WOODS HOLE LABORATORY REFERENCE DOCUMENT NUMBER 84-14

# STOMACH CONTENT ANALYSIS
# PROCESSING METHODS FOR LARVAL GADIDS

By

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(APPROVING OFFICIAL)

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# INTRODUCTION

The analysis of fish stomach contents is a common way of investigating the trophic interrelationships of marine ecosystems. Since 1980 the Larval Fish Dynamics Investigation of the Marine Ecosystems Division, Northeast Fisheries Center, has been conducting an ongoing multidisciplinary investigation into the early life history of two commercially important gadids, haddock *Melanogrammus aeglefinus* and cod, *Gadus morhua* from the Georges Bank area. One of the objectives of this investigation is to describe the spatial-temporal variability of larvae and their prey (copepods) during their first month of life on Georges Bank (Lough, 1984).

Marine scientists generally agree that year-class strength may be determined largely during the planktonic larval or juvenile stages. Other than catastrophic losses, feeding interrelationships involving both growth and predation are considered to be the basic factors controlling larval mortality (Lough, 1984). Therefore, an understanding of the causes of larval mortality demands a thorough understanding of early life history traits (Hunter, 1981), in addition to an in-depth knowledge of the physical and biological oceanographic processes affecting the target species. The investigation of fish food habits by analyzing stomach contents provides an important component of our analysis into early life history strategies. Larval traits such as feeding behavior, physiological state and

incidence of starvation may be determined through examination of stomach contents and evaluation of larval condition. This document describes the laboratory methods and procedures used by the Larval Fish Dynamics Investigation in the processing and identification of larval cod and haddock stomach contents.

Field sampling of larval cod and haddock populations on Georges Bank for the years 1981, '82 and '83 has normally occurred during the April-May period when high concentrations of larvae can be found along the southern flank. The basic field strategy was to locate and characterize a population of larvae and their prey, and then to compare and contrast their fine- to micro-scale distribution within stratified and well-mixed waters on Georges Bank. Standard MARMAP 61-cm (505- and 333-μm nets) bongo samplers are used for making transects of the study area. Once a larval population is located, a Multiple Opening/Closing Net and Environmental Sensing System (MOCNESS; Weibe et al., 1976) was employed with nine separate nets to determine the vertical distribution and abundance of fish larvae and their microzooplankton prey. A 1-m MOCNESS (.333 μm mesh nets) is used to identify the vertical position of fish larvae and larger zooplankton, and a 1/4 m MOCNESS (64 μm mesh nets) samples microzooplankton over the vertical distribution range of larvae. In addition to the bongo and MOCNESS samplers, a plankton pump also sampled microzooplankton from several discrete depths and a CTD-flurorometer cast profiled temperature, salinity and chlorophyll with depth. For a more detailed description of sampling techniques and strategies, refer to Lough (1984).

# LABORATORY METHODS

## Sample Selection, Morphometric Measurements and Processing Procedures

Laboratory processing methods utilized in this study are very similar to those used in gut studies of wild marine fish larvae by (Cohen and Lough, 1983; Kane, 1984; Last, 1978, 1980; Arthur, 1976 and Ogilvie, 1938). Larvae processed in this study are from previously sorted 1-m MOCNESS samples where they are preserved at sea in a 4% formaldehyde solution. Following sorting in the laboratory, larvae are identified to species level and a length frequency analysis is made using a Zeiss MOP digitizer. Individual species are then placed into separate vials indicating net and haul numbers and maintained in 4% formaldehyde solution. Subsample selection is achieved by placing sorted larvae from an entire net of a single species into a petri dish and then randomly selecting up to 15 individuals for gut analysis. Damaged individuals missing any morphological measurements were not used and, in cases where there are less than 15 individuals in a net, all larvae are processed. Individual larvae are then placed on a depression slide and several drops of glycerin are added to prevent desiccation and to stabilize larvae on the slide during morphological measurements. The standard length, skull width, maxillary length and body height (Columns 48-56 and 63-65) of each larva is

measured under a Wild dissecting microscope using an eye micrometer. Stage of morphological development (Columns 78, 79), absence or presence of external parasites (Column 70) and larval condition (Column 69) are noted and recorded on the data sheet at this point. The larval digestive tract is then teased away from the body intact with mounted insect pins and after removing the body from the slide, a drop of staining solution is added. Best results are obtained by staining overnight with a solution of 50% lactic acid/water and methylene blue crystals. After staining, the gut is transferred to another depression slide containing glycerin in which the stomach contents are removed. Routine morphological measurements and observations, dissection and most prey identifications are performed at 6X through 50X with a Wild dissecting microscope.

## Morphometric Measurements

The following morphological measurements and condition factors used in this study are recorded on the gut content data record. For illustration of morphometric measurements refer to Figures 1, 2, 3.

Columns 48-50 (Larval length) - Preflex larvae are measured from tip of maxillary to end of notocord. Postflex larvae are measured from maxillary to end of hypural plate (Ehrlich et al., 1976).

Columns 51-53 (Skull width) - Viewed dorsally, widest portion of skull measured posterior to orbital region (Cohen and Lough, 1979).

Column 54-56 (Maxillary length) - Maxilla of upper jaw measured to articulation with dentary, useful in mouth gape calculation (Shirota, 1970).

Columns 63-65 (Body height) - measured just posterior to pectoral fin according to Erhlich et al. (1976).

Eye height, head height and pectoral angle are not considered to be useful measurements in this investigation.

## Stage of Development

The observation of development characters in addition to morphological measurements is vital when assessing condition at an early larval stage. The stage of development of the alimentary tract and swim bladder maybe useful for determining the condition of first feeding larvae. During laboratory enclosure experiments, Ellertsen et al. (1980) determined that cod larvae differentiated their swim bladder and gut at a very early larval stage after achieving a surplus of energy before yolk exhaustion. They also determined that cod larvae $\leq$ 5.0 mm (unpreserved) without a differentiated swim bladder and gut would be in a critical starving condition. The following staging systems, larval life stage (Column 78) and yolksac stage (item 79) used in this study incorporate easily recognizable characters described by Ellertsen et al. (1980).

FIGURE #1
YOLK-SAC LARVA

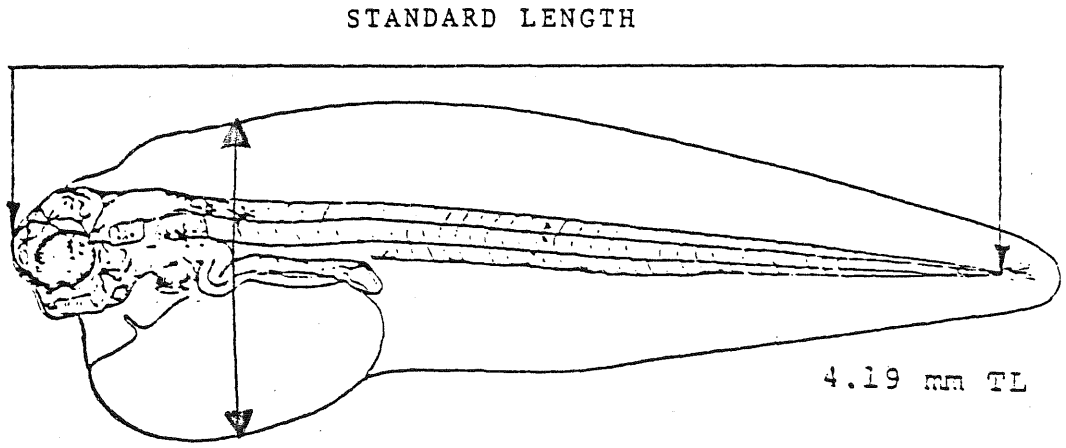



FIGURE #2
POST YOLK-SAC
LARVA

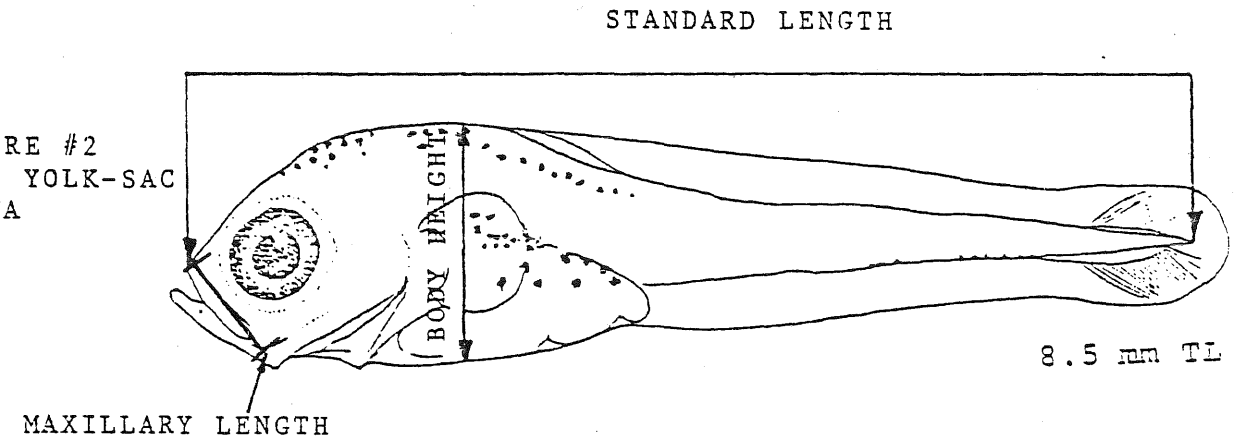



FIGURE #3
SKULL WIDTH

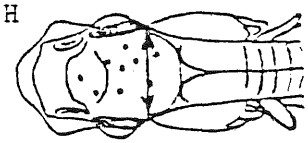
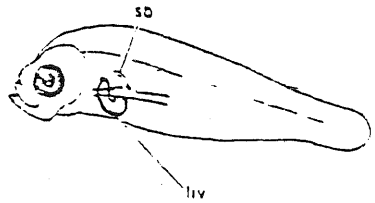


FIGURE #4
SWIMBLADDER
(Schwarz,1971)



Column 78 (Larval Life Stage)

Jaw and eyes undeveloped = 1

Jaw and eyes developed = 2

Jaw and eyes functional, Swim bladder and alimentary tract differentiated = 3

Jaw and eyes functional, Swim bladder and alimentary tract undifferentiated = 4

Jaw and eyes functional, Swim bladder evident, alimentary tract undifferentiated = 5

Jaw and eyes functional, Swim bladder not present, Alimentary tract undifferentiated (emaciated) = 6

Column 79 (Yolksac Stage)

| | |
|---|---|
| Yolksac present | = 0 |
| Yolksac partially present | = 1 |
| Yolksac absent | = 2 |

## Prey Identification, Measurement and Coding Details

Removal and identification of prey remains from the larval gut is the most labor intensive part of gut processing. The position of prey in the digestive tract must also be noted, but the majority of identifiable prey in gadids will be found in the fore and mid-gut. The prey remains are carefully teased from the gut with mounted insect pins and care is taken to remove them intact. Once the prey remains have been extracted from the gut, they are identified to the lowest taxonomic level possible, assigned a life stage code, sexed, and then length and width of whole organisms are measured to the nearest 100th mm. The length of adult or copepodite stages of copepods is assessed by measuring the entire cephalosome, but for the nauplii, only the cephalothoraxic shield is measured. Other prey such as dino-flagellates, pteropods, or lamellibranch larvae are measured at their longest and widest dimensions. Prey remains that appear highly digested or considered fragments are not measured. Prey width is generally considered the most informative measurement

for identifying prey selection patterns by larval fish. Evidence for this is based on the fact that copepods frequently found in the stomachs of larval fishes are too large to be ingested if length were the critical factor (Hunter, 1981). When estimating biomass of ingested prey, Pearre (1980) found width to be the best single predictor of copepod wet weight as well.

