae	409	15	394	+			4-14	29
Mullidae	348	7	341	+			5-21	29
Mugil curema	230	77	153	+			6-18	40
Priacanthidae	223	222	1		+		3-30	25
Coryphaena hippurus	217	188	29		+		9-62	34
Caranx crysos	191	67	124	+			7-37	42
Gobiidae	180	179	1		+		5-14	22
Anguilliformes	143	142	1		+		6-84	24
Carangidae	128	125	3		+		3-5	21
Psenes maculatus	125	125	0		+		6-49	20
Hemiramphidae	124	97	27		+		6-57	31
Decapterus punctatus	118	46	72	+			24-47	32
Monacanthus setifer	103	11	92	+			9-35	30
Scorpaenidae	102	92	10		+		3-11	29
Holocentridae	93	93	0		+		3-17	21
Caranx sp.	91	87	4		+		4-32	24
Synodontidae	88	88	0		+		5-32	18
Euthynnus alletteratus	67	67	0		+		3-10	18
Monacanthus hispidus	64	3	61	+			14-58	22
Opisthonema oglinum	62	55	7		+		5-15	20
Istiophorus platypterus	59	26	33			+	3-18	26
Decapterus sp.	54	53	1		+		7-11	18
Coryphaena equisetis	54	50	4		+		8-18	21
Aluterus sp.	49	6	43	+			1-105	17
Trachinotus falcatus	48	31	17		+		7-18	19
Balistidae	46	21	25			+	3-12	23
Pomacentridae	46	29	17			+	5-20	28
Labridae	44	43	1		+		5-18	18
Scomberomorus cavalla	41	39	2		+		5-10	18
Serranidae	40	40	0		+		3-16	15
Cynoglossidae	39	39	0		+		5-16	16
Kyphosus sp.	39	15	24			+	7-21	18
Selar crumenophthalmus	38	18	20			+	6-69	15
Bothus sp.	34	33	1		+		3-22	16
Canthigaster sp.	33	31	2		+		3-17	14
Monacanthus sp.	33	3	30	+			8-30	11
Dactylopterus volitans	30	3	27	+			8-30	11
Serioa sp.	26	4	22	+			5-18	14
Seriola rivoliana	25	0	25	+			14-43	9
Caranx hippos	23	21	2		+		6-32	14
Syngnathidae	22	19	3		+		7-69	15
Apogonidae	22	22	0		+		4-10	12
Rachycentron canadum	19	19	0		+		6-13	11

Partial correlation analyses indicated that catches of flyingfishes, Exocoetidae, and silver driftfish, *Psenes maculatus,* were positively correlated with speed. Catches of the planehead filefish, *Monacanthus hispidus,* pygmy filefish, *M. setifer,* and dolphin, *Coryphaena hippurus,* increased with concentrations of sargassum weed which corresponds to earlier observations by Dooley (1972). Catches of Exocoetidae were negatively correlated with manatee grass (Eldridge et al. 1977).

Chi-square analyses indicated that catches of 41 taxa were significantly affected by changes in diurnal period (Table 1). Catches of 29 were greater at night, whereas collections of 12 were greater during daylight hours. There was no evidence to suggest that catches varied significantly between diurnal periods for six species groups.

Data in Table 1 indicate that specimens of *Auxis* sp., Scombridae, Priacanthidae, Gobiidae, Anguilliformes, Carangidae, *Psenes maculatus,* Holocentridae, *Caranx* sp., Synodontidae, *Euthynnus alletteratus, Decapterus* sp., *Coryphaena equisetis,* Labridae, *Scomberomorus cavalla,* Serranidae, Cynoglossidae, *Bothus* sp., *Canthigaster* sp., Apogonidae, and *Rachycentron canadum* could be considered "faculative neuston" (Hempel and Weikert 1972). Specimens of Gerreidae, *Istiophorus platypterus,* Balistidae, Pomacentridae, *Kyphosus* sp., and *Selar crumenophthalmus* appear to be "euneuston" as defined by Hempel and Weikert (1972). Similarly, *Mugil curema, Caranx crysos,* and *Decapterus punctatus* appear to be "pseudoneuston."

Mugil cephalus was identified as an euneustonic species by Hempel and Weikert (1972); whereas *M. curema* in our samples appeared to be pseudoneustonic. The difference may be real because different species are involved or simply a sampling artifact. Similarly, although young stages of Exocoetidae were reported as rarely encountered and as concentrating at the surface during daytime by Hempel and Weikert (1972), Exocoetidae were the second most abundant taxa in our samples and were taken mostly at night. The reason for this is unknown, but may be due to differences in location, species sampled, or random error associated with sampling of ichthyoneuston.

Tetraodontidae, puffers, were taken most often during the day and were positively correlated with density of manatee grass.

Results of the neuston gear experiment indicated that 1) the 4.9-m net is the superior net for routine surveys, and 2) choice of sampling hours should take into account variation in catches associated with changes in light conditions.

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