# NEUSTON OF THE MAFLA LEASE AREA

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The pleustal zone fires the oceanic food webs because organic compounds, bacteria, and many of the protistans and phytoplankters are concentrated there. Zooplankton arid nekton transport energy obtained in the pleustal zone to subsurface realms, and thus support the mid-- and deepwater fauna.

It may be presumptively concluded that neustonic hydrobionts are both ecologically important, and worthy of further study. It is clear that the surface biota is now under attack by domestic pesticide, radioactive, and thermal waste products and residues, heavy metals, poisonous gases, and petroleum exploration, production, and transport (see, e.g., Hood, 1971; Horn et al., 1970; Butler, 1975) and we do not yet know if these attacks have, or will in the future change, damage, or obliterate the surface biota upon which the survival of the rest of the sea may depend.

The composition and distribution of neustonic faunal assemblages is known with certainty over a relatively small part of the world ocean (cf., the works cited above). The purpose of the present investigation was to increase our baseline knowledge of neuston assemblages occurring over the outer continental shelf of the eastern Gulf of Mexico, as a prelude to detailed time-series studies at specific locations selected on the basis of the results here obtained. To that end, one day and one night neuston sample were collected at 15 locations during the months of June - July, 1975; September - October, 1975, and January - February, 1976 (Figure 1).

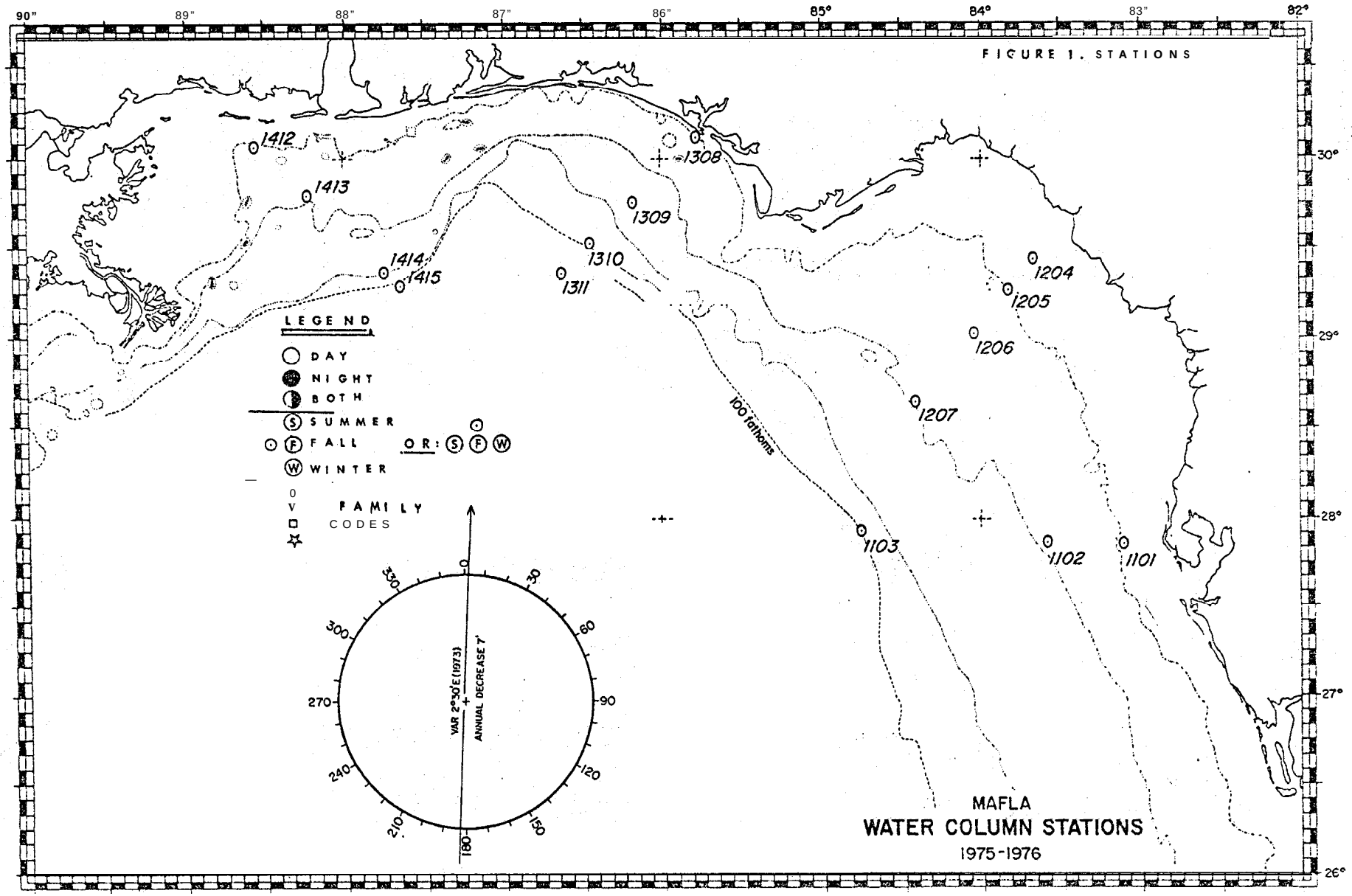
FIGURE 1. STATIONS
90°
89°
88°
87°
86°
85°
84°
83°
82°
30°
29°
28°
27°
26°
1412
1413
1414
1415
1308
1309
1310
1311
1204
1205
1206
1207
1103
1102
1101
100 fathoms
LEGEND
DAY
NIGHT
BOTH
SUMMER
FALL
OR: S F W
WINTER
FAMILY CODES
0
30
60
90
120
150
180
210
240
270
300
330
VAR 2°30'E (1973)
ANNUAL DECREASE 7'
MAFLA
WATER COLUMN STATIONS
1975-1976