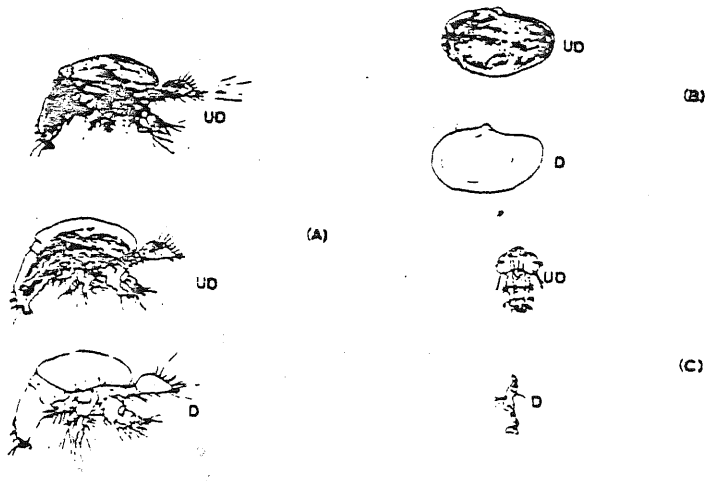
One of the most painstaking aspects of larval gut processing is in the manipulation and identification of prey remains. Routine identification of adult copepods, copepodites, nauplii, eggs and other prey is normally performed under the Wild dissecting microscope at 25 to 50X. A Zeiss compound microscope is often used to identify the following items: highly digested nauplii, prey remains from yolksac larvae, zooplankton fragments, and in viewing the fifth leg of copepods which is important for specific identification. Because large numbers of prey items are often found in the guts, our procedure is to spend no more than five minutes identifying any particular organism. A skilled technician should easily be able to categorize prey remains within this time period at 90-95% accuracy using the plankton data base code listing in Appendix 2. Varying with time of capture and larval size, approximately 60-75% of prey remains examined during this investigation are identified to a genus-species level. In cases where large numbers of particular prey are encountered, for instance, invertebrate eggs, a mean measurement for the first 20 is estimated and used for the remainder. During this study it has not been unusual for large cod and haddock larvae (>10 mm) to contain up to 70 prey items,

and some individuals exceeded 100 prey items. Difficulties are often encountered when attempting to assess the degree of digestion of prey remains. If the gut contents consist of mainly fragments and translucent exoskeletons, they are normally evaluated as highly digested. Because of the rapid digestive processes in larval fish, the majority of prey remains tend to be categorized moderately or highly digested. Certain diatoms, dinoflagellates, lamellibranch larvae and tintinnids may be found in an undigested state throughout the alimentary tract (Refer to Figure 5; Fossum, 1983, when assessing the state of digestion of copepods and other prey remains). The following prey criteria are recorded on the gut content data record.

| | | |
|---|---|---|
| Columns 80-81 | (Prey number) | 1 through 99 |
| Columns 81-84 | (Prey code) | Refer to MARMAP taxomonic data base code list in Appendix 1 |
| Columns 85-87 | (Prey life stage) | Refer to MARMAP life stage code list in Appendix 2 |

| | | | |
|---|---|---|---|
| Column 88 | (Prey sex) | Male | = 1 |
| | | Female | = 2 |
| | | Immature | = 3 |
| | | Ovigerous Female | = 4 |
| Column 89 | (Prey condition) | Intact Specimen | = 0 |
| | | Fragment(s) | = 1 |
| | | Only one measurement possible | = 2 |
| Columns 90-93 | (Prey length) | Nearest 1/100th mm | |
| Columns 94-97 | (Prey width) | Nearest 1/100th mm | |

FIGURE #5 DEGREE OF DIGESTION(FOSSUM,1983)




Rate of digestion: UD) undigested, D) digested. A) Copepod nauplii, B) Bivalve larvae and C) Polychaet larvae.

Figure 6. Gut Content Data Record Instructions

| Item | Columns | Specifics (Coding Details) |
|---|---|---|
| Cruise Code | 1-3 | Assigned cruise number |
| MOCNESS Haul No. | 4-6 | From MOCNESS Data Sheet (Log) |
| MOCNESS Net No. | 7,8 | Nets 1-9 |
| Date of Haul | 9-14 | (EST) from MOCNESS Data Sheet |
| Net Opening Time | 15-18 | Nearest whole minute (MOCNESS Data Sheet) |
| Haul Latitude | 19-22 | Nearest whole minute from beginning of tow (MOCNESS Data Sheet) |
| Haul Longitude | 23-26 | Nearest whole minute from beginning of tow |
| Gear Type | 27 | MOCNESS Code No.<br>1 meter 5<br>10 meter 6 |

Figure 6. Continued

| Item | Columns | Specifics (Coding Details) |
|---|---|---|
| Net Mesh Type | 28 | Mesh — Code No.<br>.333 mm — 1<br>3.0 mm — 2 |
| Larval Species Code No. | 29-37 | MARMAP Coding |
| Larval Specimen | 38-41 | 1-15 within individual nets |
| Larval Weight | 42-47 | Nearest 1/100th mg |
| Larval Length | 48-50 | Standard length nearest 1/100th mm |
| Larval Skull Width | 51-53 | Nearest 1/100th mm |
| Larval Maxillary Length | 54-56 | Nearest 1/100th mm |
| Larval Eye Height | 57-59 | Nearest 1/100th mm |
| Larval Head Height | 60-62 | Nearest 1/100th mm |

Figure 6. Continued

| Item | Columns | Specifics (Coding Details) |
|---|---|---|
| Larval Body Height | 63-65 | Nearest 1/100th mm |
| Predator Pectoral Angle | 66-68 | Nearest whole degree |
| Larval Condition | 69 | Good intact specimen = 0<br>Damaged measurements missing = 1 |
| Larval Parasitism | 70 | Internal Parasites<br>1 = *Bothriocephalus scorpii*<br>2 = *Scolex pleuronectis*<br>3 = Unidentified<br>4 = 1 & 2<br>5 = 1 & 3<br>6 = 2 & 3<br>7 = 1, 2 & 3<br>8 = *Caligulus*<br>9 = Unidentified |

Figure 6. Continued

| Item | Columns | Specifics (Coding Details) |
|---|---|---|
| Larval Gut Contents | 71 | Gut empty = 0<br>Prey remains identifi able = 1<br>Prey remains unidentifiable = 2<br>Prey remains both identifiable and unidentifiable = 3<br>Gut not examined = 4 |
| Prey Position in Gut | 72 | Anterior gut = 1<br>Mid-gut = 2<br>Hind gut = 3<br>1 & 2 = 4<br>1 & 3 = 5<br>2 & 3 = 6<br>1, 2, 3 = 7 |
| Degree of Prey Digestion | 75 | Slightly = 1<br>Moderately = 2<br>Highly = 3 |

Figure 6. Continued

| Item | Columns | Specifics (Coding Details) |
|---|---|---|
| Larval Life Stage | 78 | Jaw and eyes undeveloped = 1<br>Jaw and eyes developed = 2<br>Jaw and eyes functional, swim bladder and alimentary tract differentiated = 3<br>Jaw and eyes functional, swim bladder and alimentary tract undifferentiated = 4<br>Jaw and eyes functional, swim bladder evident, alimentary tract undifferentiated = 5<br>Jaw and eyes functional, swim bladder hot evident, alimentary undifferentiated (ematiated) = 6 |
| Yolksac Stage | 79 | Yolksac present = 0<br>Yolksac partially present = 1<br>Yolksac absent = 2 |
| Prey Number | 80-81 | Assign number to individual prey items |

Figure 6. Continued

| Item | Columns | Specifics (Coding Details) |
|---|---|---|
| Prey Code | 81-84 | MARMAP code list |
| Prey Life Stage | 85-87 | MARMAP code list |
| Prey Sex | 88 | MARMAP coding<br>Male = 1<br>Female = 2<br>Immature = 3<br>Ovigerous Female = 4 |
| Prey Condition | 89 | Intact Specimen = 0<br>Fragment(s) = 1<br>Only one measurement possible = 2 |
| Prey Length | 90-93 | Nearest 1/100th mm |
| Prey Width | 94-97 | Nearest 1/100th mm |

# MARMAP GUT CONTENT DATA RECORD - FISH LARVAE (GCDR)

ALBATROSS IV

| CRUISE | | | MOC EAVL | | | NET NO | | | DATE (GMT) | | | | | TIME (LOCAL) | | | | LAT | | | | LONG | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| | | | | | | | | | | | | | | | | | | | | | | | | | |

M. aeglefinus

| GEAR | | PREDATOR CODE | | | | | | | | | SPECIMEN NO. | | | | GUT LGTH. | VIAL NO. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | | | | | |
| | | 1 | 4 | 8 | 0 | 1 | 0 | 4 | 0 | 1 | | | | | _____ | | | | |

| WEIGHT | | | | | | LENGTH | | | SKULL W. | | | MX LGTH | | | EYE HT. | | | HEAD HT. | | | BODY HT. | | | PCTL 1 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |

| C | O | G | P | | | | | | LS | |
|---|---|---|---|---|---|---|---|---|---|---|
| 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 |
| | | | | | | | | | | |

| PHOTOGRAPH NO |
|---|
| |
| |

| SP | PREY | | | | | LIFE ST. | | | S | C | LENGTH | | | | WIDTH | | | | PREY NAME |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 |
| | | | | | | | | | | | | | | | | | | | |
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# MOCNESS DATA SHEET

| Cruise Station No. | MOCNESS Haul No. | Date (DST, EST, GMT) Day-Month-Year | Loran Latitude | Loran Longitude | Bottom Depth (m) |
|---|---|---|---|---|---|
| 60-1 | 426 | 14 MAY 83 | S 40 49.41 | 67 36.55 | 75.7 |
| | | | F 40 50.78 | 67 36.48 | 73.7 |

| MOCNESS Type | 1/4m | 1m | 10m |
|---|---|---|---|
| | | ✓ | |

Ancil. Records and Obs.

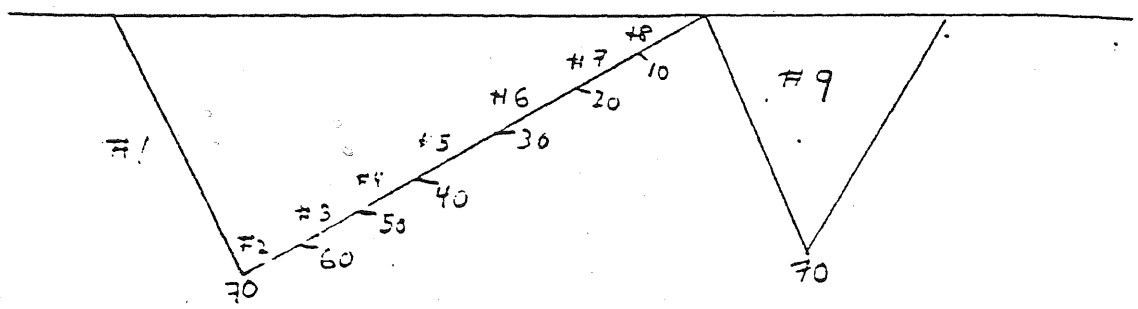
Mag. tape no.
D.U. Plot record
UWU TSK no.
Loran-C plot
Disc No.
Printout
TD plot
XBT No. ✓
Secchi disc
Photometer
STD 18:02
Fluorometer
Net haul
Sunrise
Sunset

| | Time | Net depth (m) | Ave. angle | Flow count | Mesh |
|---|---|---|---|---|---|
| Start down (Net 1 Open) | 18:32 | 0-70 | | 53 | 0.33 |
| Net 2 Open | 18:39 | 70-60 | | 52 | — |
| Net 3 Open | 18:44 | 60-50 | | 59 | |
| Net 4 Open | 18:49 | 50-40 | | 56 | |
| Net 5 Open | 18:53 | 40-30 | | 57 | |
| Net 6 Open | 18:58 | 30-20 | | 58 | |
| Net 7 Open | 19:03 | 20-10 | | 56 | |
| Net 8 open | 19:07 | 10-0 | | 55 | |
| Net 9 Open | 19:12 | 0-70-0 | | 74 | |
| Net 9 Closed | 19:19 | | | | ✓ |

Remarks:

Rec. by GRBOLZ

Tow profile:



## COMMENTS

The identification of larval prey selection patterns, prey size, feeding rates and the evaluation of larval condition are the primary objectives of the stomach analyses component of this investigation. The utilization of MOCNESS sampling systems in a 24 hour time series mode has enabled us to characterize larval migration patterns and feeding activity, in addition to the location of cod and haddock larvae and their prey at discrete vertical depths. Examination of stomach contents from these two co-occurring larvae may also provide some important insights into the possibility of interspecific competition for food resources, or the partitioning of resources by early larvae as suggested by Kane (1984).

An important measurement in fisheries ecosystem studies is the general health or "condition" of fish eggs and larvae (Lasker and Sherman, 1981). Although starvation of marine fish larvae may be one of the major causes of larval fish mortality, the resultant condition of the starving larva may increase its vulnerability to predation. The mortality rates of embryonic marine fishes are often very high indicating high rates of predation (Hunter, 1984). Measurement of morphological characteristics can provide important estimations of larval condition or health in addition to identification of size classes and feeding modes. Studies by Hunter (1981), Theilacker (1978), Ehrlich et al. (1976), Arthur (1976), and O'Connell (1976) have

shown that morphological measurements, in addition to histological and biochemical criteria, can provide an accurate evaluation of larval condition. Although histological and biochemical methods have proved to be useful in assessing larval condition, morphological measurements take much less time, require no special preservation techniques and are more suited to gut studies of this type. Blaxter (1971), O'Connell (1976), Ehrlich (1976) and Theilacker (1978) found body depth or height to be the most consistent indicator of starvation in larval herring, plaice, anchovy and jack mackerel. Ellersten et al. (1980) recommend a system based on evaluation of morphological development characters such as differentiation of the gut and swim bladder development, as well as routine morphological measurements when assessing larval cod condition. This system is more useful for assessing the condition and physiological state of yolk sac and early first feeding larvae. In evaluating the condition of larval herring, Hempel and Blaxter (1963) point out that larval condition may be the result of physiological state or nutritional condition. They noted a decrease in larval "condition" after resorption of the yolk followed by increases in "condition" with length in herring. Changes in weight/length relationships as a result of allometric growth must be considered when evaluating larval condition especially when encountering larvae of different lengths in the same sample.

Research by Buckley (1979, 1980, 1984) has indicated that RNA/DNA ratios are reliable indications of larval condition and growth for a variety of larval fishes including haddock and

cod. In conclusion, evaluation of the condition of wild marine fish larvae involves the consideration of a number of variables: stage of development, physiological state, capture damage on stress and fixation shrinkage. When evaluating the condition of wild larval cod and haddock, this study utilizes routine morphological measurements, a larval life staging system and biochemical analysis for RNA/DNA ratios. Reseachers must seriously consider all parameters before attributing poor larval condition to nutrition on any other variable. Because starvation of any significance will probably occur in patches, O'Connell (1980) concludes that a stereomicroscope scan of the total aggregation of larvae from each tow should suffice for the identification and enumeration of such patches, with histological processing reserved for selected verification.

## Shrinkage

Factors such as pre- and post-fixation shrinkage and capture damage or stress make estimation of sea-caught larval length difficult. Hay (1981, 1982) estimated a shrinkage rate of up to 20% when laboratory reared herring larvae were subjected to a simulated capture process, and up to 30% shrinkage when fixation of herring larvae was delayed. Hay (1982) concluded that tows should be short in duration and larvae must be fixed immediately after capture in order to minimize shrinkage.

Although the MOCNESS system provides a wide spectrum of sampling capabilities, the multiple net system produces considerable variability in net residence time resulting in varying degrees of shrinkage and damage to fish larvae. This complicates the already difficult task of estimating larval length and condition, because the highest levels of shrinkage are thought to occur shortly after death in the net. Theilacker (1980) found shrinkage rates of up to 19% for <6 mm S.L. northern anchovy larvae occurred after a 5-10 minute net-treatment period, and only 2% shrinkage occurred for 18-22 mm SL larvae treated similarly. Although measureable shrinkage decreases for older, larger larvae it appears nearly constant for larvae from 12-22 mm, and is probably related to the degree of ossification (Theilacker, 1980). This investigation uses Theilacker's shrinkage model for 20 min net hauls and an additional 3% shrinkage is added for formaldehyde fixation when estimating live larval length from MOCNESS samples.

Cod and haddock larvae like most pelagic marine fish larvae are particulate planktivores, specializing in the naupliar through adult stages of copepods (Hunter, 1981). Although most prey remains examined to data have been dominated by the various life stages of copepods, a wide variety of other planktors have also been encountered including: dinoflagellates, centric diatoms, tintinnids, lamellibranch larvae, cypris larvae, euphausid calyptopes and pteropods. It is often very difficult to accurately identify all the prey remains from larval fish stomachs because of rapid digestion processes. Recent

investigations have shown that the cod larval digestive rate is very fast; about 30 minutes for complete digestion of a nauplius even at low temperatures (Ellertsen et al., 1981). Often prey remains may be highly digested, resembling nothing more than translucent exoskeletons with important taxonomic characteristics absent. In this case most prey remains can be identified to either the family or order level only. Depending on larval size and time of capture, up to 60-75% of the prey remains are identified to a genus-species level; only rarely are 100% of the prey remains identifiable to this level. Some taxonomists argue that prey identification to species and sex is necessary in order to recognize distinct life histories or ecological differences between sex which might imply differential exposure to predation. However, in the last ten years, those studies that have provided the greatest insights into the trophic ecology of fish have been those that identified prey at only the higher taxonomic levels, such as order or family, and that included data on prey size (Bowen, 1984).

In summary this investigation is attempting to describe the early life history strategies of larval cod and haddock from Georges Bank. By examining stomach contents and evaluating larval condition, we hope to gain a greater understanding of the processes which may control larval mortality and survivorship. The laboratory techniques which have been found useful for evaluating larval condition and for analyzing stomach contents of larval cod and haddock are described here in detail.

## ACKNOWLEDGEMENTS

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# LITERATURE CITED

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# MARMAP CODES FOR ZOOPLANKTON LIFE STAGES

| CODE | STAGE |
|---|---|
| 035 | ACANTHOSOMA (ZOEA) |
| 002 | ACTINULA |
| 000 | ADULT |
| 009 | ATOKE |
| 048 | AURICULARIA |
| 044 | BIPINNARIA |
| 045 | BRACHIOLARIA |
| 028 | CALYPTOPIS (PROTOZOEA) |
| 052 | COPEPODITE |
| 020 | COPEPODITE I |
| 021 | COPEPODITE II |
| 022 | COPEPODITE III |
| 023 | COPEPODITE IV |
| 024 | COPEPODITE V |
| 007 | CYDIPPID |
| 058 | CYPHONAUNTES |
| 025 | CYPRIS |
| 030 | CYRTOPIA (POSTLARVA) |
| 040 | DIPLEURULA |
| 049 | DOLIOLARIA |
| 047 | ECHINOPLUTEUS |
| 034 | ELAPHOCARIS (PROTOZOEA) |
| 005 | EPHYRA |
| 008 | EPITOKE |
| 029 | FURCILIA (ZOEA) |
| 042 | GLAUCOTHOE (POSTLARVA) |
| 004 | POLYP |
| 054 | IMMATURE (SEXUALLY), or JUVENILE |
| 050 | INVERT. EGG |
| 051 | LARVA |
| 026 | MANCA (POSTLARVA) |
| 033 | MASTIGOPUS (POSTLARVA) |
| 003 | MEDUSA |
| 043 | MEGALOPA (POSTLARVA) |
| 053 | METATROCHOPHORE |
| 032 | MYSIS (ZOEA) |
| 013 | NAUPLIUS |
| 014 | NAUPLIUS I |
| 015 | NAUPLIUS II |
| 016 | NAUPLIUS III |
| 017 | NAUPLIUS IV |
| 018 | NAUPLIUS V |
| 019 | NAUPLIUS VI |
| 046 | OPHIOPLUTEUS |
| 037 | PARVA (POSTLARVA) |
| 039 | PHYLLOSOMA (ZOEA) |
| 027 | PHYSOSOMA |
| 001 | PLANULA |
| 038 | POSTLARVA |
| 012 | PROTONYMPHON |
| 031 | PROTOZOEA |
| 041 | PUERULUS, NISTO, or PLEUDIBACCUS (POSTLARVA) |
| 006 | SCYPHISTOMA |
| 055 | STROBILA |
| 010 | TROCHOPHORE |
| 011 | VELIGER |
| 056 | VITELLARIA |
| 999 | UNKNOWN |
| 036 | ZOEA |