Terminology

The vocabulary of neustonology was largely created by Geitler (1942), Zaitsev (1967), Hemple (1970, 1971, 1972) and Morris (1975). Terms will be used in the present report as follows :

Bacterioneuston: microorganisms that live in sea foam and in the surface layer of water.

Benthogenic neuston: merohyponeuston that are benthonic when adult.

Benthohyponeuston: facultative hyponeuston recruited on a diel basis from the benthos.

Bathyplanktohyponeuston: facultative, pseudo-, or quasineuston found at the surface at times, either regularly or occasionally; they occur beneath the pleustal biotope normally (regularly).

Epineuston: organisms that live on the surface of the sea (e.g., Halobates spp.)

Euneuston: organisms that live only at the surface throughout their lives.

Facultative neuston: organisms that migrate from depths to the surface daily (includes benthohyponeuston, bathyplanktohyponeuston, and some of the ichthyoneuston).

Hyponeuston: organisms that live beneath the surface in the pleustal zone.

Ichthyoneuston: fishes that occur in surface waters regardless of time of day, length of stay, ontogenetic stage, or place of origin.

Merohyponeuston: organisms that spend only part of their lives (usually young stages) in surface waters.

Neuston: Organisms which, during part or all of their lives, exist in surface waters. No absolute bathymetric depth interval is specified (cf. Surface).

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Planktogenic neuston: cf. bathyplanktohyponeuston. Organisms that, when adult, live beneath the surface.

Plankton: drifters (without size limitations); hyponeuston.

Pleustal zone: "the" surface biotope.

Pleuston: organisms that are morphologically and physiologically adapted to live partially exposed to the atmosphere and partially submerged (e.g., Physalia, but not Sargassum).

Quasineuston: organisms that are surface-neutral (species that are neither euneustonic, pseudoneustonic, nor facultatively neustonic, and live either at the surface or elsewhere in the water column, or in both areas in equal abundance).

Surface-positive neuston: organisms that seek or are found only at the surface.

Surface-neutral neuston: pseudoneuston.

Surface-negative neuston: organisms that avoid the pleustal zone.

Surface: The environment from sea foam to a depth of one millimeter to 20 cm. The surface is here recognized more by its included biota than by arbitrary bathymetric or physico-chemical limits. The surface is the pleustal biotope within which the neuston – or surface biotic assemblages of organisms occur. As incorrectly but commonly used, the term "neuston" includes both plankton and nekton. The present work will promulgate that use of the term because it is widely understood and has been found acceptable. Surface = neuston in this report.