SEX

1 = Male

2 = Female

3 = Immature

4 = Ovigerous ♀

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKTA |
|---|---|---|
| ABYLOPSIS TETRAGONE | ABY. TETRAGONE | 1807 |
| ACARINA | ACARINA | 4300 |
| ACARTIA CLAUSI | ACA. CLAUSI | 112 |
| ACARTIA DANAE | ACA. DANAE | 148 |
| ACARTIA DISCAUDATA | ACA. DISCAUDATA | 4110 |
| ACARTIA LONGIREMIS | ACA LONGIREMIS | 107 |
| ACARTIA NEGLIGENS | ACA. NEGLIGENS | 4037 |
| ACARTIA SP. | ACARTIA | 129 |
| ACARTIA SPP | ACARTIA | 4027 |
| ACARTIA TONSA | ACA. TONSA | 151 |
| ACHELIA SPINOSA | ACH. SPINOSA | 2401 |
| ACTINOPTYCHUS SPP. | ACTINOPTYCHUS | 9126 |
| AEGININA LONGICORNIS | AEG. LONGICORNIS | 851 |
| AETIDEIDAE | AETIDEIDAE | 4061 |
| AETIDEINAE | AETIDEINAE | 4038 |
| AETIDEOPSIS ROSTRATA | AET. ROSTRATA | 154 |
| AETIDEUS ARMATUS | AET. ARMATUS | 120 |
| AETIDEUS SPP. | AETIDEUS | 4091 |
| AGALMA ELEGANS | AGA. ELEGANS | 1810 |
| AGLANTHA DIGITALE | AGL. DIGITALE | 1809 |
| ALCIOPIDAE | ALCIOPIDAE | 2506 |
| ALTEUTHA DEPRESSA | ALT. DEPRESSA | 192 |
| ALTEUTHA SPP. | ALTEUTHA | 4069 |
| AMPELISCA AGASSIZI | AMP. AGASSIZI | 4401 |
| AMPELISCA VUDORUM | AMP. VUDORUM | 4402 |
| AMPELISCIDAE | AMPELISCIDAE | 873 |
| AMPHIDINIUM SPP. | AMPHIDINIUM | 9050 |
| AMPHIPODA | AMPHIPODA | 400 |
| AMPHITHYRUS BISPINOSUS | AMP. BISPINOSUS | 844 |
| AMPHITHYRUS SCULPTURATUS | AMP. SCULPTURATU | 845 |
| ANAPRONOE REINHARDTI | ANA. REINHARDTI | 481 |
| ANCHYLOMERA BLOSSEVILLEI | ANC. BLOSSEVILLE | 476 |
| ANOMALOCERA PATERSONI | ANO. PATERSONI | 119 |
| ANOMURA | ANOMURA | 3200 |
| ANONYX LILJEBORGI | ANO. LILJEBORGI | 875 |
| ANONYX SARSI | ANO. SARSI | 4404 |
| ANURIDA MARITIMA | ANU. MARITIMA | 3500 |
| APPENDICULARIA | APPENDICULARIA | 700 |
| ARTHROPODA | ARTHROPODA | 2402 |
| ASCHELMINTHES | ASCHELMINTHES | 950 |
| ASTACIDEA | ASTACIDEA | 3100 |
| ASTERIONELLA JAPONICA | AST. JAPONICA | 9018 |
| ASTERIONELLA SPP. | ASTERIONELLA | 9133 |
| ASTEROIDEA | ASTEROIDEA | 1560 |
| ATLANTA SP. | ATLANTA | 3302 |
| ATLANTA SPP. | ATLANTA | 3303 |
| ATLANTIDAE | ATLANTIDAE | 3304 |
| AUGAPTILIDAE | AUGAPTILIDAE | 4132 |
| AXIUS | AXIUS | 3207 |
| BACTERIASTRUM SPP. | BACTERIASTRUM | 9014 |
| BALANIDAE | BALANIDAE | 2101 |
| BASSIA BASSENSIS | BAS. BASSENSIS | 1806 |
| BELLEROCHEA MALLEUS | BEL. MALLEUS | 9119 |
| BIDDULPHIA ALTERNANS | BID. ALTERNANS | 9083 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKTAXN |
|---|---|---|
| BIDDULPHIA AURITA | BID. AURITA | 9085 |
| BIDDULPHIA REGIA | BID. REGIA | 9128 |
| BIDDULPHIA SINENSIS | BID. SINENSIS | 9017 |
| BIDDULPHIA SPP. | BIDDULPHIA | 9074 |
| BOSMINA SPP. | BOSMINA | 615 |
| BRACHYSCELUS CRUSCULUM | BRA. CRUSCULUM | 800 |
| BRACHYSCELUS GLOBICEPS | BRA. GLOBICEPS | 801 |
| BRACHYSCELUS MACROCEPHALUS | BRA. MACROCEPHAL | 803 |
| BRACHYSCELUS RAPACOIDES | BRA. RAPACOIDES | 802 |
| BRACHYSCELUS SPP. | BRACHYSCELUS | 499 |
| BRACHYURA | BRACHYURA | 1000 |
| BRANCHIOPODA | BRANCHIOPODA | 612 |
| BRYOZOA | BRYOZOA | 900 |
| BYBLIS SPP. | BYBLIS | 4406 |
| CALANIDAE | CALANIDAE | 4012 |
| CALANOIDEA | CALANOIDEA | 4130 |
| CALANOIDES CARINATUS | CAL. CARINATUS | 4132 |
| CALANOII SP. | CALANOIDA | 128 |
| CALANOID SPP. | CALANOIDA | 142 |
| CALANOPIA SPP. | CALANOPIA | 4171 |
| CALANUS FINMARCHICUS | CAL. FINMARCHICU | 101 |
| CALANUS GLACIALIS | CAL. GLACIALIS | 4131 |
| CALANUS HELGOLANDICUS | CAL. HELGOLANDIC | 4130 |
| CALANUS HYPERBOREUS | CAL. HYPERBOREUS | 121 |
| CALANUS MINOR | NAN. MINOR | 143 |
| CALANUS SP. | CALANUS | 4104 |
| CALANUS SPP. | CALANUS | 178 |
| CALANUS TENUICORNIS | CAL. TENUICORNIS | 4090 |
| CALIGOIDA | CALIGOIDA | 4005 |
| CALIGUS SPP. | CALIGUS | 4004 |
| CALLIANASSA | AXIUS | 8001 |
| CALLIOPIUS SPP. | CALLIOPIUS | 871 |
| CALOCALANUS CONTRACTUS | CAL. CONTRACTUS | 4169 |
| CALOCALANUS PAVO | CAL. PAVO | 156 |
| CALOCALANUS PLUMULOSUS | CAL. PLUMULOSUS | 4039 |
| CALOCALANUS SP. | CALOCALANUS | 4011 |
| CALOCALANUS SPP. | CALOCALANUS | 4129 |
| CALOCALANUS SPP. | CALOCALANUS | 4141 |
| CALOCALANUS TENUIS | CAL. TENUIS | 4070 |
| CANCER BOREALIS | CAN. BOREALIS | 1006 |
| CANCER IRRORATUS | CAN. IRRORATUS | 1005 |
| CANCER IRRORATUS OR CANCER BOREALIS | CAN. IRR-BOR | 1007 |
| CANCER SPP | CANCER | 1003 |
| CANDACIA ARMATA | CAN. ARMATA | 117 |
| CANDACIA BIPINNATA | CAN. BIPINNATA | 4149 |
| CANDACIA BISPINOSA | CAN. BISPINOSA | 4092 |
| CANDACIA CURTA | CAN. CURTA | 4147 |
| CANDACIA LONGIMANA | CAN. LONGIMANA | 4148 |
| CANDACIA PACHYDACTYLA | CAN. PACYDACTYLA | 4018 |
| CANDACIA PAENELONGIMANA | CAN. PAENELONGIM | 4158 |
| CANDACIA SIMPLEX | CAN. SIMPLEX | 4040 |
| CANDACIA SP | CANDACIA | 4041 |
| CANDACIA SPP | CANDACIA | 4042 |
| CANDACIA VARICANS | CAN. VARICANS | 4178 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKT |
|---|---|---|
| CAPRELLIDEA | CAPRELLIDEA | 850 |
| CARDIUM SPP. | DINOCARDIUM | 8002 |
| CARIDEA | CARIDEA | 554 |
| CARINARIA LAMARCKI | CAR. LAMARCKI | 3301 |
| CAVOLINA INFLEXA | CAV. INFLEXA | 312 |
| CAVOLINA LONGIROSTRIS | CAV. LONGIROSTRI | 313 |
| CAVOLINA SPP. | CAVOLINA | 320 |
| CAVOLINA UNCINATA | CAV. UNCINATA | 311 |
| CENTROPAGES BRADYI | CEN. BRADYI | 4020 |
| CENTROPAGES CHIERCHIAE | CEN. CHIERCHIAE | 4140 |
| CENTROPAGES FURCATUS | CEN. FURCATUS | 4112 |
| CENTROPAGES HAMATUS | CEN. HAMATUS | 109 |
| CENTROPAGES SPP. | CENTROPAGES | 133 |
| CENTROPAGES TYPICUS | CEN. TYPICUS | 103 |
| CENTROPAGES VIOLACEUS | CEN. VIOLACEUS | 4043 |
| CEPHALOPODA | CEPHALOPODA | 3000 |
| CERATAULINA BERGONII | CER. BERGONII | 9059 |
| CERATIUM ARCTICUM | CER. ARCTICUM | 9034 |
| CERATIUM BELONE | CER. BELONE | 9086 |
| CERATIUM BUCEPHALUM | CER. BUCEPHALUM | 9111 |
| CERATIUM CANDELABRUM | CER. CANDELABRUM | 9087 |
| CERATIUM CARRIENSE | CER. CARRIENSE | 9071 |
| CERATIUM CONCILIANS | CER. CONCILIANS | 9095 |
| CERATIUM CONTORTUM | CER. CONTORTUM | 9117 |
| CERATIUM CONTRARIUM | CER. CONTRARIUM | 9136 |
| CERATIUM DECLINATUM | CER. DECLINATUM | 9112 |
| CERATIUM EUARCUATUM | CER. EUARCUATUM | 9121 |
| CERATIUM EXTENSUM | CER. EXTENSUM | 9113 |
| CERATIUM FURCA | CER. FURCA | 9028 |
| CERATIUM FUSUS | CER. FUSUS | 9027 |
| CERATIUM GALLICUM | CER. GALLICUM | 9096 |
| CERATIUM HEXACANTHUM | CER. HEXACANTHUM | 9078 |
| CERATIUM HORRIDUM | CER. HORRIDUM | 9032 |
| CERATIUM HUMILE | CER. HUMILE | 9092 |
| CERATIUM INFLATUM | CER. INFLATUM | 9104 |
| CERATIUM KARSTENII | CER. KARSTENII | 9089 |
| CERATIUM KOFOIDII | CER. KOFOIDII | 9077 |
| CERATIUM LINEATUM | CER. LINEATUM | 9029 |
| CERATIUM LONGINUM | CER. LONGINUM | 9079 |
| CERATIUM LONGIPES | CER. LONGIPES | 9033 |
| CERATIUM LONGIROSTRUM | CER. LONGIROSTRU | 9097 |
| CERATIUM LUNULA | CER. LUNULA | 9093 |
| CERATIUM MACROCEROS | CER. MACROCEROS | 9031 |
| CERATIUM MASSILIENSE | CER. MASSILIENSE | 9055 |
| CERATIUM MINUTUM | CER. MINUTUM | 9091 |
| CERATIUM PENTAGONUM | CER. PENTAGONUM | 9067 |
| CERATIUM SPP. | CERATIUM | 9115 |
| CERATIUM TERES | CER. TERES | 9088 |
| CERATIUM TRICHOCEROS | CER. TRICHOCEROS | 9048 |
| CERATIUM TRIPOS | CER. TRIPOS | 9030 |
| CERATOCORYS HORRIDA | CER. HORRIDA | 9103 |
| CERATOCORYS SPP. | CERATOCORYS | 9039 |
| CHAETOCEROS CURVISETUS | CHA. CURVISETUS | 9137 |
| CHAETOCEROS SPP. | CHAETOCEROS | 9045 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKTA |
|---|---|---|
| CHAETOGNATHA | CHAETOGNATHA | 200 |
| CHAETOGNATHA HPR EYECOUNT | CHA. EYECOUNT | 229 |
| CHAETOGNATHA HPR TRAVERSE | CHA. TRAVERSE | 230 |
| CHELOPHYES APPENDICULATA | CHE. APPENDICULA | 1805 |
| CHIRIDOTEA SP. | CHIRIDOTEA | 2205 |
| CHIRONDINA STREETSKI | CHI. STREETSKI | 4085 |
| CHIRUNDINA SPP. | CHIRUNDINA | 187 |
| CHORDATA | CHORDATA | 799 |
| CIROLANA POLITA | CIR. POLITA | 2206 |
| CIRRIPEDIA | CIRRIPEDIA | 2100 |
| CLADOCERA | CLADOCERA | 600 |
| CLADOPHYXIS SETIFERA | CLA. SETIFERA | 9134 |
| CLADOPHYXIS SPP. | CLADOPHYXIS | 9098 |
| CLAUSOCALANUS ARCUICORNIS | CLA. ARCUICORNIS | 157 |
| CLAUSOCALANUS FURCATUS | CLA. FURCATUS | 4064 |
| CLAUSOCALANUS SP. | CLAUSOCALANUS | 4044 |
| CLAUSOCALANUS SPP. | CLAUSOCALANUS | 4098 |
| CLIO CUSPIDATA | CLI. CUSPIDATA | 8003 |
| CLIONE CUSPIDATA | CLI. CUSPIDATA | 309 |
| CLIONE LIMACINA | CLI. LIMACINA | 354 |
| CLIONE PYRAMIDATA | CLI. PYRAMIDATA | 310 |
| CLIONE SP. | CLIONE | 351 |
| CLIONE SPP. | CLIONE | 306 |
| CLIO PYRAMIDATA | CLI. PYRAMIDATA | 8004 |
| CLIO SP. | CLIONE | 8005 |
| CLIO SPP. | CLIONE | 8006 |
| CLYTEMNESTRA ROSTRATA | CLY. ROSTRATA | 145 |
| CLYTEMNESTRA SCUTELLATA | CLY. SCUTELLATA | 4006 |
| CLYTEMNESTRA SP. | CLYTEMNESTRA | 4111 |
| CLYTEMNESTRA SPP. | CLYTEMNESTRA | 4139 |
| CNIDERIA | COELENTERATA | 8007 |
| COCCOLITHACEAE | COCCOLITHACEAE | 9042 |
| COELENTERATA | COELENTERATA | 2350 |
| CONCHOAEIDAE | CONCHOAEIDAE | 3603 |
| CONCHOECIA BISPINOSA | CON. BISPINOSA | 3610 |
| CONCHOECIA ELEGANS | CON. ELEGANS | 3608 |
| CONCHOECIA SP. | CONCHOECIA | 3604 |
| CONCHOECIA SPP. | CONCHOECIA | 3605 |
| CONCHOECIA TERETIVALIVATA | CON. TERETIVALIV | 3609 |
| COPEPODA | COPEPODA | 100 |
| COPILIA MIRABILIS | COP. MIRABILIS | 4154 |
| COPILIA QUADRATA | COP. QUADRATA | 4150 |
| COPILIA SP. | COPILIA | 4076 |
| COPILIA SPP. | COPILIA | 4155 |
| CORETHRON CRIOPHILUM | COR. CRIOPHILUM | 9004 |
| COROPHIIDAE | COROPHIIDAE | 4407 |
| CORYCAEIDAE | CORYCAEIDAE | 4045 |
| CORYCAEUS DANAE | COR. DANAE | 163 |
| CORYCAEUS ELONGATUS | COR. ELONGATUS | 4034 |
| CORYCAEUS FLACCUS | COR. FLACCUS | 4092 |
| CORYCAEUS GIESBRECHTI | COR. GIESBRECHTI | 4105 |
| CORYCAEUS LAUTUS | COR. LAUTUS | 4046 |
| CORYCAEUS SP. | CORYCAEUS | 4106 |
| CORYCAEUS SPECIOSUS | COR. SPECIOSUS | 4023 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKTAXN |
|---|---|---|
| CORYCAEUS SPP. | CORYCAEUS | 177 |
| CORYCAEUS VENUSTUS | COR. VENUSTUS | 4047 |
| CORYCELLA CARINATA | COR. CARINATA | 4048 |
| CORYCELLA ROSTRATA | COR. ROSTRATA | 4093 |
| CORYCELLA SP. | CORYCELLA | 4079 |
| COSCINODISCUS CONCINNUS | COS. CONCINNUS | 9108 |
| COSCINODISCUS SPP. | COSCINODISCUS | 9003 |
| CRANGONIDAE | CRANGONIDAE | 567 |
| CRANGON SEPTEMSPINOSA | CRA. SEPTEMSPINO | 556 |
| CRANGON SP. | CRANGON | 572 |
| CRANGON SPP. | CRANGON | 552 |
| CRANGON VULGARIS | CRA. VULGARIS | 553 |
| CRESEIS SP. | CRESEIS | 316 |
| CRESEIS SPP. | CRESEIS | 317 |
| CRESEIS VIRGULA CONICA | CRE. VIRGULACONI | 307 |
| CRUSTACEA | CRUSTACEA | 1900 |
| CTENOCALANUS VANUS | CTE. VANUS | 4175 |
| CTENOPHORA | CTENOPHORA | 2700 |
| CUMACEA | CUMACEA | 1700 |
| CYANOPHYTA | CYANOPHYTA | 9052 |
| CYCLOPENA LONGICORNIS | CYC. LONGICORNIS | 193 |
| CYCLOPIDAE | CYCLOPIDAE | 4063 |
| CYCLOPOID SP. | CYCLOPOID | 4049 |
| CYCLOPOID SPP. | CYCLOPOID | 130 |
| CYCLOPS SP. | CYCLOPS | 4060 |
| CYCLOPS SPP. | CYCLOPS | 4026 |
| CYMATOSIRA SPP. | CYMATOSIRA | 9047 |
| CYSTISOMA SPP | CYSTISOMA | 436 |
| DACTYLIOSOLEN ANTARCTICUS | DAC. ANTARCTICUS | 9005 |
| DACTYLIOSOLEN MEDITERRANEUS | DAC. MEDITERRANE | 9006 |
| DACTYLIOSOLEN SPP. | DACTYLIOSOLEN | 9046 |
| DAIRELLA LATISSIMA | DAI. LATISSIMA | 459 |
| DAIRELLA SPP. | DAIRELLA | 458 |
| DECAPODA-ARTHROPODA | DECAPODA ARTHRO | 500 |
| DECAPODA-MOLLUSCA | DECAPODA. MOLLUS | 3001 |
| DETONULA CONFERVACEA | DET. CONFERVACEA | 9124 |
| DIACRIA TRISPINOSA | DIA. TRISPINOSA | 308 |
| DIAPTOMUS MINUTUS | DIA. MINUTUS | 115 |
| DIAPTOMUS PIGMAEUS | DIA. PIGMAEUS | 127 |
| DIAPTOMUS SPP. | DIAPTOMUS | 136 |
| DIASTYLIS SCULPTA | DIA. SCULPTA | 1701 |
| DIATOM | DIATOM | 9129 |
| DIATOM , CENTRIC | DIA. CENTRIC | 9131 |
| DIATOM , PENNATE | DIA. PENNATE | 9130 |
| DICHELOPANDALUS LEPTOCERUS | DIC. LEPTOCERUS | 557 |
| DINOCARDIUM SPP. | DINOCARDIUM | 1301 |
| DINOFLAGELLATA | DINOFLAGELLATA | 9114 |
| DINOPHYSIS NORVEGICA | DIN. NORVEGICA | 9123 |
| DINOPHYSIS SPP. | DINOPHYSIS | 9036 |
| DINOPHYSIS TRIPOS | DIN. TRIPOS | 9122 |
| DIPHYES DISPAR | DIP. DISPAR | 1804 |
| DIPLOPSALIS | DIPLOPSALIS | 9138 |
| DISINTEGRATED | DISINTEGRATED | 1 |
| DITYLUM BRIGHTWELLII | DIT. BRIGHTWELLI | 9068 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKTA |
|---|---|---|
| DOLIOLIDAE | DOLIOLIDAE | 3402 |
| DOLIOLUM SPP. | DOLIOLUM | 3401 |
| ECHINARACHMUS SPP. | ECHINARACHMUS | 1571 |
| ECHINODERMATA | ECHINODERMATA | 1500 |
| ECHINOIDEA | ECHINOIDEA | 1570 |
| EDOTEA TRILOBA | EDO. TRILOBA | 2204 |
| EMERITA SPP. | EMERITA | 3210 |
| EOPRONOE LATICARPA | EOP. LATICARPA | 487 |
| ERICHTHONIUS SPP. | ERICHTHONIUS | 874 |
| ERYTHROPS ERYTHROPTHALMA | ERY. ERYTHROPTHA | 2803 |
| EUAETIDEUS GIESBRECHTI | EUA. GIESBRECHTI | 4121 |
| EUAUGAPTILUS SPP. | EUAUGAPTILUS | 182 |
| EUCALANIDAE | EUCALANIDAE | 4081 |
| EUCALANUS ATLANTICUS | EUC. ATLANTICUS | 4088 |
| EUCALANUS ATTENUATUS | EUC. ATTENUATUS | 168 |
| EUCALANUS CRASSUS | EUC. CRASSUS | 4077 |
| EUCALANUS ELONGATUS | EUC. ELONGATUS | 167 |
| EUCALANUS MONACHUS | EUC. MONACHUS | 166 |
| EUCALANUS MUCRONATUS | EUC. MUCRONATUS | 4157 |
| EUCALANUS SP. | EUCALANUS | 4101 |
| EUCALANUS SPP. | EUCALANUS | 180 |
| EUCAMPIA ZODIACUS | EUC. ZODIACUS | 9125 |
| EUCARIDA | EUCARIDA | 2022 |
| EUCHAETA ACUTA | EUC. ACUTA | 4133 |
| EUCHAETA HEBES | EUC. HEBES | 4134 |
| EUCHAETA MARINA | EUC. MARINA | 169 |
| EUCHAETA MEDIA | EUC. MEDIA | 4176 |
| EUCHAETA NORVEGICA | EUC. NORVEGICA | 116 |
| EUCHAETA PUBERA | EUC. PUBERA | 4174 |
| EUCHAETA SP. | EUCHAETA | 139 |
| EUCHAETA SPP. | EUCHAETA | 4036 |
| EUCHAETA TONSA | EUC. TONSA | 4146 |
| EUCHAETIDAE | EUCHAETIDAE | 4062 |
| EUCHIRELLA BITUMIDA | EUC. BITUMIDA | 4089 |
| EUCHIRELLA MESSINENSIS | EUC. MESSINENSIS | 4144 |
| EUCHIRELLA ROSTRATA | EUC. ROSTRATA | 179 |
| EUCHIRELLA SPP. | EUCHIRELLA | 4145 |
| EUDORELLA SPITIBERGENSIS | EUD. SPITIBERGEN | 1702 |
| EUKROHNIA HAMATA | EUK. HAMATA | 211 |
| EUKROHNIA SPP. | EUKROHNIA | 212 |
| EUPHAUSIA AMERICANA | EUP. AMERICANA | 2005 |
| EUPHAUSIA BREVIS | EUP. BREVIS | 2007 |
| EUPHAUSIACEA | EUPHAUSIACEA | 2000 |
| EUPHAUSIA HEMIGIBBA | EUP. HEMIGIBBA | 2008 |
| EUPHAUSIA KROHNII | EUP. KROHNII | 2006 |
| EUPHAUSIA SPP. | EUPHAUSIA | 2010 |
| EUPHAUSIA TENERA | EUP. TENERA | 2009 |
| EUPRONE MACULATA | EUP. MACULATA | 482 |
| EUPRONE MINUTA | EUP. MINUTA | 483 |
| EUPRONOE INSCRIPTA | EUP. INSCRIPTA | 488 |
| EUPRONOE INTERMEDEA | EUP. INTERMEDEA | 489 |
| EURYTEMORA AFFINIS | EUR. AFFINIS | 113 |
| EURYTEMORA AMERICANA | EUR. AMERICANA | 4165 |