Thanatoneuston: the dead components of neuston collections (e.g., the antirain of crustacean "skeletons"; a new term here introduced).

## MATERIALS AND METHODS

### Collections

Collections were, by contractual agreement, made with the gear and methods described below.

### Sampling

A total of 90 neuston collections was made. The collection device was a Kahlsico "Floating Plankton Sampler" equipped with a one meter, 5:1 (length/width ratio) 202 μ mesh (No. 8) Nytex net. Samples were collected twice daily at each of 15 stations located on four transects during each of three sampling periods (June - July, 1975 ; September - October, 1975; January - February, 1976). One collection was made during hours of darkness, and one was made during the day at each station during each season (Figure 1). The net was towed at steerage speed (ea. 2 kt) for 4-30 minutes. Nets were fished off the port side of the 65-foot R/V TURSIOPS from a three meter boom.

### Shipboard Sample Processing

Neuston collections subject to taxonomic analyses were flushed into 1.0 ℓ plastic sorting trays, then transferred to glass jars in which they were fixed in a solution of 5% formalin-seawater buffered with sodium borate. Collections subject to trace metal and hydrocarbon analyses were put into acid-washed glass jars with teflon-lined lids, and were frozen for onshore processing. Water was removed from the hydrocarbon/trace metal samples by means of a 202 μ acid-washed net.

### Laboratory Sample Processing

The volume displacement of all samples was measured prior to their transfer to alcohol. Samples were washed in tap water for 48 hr, then

transferred to 70% ethyl alcohol for permanent conservation. Separate volume displacements were measured for: Sargassum; organisms whose greatest dimension exceeded 2.5 cm, and the remaining sample after oil, tar, and other debris (e.g. , plastics, wood, feathers) had been removed.

Analyses

By means of a Folsom plankton splitter each collection was fractionated into a 500-1000 animal aliquot for taxonomic analyses. All adult animals present in the sample aliquots were counted and identified at least to the Family level when that taxon existed for the group under consideration. Larvae were identified by taxon and stage, and were counted. Fish eggs were identified as such, and counted. All counts are presented as number of individuals captured per minute fished. Estimates of the number of individuals captured per volume of water sampled were impossible to make with the gear used.

## Data Reduction

Data were coded on standard 80 column IBM forms as follows:

Card Type 1: Oceanographic Collection Data.

a. Date.
b. Time set and hauled.
c. Ship heading.
d. Engine RPM.
e. Surface current direction.
f. Sea state.
g. Flowmeter start and stop reading.
h. Secchi disk depth.
i. Forel color.
j. Surface temperature.
k. Surface salinity.
l. Station number.

Card Type 2: Meteorological Collection Data.

"a. Wind direction, speed, range, and maximum gusts.
b. Cloud cover, and type of low, middle and high clouds present.
c. Type of' weather occurring.
d. Visibility.
e. Barometric pressure.
f. Incident light.
g. Air tempera.ture.
h. Time of moonrise and moonset.
i. Time of sunrise and sunset.

Card Type 3: Totals and Volume Data

a. Total sample volume.
b. Number of splits made.
c. Number of invertebrate families in the sample.
d. Number of adult invertebrate families in the sample.
e. Number of fish families in the sample.
f. Number of fish eggs in the sample.
g. Number of larval types in the sample.
h. Number of larvae in the sample.
i. Volume of organisms larger than 2.5 cm.
j. Volume of sargassum in the sample.
k. Weight of tar in the sample.
1. Station number.

Card Type 4: Larval Types and Numbers.

Card Type 5: Fish Types and Eggs and Their Numbers.

Card Type 6: Adult Invertebrate Families and Number of Specimens.

## Data Analyses

Numbers of specimens of each taxon were multiplied by the aliquot factor ($2^n$), and the number caught per minute fished was calculated. The mean, median, variance, standard deviation and standard error of the mean were calculated for each taxon collected (all-station totals . A 5 X 14 correlation matrix (Table 11) and 108 analysis of variance tests (model 1, one-way; two-way, and nested) were performed using raw data, and data transformed by the $\sqrt{X}$ and log n methods described by Barnes (1952). ANOVA results are summarized as Table 10, and individual. ANOVA tables are