| EURYTEMORA HERDMANI | EUR. HERDMANI | 110 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKTAX |
|---|---|---|
| EURYTEMORA HIRUNDOIDES | EUR. HIRUNDOIDES | 140 |
| EURYTEMORA LACUSTRUS | EUR. LACUSTRUS | 134 |
| EURYTEMORA SP. | EURYTEMORA | 4095 |
| EURYTEMORA SPP. | EURYTEMORA | 132 |
| EUTERPINA ACUTIFRONS | EUT. ACUTIFRONS | 4160 |
| EUTERPINA SPP. | EUTERPINA | 4163 |
| EUTHAMNEUS PLATYRHUCHUS | EUT. PLATYRHUCHU | 811 |
| EUTHEMISTO COMPRESSA | EUT. COMPRESSA | 848 |
| EVADNE NORDMANNI | EVA. NORDMANNI | 607 |
| EVADNE SP. | EVADNE | 608 |
| EVADNE SPINIFERA | EVA. SPINIFERA | 606 |
| EVADNE SPP. | EVADNE | 605 |
| EVADNE TERGESTINA | EVA. TERGESTINA | 614 |
| EXUVIAELLA COMPRESSA | EXU. COMPRESSA | 9106 |
| EXUVIAELLA SPP. | EXUVIAELLA | 9118 |
| FARDELLA SPP. | FARDELLA | 190 |
| FARRANULA CARINATA | FAR. CARINATA | 4022 |
| FARRANULA GRACILIS | FAR. GRACILIS | 4021 |
| FARRANULA SPP. | FARRANULA | 4136 |
| FIROLOIDA SPP. | FIROLOIDA | 3305 |
| FISH | FISH | 3500 |
| FLABELLIFERA | FLABELLIFERA | 2207 |
| FORAMINIFERA | FORAMINIFERA | 3900 |
| FRAGILARIA SPP. | FRAGILARIA | 9038 |
| FRITILLARIA SP. | FRITILLARIA | 720 |
| GAETANUS SP. | GAETANUS | 4072 |
| GAIDIUS TENUISPINUS | GAI. TENUISPINUS | 4152 |
| GALATHEIDEA | GALATHEIDEA | 3208 |
| GAMMARIDAE | GAMMARIDAE | 892 |
| GAMMARIDEA | GAMMARIDEA | 895 |
| GAMMARUS ANNULATUS | GAM. ANNULATUS | 897 |
| GAMMARUS OCEANICUS | GAM. OCEANICUS | 896 |
| GAMMARUS SP. | GAMMARUS | 888 |
| GASTROPODA | GASTROPODA | 1100 |
| GERYON QUINQUEDENS | GER. QUINQUEDENS | 1002 |
| GLOSSOCEPHALUS MILNE-EDWARDSII | GLO. MILNE-EDWAR | 920 |
| GONYAULAX SPP. | GONYAULAX | 9072 |
| GRAMMATOPHORA SPP. | GRAMMATOPHORA | 9080 |
| GYMNODINIUM SPP. | GYMNODINIUM | 9049 |
| GYMNOSOMATA | GYMNOSOMATA | 350 |
| GYROSIGMA SPP. | GYROSIGMA | 9120 |
| HALITHALESTRIS CRONI | HAL. CRONI | 4050 |
| HALITHALESTRIS SP. | HALITHALESTRIS | 4113 |
| HALOCYPRIDAE | HALOCYPRIDAE | 3607 |
| HALOCYPRIDAE | HALOCYPRIDAE | 5604 |
| HALOCYPRIS GLOBOSA | HAL. GLOBOSA | 3601 |
| HALOCYPRIS SP. | HALOCYPRIS | 3602 |
| HALOCYPRIS SPP. | HALOCYPRIS | 3606 |
| HALOPTILUS LONGICORNIS | HAL. LONGICORNIS | 4170 |
| HALOPTILUS SPP. | HALOPTILUS | 4003 |
| HALOSPHAERA SPP. | HALOSPHAERA | 9025 |
| HARPACTICOID SP. | HARPACTICOID | 4051 |
| HARPACTICOID SPP. | HARPACTICOID | 131 |
| HEMIAULUS SPP. | HEMIAULUS | 9063 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKTA |
|---|---|---|
| HEMITYPHIS CRUSTULATUS | HEM. CRUSTULATUS | 847 |
| HEMITYPHIS SPP. | HEMITYPHIS | 846 |
| HETEROPODA | HETEROPODA | 3300 |
| HETERORHABDIDAE | HETERORHABDIDAE | 4030 |
| HETERORHABDUS ABYSSALIS | HET. ABYSSALIS | 185 |
| HETERORHABDUS NORVEGICA | HET. NORVEGICA | 4084 |
| HETERORHABDUS PAPPILLIGER | HET. PAPPILLIGER | 4135 |
| HETERORHABDUS SPINIFROUS | HET. SPINIFROUS | 4024 |
| HETERORHABDUS SPP. | HETERORHABDUS | 158 |
| HOMARUS AMERICANUS | HOM. AMERICANUS | 3151 |
| HYALOCHAETE SPP. | HYALOCHAETE | 9015 |
| HYDROZOA | HYDROZOA | 2300 |
| HYPERIA GALBA | HYP. GALBA | 440 |
| HYPERIA MEDUSARUM | HYP. MEDUSARUM | 445 |
| HYPERIA MEDUSARUM HYSTRIX | HYP. MEDUSARUMHY | 444 |
| HYPERIA MEDUSARUM MEDUSARUM | HYP. MEDUSARUMME | 443 |
| HYPERIA SP. | HYPERIA | 4501 |
| HYPERIA SPP. | HYPERIA | 439 |
| HYPERIETTA VOSSELERI | HYP. VOSSELERI | 441 |
| HYPERIIDAE | HYPERIIDAE | 425 |
| HYPERIIDEA | HYPERIIDEA | 457 |
| HYPERIOIDES LONGIPES | HYP. LONGIPES | 453 |
| HYPEROCHE SP. | HYPEROCHE | 4502 |
| IDOTEA BALTICA | IDO. BALTICA | 2201 |
| IDOTEA METALLICA | IDO. METALLICA | 2203 |
| IDOTEA PHOSPHOREA | IDO. PHOSPHOREA | 2202 |
| INSECTA | INSECTA | 3801 |
| INVERTEBRATE | INVERTEBRATE | 2900 |
| ISOPODA | ISOPODA | 2200 |
| JASSA FALCATA | POD. FALCATUS | 8008 |
| KATODINIUM SPP. | KATODINIUM | 9060 |
| KROHNITTA SP. | KROHNITTA | 228 |
| KROHNITTA SPP. | KROHNITTA | 227 |
| KROHNITTA SUBTILIS | KRO. SUBTILIS | 214 |
| LABIDOCERA ACUTIFRONS | LAB. ACUTIFRONS | 160 |
| LABIDOCERA AESTIVA | LAB. AESTIVA | 159 |
| LABIDOCERA NERII | LAB. NERII | 4035 |
| LABIDOCERA SP. | LABIDOCERA | 4109 |
| LABIDOCERA SPP. | LABIDOCERA | 4025 |
| LAMELLIBRANCH | LAMELLIBRANCH | 1302 |
| LANCEOLA CLAUSI | LAN. CLAUSI | 404 |
| LANCEOLA FELINA | LAN. FELINA | 405 |
| LANCEOLA LOVENI | LAN. LOVENI | 402 |
| LANCEOLA PELAGICA | LAN. PELAGICA | 403 |
| LANCEOLA SPP. | LANCEOLA | 401 |
| LARVACEA | APPENDICULARIA | 8009 |
| LAUDERIA BOREALIS | LAU. BOREALIS | 9110 |
| LEPAS SPP. | LEPAS | 2102 |
| LEPTOCOTIS TENUIROSTRIS | LEP. TENUIROSTRI | 816 |
| LEPTOCYLINDRUS DANICUS | LEP. DANICUS | 9041 |
| LEPTOCYLINDRUS SPP. | LEPTOCYLINDRUS | 9058 |
| LESTRIGONUS BENGALENSIS | LES BENGALENSIS | 442 |
| LESTRIGONUS SP. | LESTRIGONUS | 446 |
| LIMACINA BULIMOIDES | SPI. BULIMOIDES | 8010 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKTAXN |
|---|---|---|
| LIMACINA HELICINA | SPI. HELICINA | 8011 |
| LIMACINA INFLATA | SPI. INFLATA | 8012 |
| LIMACINA RETROVERSA | SPI. RETROVERSA | 8013 |
| LIMACINA SP. | SPIRATELLA | 8014 |
| LIMACINA SPP. | SPIRATELLA | 8015 |
| LIMACINA TROCHIFORMES | SPI. TROCHIFORME | 8016 |
| LITHODIDAE | LITHODIDAE | 3205 |
| LOPHOTHRIX SPP. | LOPHOTHRIX | 4162 |
| LUBBOCKIA SP. | LUBBOCKIA | 4122 |
| LUBBOCKIA SQUILLIMANA | LUB. SQUILLIMANA | 4161 |
| LUCECUTIA SP. | LUCECUTIA | 4096 |
| LUCICUTIA FLAVICORNIS | LUC. FLAVICORNIS | 4073 |
| LUCICUTIA SPP. | LUCICUTIA | 4007 |
| LUCICUTIIDAE | LUCICUTIIDAE | 4078 |
| LUCIFER FAXONI | LUC. FAXONI | 561 |
| LUCIFER SP. | LUCIFER | 563 |
| LUCIFER SPP. | LUCIFER | 568 |
| LUCIFER TYPUS | LUC. TYPUS | 575 |
| LYCAEOPSIS EDWARDSII | LYC. EDWARDSII | 478 |
| LYCAEOPSIS THEMISTOIDES | LYC. THEMISTOIDE | 479 |
| LYCAEOPSIS ZAMBOANGAE | LYC. ZAMBOANGAE | 480 |
| LYCAE PULEX | LYC. PULEX | 497 |
| MACROCHEIRON SPP. | MACROCHEIRON | 4173 |
| MACROCHEIRON TUCIADUM | MAC. TUCIADUM | 4168 |
| MACROSETELLA GRACILIS | MAC. GRACILIS | 194 |
| MACROSETELLA SP. | MACROSETELLA | 4052 |
| MACRURA | ASTACIDEA | 8017 |
| MARGARITES SPP. | MARGARITES | 1101 |
| MECYNOCERA CLAUSI | MEC. CLAUSI | 146 |
| MECYNOCERA SP. | MECYNOCERA | 4123 |
| MEGACALANUS LONGICORNIS | MEG. LONGICORNIS | 195 |
| MEGACALANUS SPP. | MEGACALANUS | 4166 |
| MEGANYCTIPHANES NORVEGICA | MEG. NORVEGICA | 2002 |
| METRIDIA LONGA | MET. LONGA | 111 |
| METRIDIA LUCENS | MET. LUCENS | 105 |
| METRIDIA SP. | METRIDIA | 4053 |
| METRIDIA SPP. | METRIDIA | 149 |
| METRIDIDAE | METRIDIDAE | 196 |
| MICROCALANUS PUSILUS | MIC. PUSILUS | 150 |
| MICROCALANUS SP. | MICROCALANUS | 4125 |
| MICROSETELLA NORVEGICA | MIC. NORVEGICA | 147 |
| MICROSETELLA SPP. | MICROSETELLA | 170 |
| MOLLUSCA | MOLLUSCA | 4500 |
| MONOCULODESD EDWARDSII | MON. EDWARDSII | 893 |
| MONOCULODES SP. | MONOCULODES | 890 |
| MONOCULODES SPP. | MONOCULODES | 891 |
| MONOCULODES TENUROSTRATIS | MON. TENUROSTRAT | 889 |
| MONSTRILLOIDA SPP. | MONSTRILLOIDA | 137 |
| MURRAYELLA BICONICA | MUR. BICONICA | 9056 |
| MYSIDACEA | MYSIDACEA | 2800 |
| MYSIDOPSIS BIGELOWI | MYS. BIGELOWI | 2801 |
| MYSIS MIXTA | MYS. MIXTA | 2805 |
| NANNOCALANUS MINOR | NAN. MINOR | 8018 |
| NANNOCALANUS SPP. | NANNOCALANUS | 4138 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKT |
|---|---|---|
| NANOMIA CARA | NAN. CARA | 1801 |
| NANOMIA CARA | NAN. CARA | 1811 |
| NATANTIA | NATANTIA | 551 |
| NAVICULA SPP. | NAVICULA | 9024 |
| NEMATODA | NEMATODA | 4700 |
| NEMATOSCELIS MEGALOPS | NEM. MEGALOPS | 2019 |
| NEMATOSCELIS SPP. | NEMATOSCELIS | 2013 |
| NEOCALANUS GRACILIS | NEO. GRACILIS | 4087 |
| NEOCALANUS ROBUSTIOR | NEO. ROBUSTIOR | 4156 |
| NEOCALANUS SP. | NEOCALANUS | 4108 |
| NEOMYSIS BIGELOWI | NEO. BIGELOWI | 2804 |
| NEPHROPSIDEA | NEPHROPSIDEA | 3150 |
| NEPHTYS SPP. | NEPHTYS | 2503 |
| NITZSCHIA ANGULARIS | NIT. ANGULARIS | 9044 |
| NITZSCHIA CLOSTERIUM | NIT. CLOSTERIUM | 9023 |
| NITZSCHIA DELICATISSIMA | NIT. DELICATISSI | 9022 |
| NITZSCHIA SERIATA | NIT. SERIATA | 9021 |
| NITZSCHIA SPP. | NITZSCHIA | 9053 |
| NOEMYSIS AMERICANA | NOE. AMERICANA | 2802 |
| NUDIBRANCHIA | NUDIBRANCHIA | 370 |
| NYCTIPHANES COUCHII | NYC. COUCHII | 2011 |
| OCTOPODA | OCTOPODA | 3050 |
| OCULOSETELLA GRACILIS | OCU. GRACILIS | 4143 |
| OEDICEROTIDAE | OEDICEROTIDAE | 872 |
| OIKOPLEURA DIOICA | OIK. DIOICA | 702 |
| OIKOPLEURA LABRADORENSIS | OIK. LABRADORENS | 704 |
| OIKOPLEURA SP. | OIKOPLEURA | 703 |
| OIKOPLEURA SPP. | OIKOPLEURA | 701 |
| OITHONA HELGOLANDICA | OIT. HELGOLANDIC | 4032 |
| OITHONA LINEARIS | OIT. LINEARIS | 4054 |
| OITHONA OMILIO | OIT. OMILIO | 144 |
| OITHONA PLUMIFERA | OIT. PLUMIFERA | 122 |
| OITHONA SETIGERA | OIT. SETIGERA | 197 |
| OITHONA SIMILIS | OIT. SIMILIS | 106 |
| OITHONA SP. | OITHONA | 4055 |
| OITHONA SPINIROSTRIS | OIT. SPINIROSTRI | 114 |
| OITHONA SPP. | OITHONA | 138 |
| ONCAEA CONIFERA | ONC. CONIFERA | 4074 |
| ONCAEA MEDITERRANEA | ONC. MEDITERRANE | 4102 |
| ONCAEA MINUTA | ONC. MINUTA | 164 |
| ONCAEA SP. | ONCAEA | 4029 |
| ONCAEA SPP. | ONCAEA | 191 |
| ONCAEA VENUSTA | ONC. VENUSTA | 165 |
| OPHIURA SPP. | OPHIURA | 1551 |
| OPHIUROIDEA | OPHIUROIDEA | 1550 |
| ORNITHOCERCUS SPP. | ORNITHOCERCUS | 9105 |
| OSCILLATORIA SPP. | OSCILLATORIA | 9100 |
| OSTRACODA | OSTRACODA | 3600 |
| OVALIPES OCELLATUS | OVA. OCELLATUS | 1004 |
| OXYCEPHALUS CLAUSI | OXY. CLAUSI | 814 |
| OXYCEPHALUS PISCATOR | OXY. PISCATOR | 815 |
| OXYTOXUM PARVUM | OXY. PARVUM | 9081 |
| OXYTOXUM SCOLOPAX | OXY. SCOLOPAX | 9082 |
| OXYTOXUM SPP. | OXYTOXUM | 9061 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKT |
|---|---|---|
| PAEDOCLIONE DOLIIFORMIS | PAE. DOLIIFORMIS | 353 |
| PAGURIDAE | PAGURIDAE | 3201 |
| PAGURIDEA | PAGURIDEA | 3209 |
| PAGURUS BERNMARDUS | PAG. BERNMARDUS | 3202 |
| PAGURUS PUBESCENS | PAG. PUBESCENS | 3203 |
| PAGURUS SP. | PAGURUS | 3206 |
| PALAEMONETES VULGARIS | PAL. VULGARIS | 562 |
| PALAEMONIDAE | PALAEMONIDAE | 569 |
| PALINURUS VULGARIS | PAL. VULGARIS | 3152 |
| PANDALIDAE | PANDALIDAE | 558 |
| PANDALUS BOREALIS | PAN. BOREALIS | 566 |
| PARACALANUS ACULEATUS | PAR. ACULEATUS | 4119 |
| PARACALANUS AND CLAUSOCALANUS | PAR-CLAUSOCALAN | 4031 |
| PARACALANUS CRASSIROSTRUS | PAR. CRASSIROSTR | 4068 |
| PARACALANUS OR PSEUDOCALANUS | PAR-PSEUDOCALAN | 4127 |
| PARACALANUS PARVUS | PAR. PARVUS | 135 |
| PARACALANUS PYGMAEUS | PAR. PYGMAEUS | 4080 |
| PARACALANUS SP. | PARACALANUS | 4117 |
| PARACALANUS SPP. | PARACALANUS | 4118 |
| PARACALINIDAE | PARACALINIDAE | 198 |
| PARACANDACIA BISPINOSA | PAR. BISPINOSA | 4153 |
| PARAEUCHAETA NORVEGICA | EUC. NORVEGICA | 8019 |
| PARAEUCHAETA SPP. | PARAEUCHAETA | 4172 |
| PARALIA SULCATA | PAR. SULCATA | 9000 |
| PARALYCAEA GRACILIS | PAR. GRACILIS1 | 495 |
| PARALYCAEA SPP. | PARALYCAEA | 496 |
| PARAMETOPELLA CYPRIS | PAR. CYPRIS | 876 |
| PARAPAGURUS PILOSIMANUS | PAR. PILOSIMANUS | 3204 |
| PARAPHRONIMA CRASSIPES | PAR. CRASSIPES | 437 |
| PARAPHRONIMA GRACILIS | PAR. GRACILIS2 | 438 |
| PARAPRONONOE CRUSTULUM | PAR. CRUSTULUM | 486 |
| PARATHEMISTO ABYSSORUM | PAR. OBLIVIA | 8020 |
| PARATHEMISTO GAUDICHAUDII | PAR. GAUDICHAUDI | 450 |
| PARATHEMISTO GRACILIPES | PAR. GRACILIPES | 449 |
| PARATHEMISTO LIBELLULA | PAR. LIBELLULA | 4600 |
| PARATHEMISTO OBLIVIA | PAR. OBLIVIA | 4503 |
| PARATHEMISTO SP. | PARATHEMISTO | 849 |
| PARATHEMISTO SPP. | PARATHEMISTO | 451 |
| PARATYPHIS MACULATA | PAR. MACULATA | 843 |
| PASIPHAEA | PASIPHAEA | 565 |
| PELECYPODA | PELECYPODA | 1300 |
| PENAEIDEA | PENAEIDEA | 555 |
| PENILIA AVIROSTRIS | PEN. AVIROSTRIS | 611 |
| PENILIA SP. | PENILIA | 610 |
| PENILIA SPP. | PENILIA | 613 |
| PENTIDOTEA SP. | PENTIDOTEA | 2208 |
| PERIDINIUM CERASUS | PER. CERASUS | 9107 |
| PERIDINIUM DEPRESSUM | PER. DEPRESSUM | 9094 |
| PERIDINIUM SPP. | PERIDINIUM | 9035 |
| PESIPHAEIDAE | PESIPHAEIDAE | 574 |
| PETELOSARSIA DECELIVIS | PET. DECELIVIS | 1703 |
| PHAENNA SPINIFERA | PHA. SPINIFERA | 4151 |
| PHAENNIDAE | PHAENNIDAE | 4103 |
| PHAEOCEROS SPP. | PHAEOCEROS | 9016 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKT |
|---|---|---|
| PHAEOCYSTIS | PHAEOCYSTIS | 9026 |
| PHALACROMA SPP. | PHALACROMA | 9070 |
| PHORONIDA | PHORONIDA | 5100 |
| PHORONIS SPP. | PHORONIS | 5101 |
| PHOXOCEPHALUS HOLBOLLI | PHO. HOLBOLLI | 4400 |
| PHRONIMA ATLANTICA | PHR. ATLANTICA | 462 |
| PHRONIMA ATLANTICA SOLITARIA | PHR. ATLANTICASO | 466 |
| PHRONIMA COLLETTI | PHR. COLLETTI | 463 |
| PHRONIMA CURVIPES | PHR. CURVIPES | 465 |
| PHRONIMA PACIFICA | PHR. PACIFICA | 464 |
| PHRONIMA SEDENTARIA | PHR. SEDENTARIA | 461 |
| PHRONIMA SPP. | PHRONIMA | 460 |
| PHRONIMELLA ELONGATA | PHR. ELONGATA | 474 |
| PHRONIMIDAE | PHRONIMIDAE | 467 |
| PHRONIMOPSIS SARSI | PHR. SARSI | 455 |
| PHRONIMOPSIS SP. | PHRONIMOPSIS | 456 |
| PHRONIMPOSIS SPINIFERA | PHR. SPINIFERA | 454 |
| PHROSINA SEMILUNATA | PHR. SEMILUNATA | 475 |
| PHROSINIDAE | PHROSINIDAE | 473 |
| PHYTOPLANKTON | PHYTOPLANKTON | 9132 |
| PLATYHELMINTHES | PLATYHELMINTHES | 5000 |
| PLATYSCELUS SERRATULUS | PLA. SERRATULUS | 834 |
| PLATYSCELUS SPP. | PLATYSCELUS | 833 |
| PLEUROBRANCHIA PILEUS | PLE. PILEUS | 2701 |
| PLEUROMAMMA ABDOMINALIS | PLE. ABDOMINALIS | 4002 |
| PLEUROMAMMA BOREALIS | PLE. BOREALIS | 176 |
| PLEUROMAMMA BOREALIS OR PLEUROMAMMA GRACILIS | PLE. BOR-GRA | 4180 |
| PLEUROMAMMA GRACILIS | PLE. GRACILIS | 161 |
| PLEUROMAMMA PISEKI | PLE. PISEKI | 199 |
| PLEUROMAMMA ROBUSTA | PLE. ROBUSTA | 123 |
| PLEUROMAMMA SP. | PLEUROMAMMA | 4056 |
| PLEUROMAMMA SPP. | PLEUROMAMMA | 4057 |
| PLEUROMAMMA XIPHIAS | PLE. XIPHIAS | 124 |
| PLEUROSIGMA SPP. | PLEUROSIGMA | 9099 |
| PLEUSTES PANOPLUS | PLE. PANOPLUS | 877 |
| PLEUSYMTES GLABER | PLE. GLABER | 878 |
| PNEUMODERMOPSIS PAUCIDENS | PNE. PAUCIDENS | 355 |
| PNEUMODERMOPSIS SPP. | PNEUMODERMOPSIS | 352 |
| PODOCERIDAE | PODOCERIDAE | 880 |
| PODOCERUS FALCATUS | POD. FALCATUS | 881 |
| PODOLAMPUS SPINIFER | POD. SPINIFER | 9102 |
| PODON INTERMEDIUS | POD. INTERMEDIUS | 602 |
| PODON LEUCARTI | POD. LEUCARTI | 603 |
| PODON SP. | PODON | 609 |
| PODON SPP. | PODON | 601 |
| POLYCHAETA | POLYCHAETA | 2500 |
| PONTELLA MEADII | PON. MEADII | 155 |
| PONTELLA PENNATA | PON. PENNATA | 186 |
| PONTELLA SPP. | PONTELLA | 172 |
| PONTELLIDAE | PONTELLIDAE | 4055 |
| PONTELLINA PLUMATA | PON. PLUMATA | 4017 |
| PONTOGENEIA INERMIS | PON. INERMIS | 870 |
| PORCELLANIDAE | PORCELLANIDAE | 8211 |
| PORTUNUS SPP. | PORTUNUS | 1001 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKTAX |
|---|---|---|
| PRIMO MACROPA | PRI. MACROPA | 477 |
| PROROCENTRUM SPP. | PROROCENTRUM | 9040 |
| PROSOBRANCHIATA | PROSOBRANCHIATA | 1102 |
| PSEUDOAETIDEUS SPP. | PSEUDOAETIDEUS | 189 |
| PSEUDOCALANIDAE | PSEUDOCALANIDAE | 4013 |
| PSEUDOCALANUS MINOR | PSE. MINOR | 4001 |
| PSEUDOCALANUS MINUTUS | PSE. MINUTUS | 102 |
| PSEUDOCALANUS MINUTUS OR PARACALANUS PARVUS | PAR-PSE. PAR-MIN | 171 |
| PSEUDOCALANUS OR CALANUS | PSEUDOCALANUS | 4179 |
| PSEUDOCALANUS SPP. | PSEUDOCALANUS | 4128 |
| PSEUDODIAPTOMUS CORNATUS | PSE. CORNATUS | 152 |
| PSEUDODIAPTOMUS SPP. | PSEUDODIAPTOMUS | 4164 |
| PSEUDOLYCAE PACHYPODA | PSE. PACHYPODA | 498 |
| PTEROPODA , NAKED | GYMNOSOMATA | 8021 |
| PTEROPODA , SHELLED | THECOSOMATA | 8022 |
| PTEROSAGITTA DRACO | PTE. DRACO | 213 |
| PTEROSAGITTA SP. | PTEROSAGITTA | 219 |
| PTEROSAGITTA SPP. | PTEROSAGITTA | 221 |
| PYCNOGONIDA | PYCNOGONIDA | 2400 |
| RACHOTROPIS OCULATA | RAC. OCULATA | 879 |
| RADIOLARIA | RADIOLARIA | 3901 |
| REPTANTIA | REPTANTIA | 501 |
| RHABDOSOMA SPP. | RHABDOSOMA | 828 |
| RHABDOSOMA WHITEI | RHA. WHITEI | 829 |
| RHINCALANIDAE | RHINCALANIDAE | 4114 |
| RHINCALANUS CORNUTUS | RHI. CORNUTUS | 175 |
| RHINCALANUS NASUTUS | RHI. NASUTUS | 125 |
| RHINCALANUS SP. | RHINCALANUS | 4075 |
| RHINCALANUS SPP. | RHINCALANUS | 4100 |
| RHIZOSOLENIA ACUMINATA | RHI. ACUMINATA | 9075 |
| RHIZOSOLENIA ALATA ALATA | RHI. ALATAALATA | 9012 |
| RHIZOSOLENIA ALATA CURVIROSTRIS | RHI. ALATACURVIR | 9084 |
| RHIZOSOLENIA ALATA GRACILLIMA | RHI. ALATAGRACIL | 9065 |
| RHIZOSOLENIA ALATA INDICA | RHI. ALATAINDICA | 9011 |
| RHIZOSOLENIA ALATA INERMIS | RHI. ALATAINERMI | 9013 |
| RHIZOSOLENIA CALCAR-AVIS | RHI. CALCAR-AVIS | 9076 |
| RHIZOSOLENIA CYLINDRUS | RHI. CYLINDRUS | 9062 |
| RHIZOSOLENIA DELICATULA | RHI. DELICATULA | 9064 |
| RHIZOSOLENIA FRAGILISSIMA | RHI. FRAGILISSIM | 9127 |
| RHIZOSOLENIA HEBETATA SEMISPINA | RHI. HEBETATASEM | 9010 |
| RHIZOSOLENIA IMBRICATA | RHI. IMBRICATA | 9090 |
| RHIZOSOLENIA IMBRICATA SHROBSOLEI | RHI. IMBRICATASH | 9008 |
| RHIZOSOLENIA SETIGERA | RHI. SETIGERA | 9069 |
| RHIZOSOLENIA SPP. | RHIZOSOLENIA | 9043 |
| RHIZOSOLENIA STOLTERFOTHII | RHI. STOLTERFOTH | 9007 |
| RHIZOSOLENIA STYLIFORMIS | RHI. STYLIFORMIS | 9009 |
| RHOPALANEMA VELATUM | RHO. VELATUM | 1808 |
| ROSSIA TENERA | ROS. TENERA | 3003 |
| ROTIFERA | ROTIFERA | 951 |
| SAGITTA BIPUNCTATA | SAG. BIPUNCTATA | 236 |
| SAGITTA DECIPIENS | SAG. DECIPIENS | 207 |
| SAGITTA ELEGANS | SAG. ELEGANS | 202 |
| SAGITTA ENFLATA | SAG. ENFLATA | 203 |
| SAGITTA FEROX | SAG. FEROX | 223 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKT. |
|---|---|---|
| SAGITTA FRIDERICI | SAG. FRIDERICI | 216 |
| SAGITTA HELENAE | SAG. HELENAE | 231 |
| SAGITTA HEXAPTERA | SAG. HEXAPTERA | 204 |
| SAGITTA LYRA | SAG. LYRA | 205 |
| SAGITTA MAXIMA | SAG. MAXIMA | 222 |
| SAGITTA MINIMA | SAG. MINIMA | 206 |
| SAGITTA ROBUSTA | SAG. ROBUSTA | 217 |
| SAGITTA SERRATODENTATA | SAG. SERRATODENT | 201 |
| SAGITTA SERRATODENTATA OR SAGITTA TASMANICA | SAG. SER-TAS | 224 |
| SAGITTA SP. | SAGITTA | 220 |
| SAGITTA SPP. | SAGITTA | 218 |
| SAGITTA TASMANICA | SAG. TASMANICA | 215 |
| SAGITTA TENUIS | SAG. TENUIS | 225 |
| SAGITTA UNKNOWN #1 " NYOSL " | SAGITTA | 208 |
| SAGITTA UNKNOWN #2 " NYOSL " | SAGITTA | 209 |
| SAGITTA UNKNOWN #3 " NYOSL " | SAGITTA | 210 |
| SALPA FUSIFORMIS | SAL. FUSIFORMIS | 3406 |
| SALPA MAXIMA | SAL. MAXIMA | 3405 |
| SALPA SP. | SALPA | 3407 |
| SALPA SPP. | SALPA | 3408 |
| SALPIDAE | SALPIDAE | 3403 |
| SALPS | THALIACEA | 8023 |
| SAPHIRELLA SPP. | SAPHIRELLA | 184 |
| SAPHIRELLA TROPICA | SAP. TROPICA | 4137 |
| SAPPHIRINA SP. | SAPPHIRINA | 4028 |
| SAPPHIRINA SPP. | SAPPHIRINA | 181 |
| SAPPHIRINIDAE | SAPPHIRINIDAE | 4116 |
| SCAPHOCALANUS SPP. | SCAPHOCALANUS | 173 |
| SCHIZOSCELUS ORNATUS | SCH. ORNATUS | 836 |
| SCHRODERELLA DELICATULA | SCH. DELICATULA | 9116 |
| SCINA BOREALIS | SCI. BOREALIS | 413 |
| SCINA SP. | SCINA | 416 |
| SCINA SPP. | SCINA | 412 |
| SCINA STEBBINGI | SCI. STEBBINGI | 418 |
| SCINA TULBERGI | SCI. TULBERGI | 414 |
| SCLEROCRANGON BOREAS | SCL. BOREAS | 573 |
| SCOLECITHRICELLA MINOR | SCO. MINOR | 126 |
| SCOLECITHRICELLA SPP. | SCOLECITHRICELL | 4099 |
| SCOLECITHRICELLA VITTATA | SCO. VITTATA | 4167 |
| SCOLECITHRICIDAE | SCOLECITHRICIDA | 4066 |
| SCOLECITHRIX BRADYI | SCO. BRADYI | 4033 |
| SCOLECITHRIX DANAE | SCO. DANAE | 162 |
| SCOLECITHRIX SP. | SCOLECITHRIX | 4067 |
| SCOLECITHRIX SPP. | SCOLECITHRIX | 4115 |
| SCOLOCITHRICELLA SP. | SCOLOCITHRICELL | 4071 |
| SCOTTOCALANUS PERSECANS | SCO. PERSECANS | 174 |
| SCOTTOCALANUS SECURIFRONS | SCO. SECURIFRONS | 4159 |
| SCYLLARIDEA | SCYLLARIDEA | 3101 |
| SCYPHOZOA | SCYPHOZOA | 1200 |
| SEPIOLIDEA | SEPIOLIDEA | 3002 |
| SERGESTES SIMILIS | SER. SIMILIS | 560 |
| SERGESTES SPP. | SERGESTES | 559 |
| SERGESTIDAE | SERGESTIDAE | 570 |
| SILICOFLAGELLATAE | SILICOFLAGELLAT | 9037 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLKTA |
|---|---|---|
| SIMORHYNCHOTUS ANTENNARIUS | SIM. ANTENNARIUS | 813 |
| SIPHONOPHORA | SIPHONOPHORA | 1800 |
| SIPHONOPHORA BELLS | SIP. BELLS | 1802 |
| SIPHONOPHORA FLOATS | SIP. FLOATS | 1803 |
| SIPUNCULIDA | SIPUNCULIDA | 4504 |
| SKELETONEMA COSTATUM | SKE. COSTATUM | 9001 |
| SPIRATELLA BULIMOIDES | SPI. BULIMOIDES | 315 |
| SPIRATELLA HELICINA | SPI. HELICINA | 302 |
| SPIRATELLA INFLATA | SPI. INFLATA | 303 |
| SPIRATELLA RETROVERSA | SPI. RETROVERSA | 301 |
| SPIRATELLA SP. | SPIRATELLA | 318 |
| SPIRATELLA SPP. | SPIRATELLA | 305 |
| SPIRATELLA TROCHIFORMES | SPI. TROCHIFORME | 304 |
| SPIRONTOCARIS LILLJEBORGII | SPI. LILLJEBORGI | 571 |
| SPIRONTOCARIS SPINUS | SPI. SPINUS | 564 |
| STELLATE BODIES | STE. BODIES | 9999 |
| STENOTHOE MINUTA | STE. MINUTA | 894 |
| STENOTHOIDAE | STENOTHOIDAE | 898 |
| STEPHANOPYXIS SPP. | STEPHANOPYXIS | 9135 |
| STOMATOPODA | STOMATOPODA | 3700 |
| STREETSIA CHALLENGERI | STR. CHALLENGERI | 818 |
| STREETSIA MINDANAONIS | STR. MINDANAONIS | 821 |
| STREETSIA PORCELLA | STR. PORCELLA | 817 |
| STREETSIA STEENSTRUPI | STR. STEENSTRUPI | 819 |
| STYLIOLA SUBULA | STY. SUBULA | 314 |
| STYLOCHEIRON ELONGATUM | STY. ELONGATUM | 2017 |
| STYLOCHEIRON LONGICORNE | STY. LONGICORNE | 2014 |
| STYLOCHEIRON ROBUSTUM | STY. ROBUSTUM | 2016 |
| STYLOCHEIRON SPP. | STYLOCHEIRON | 2015 |
| SUCTORIA | SUCTORIA | 3903 |
| SYMPRONOE PARVA | SYM. PARVA | 455 |
| TEMORA LONGICORNIS | TEM. LONGICORNIS | 104 |
| TEMORA SP. | TEMORA | 4097 |
| TEMORA SPP. | TEMORA | 4059 |
| TEMORA STYLIFERA | TEM. STYLIFERA | 153 |
| TEMORA TURBINATA | TEM. TURBINATA | 4094 |
| TETRATHYRUS FORCIPATUS | TET. FORCIPATUS | 842 |
| THALASSINIDEA | THALASSINIDEA | 502 |
| THALASSIONEMA NITZSCHIOIDES | THA. NITZSCHIOID | 9020 |
| THALASSIONEMA SPP. | THALASSIONEMA | 9054 |
| THALASSIOSIRA SPP. | THALASSIOSIRA | 9002 |
| THALASSIOTHRIX FRAUENFELDII | THA. FRAUENFELDI | 9070 |
| THALASSIOTHRIX LONGISSIMA | THA. LONGISSIMA | 9019 |
| THALASSIOTHRIX SPP. | THALASSIOTHRIX | 9057 |
| THALIACEA | THALIACEA | 3400 |
| THALIA DEMOCRATICA | THA. DEMOCRATICA | 3404 |
| THECOSOMATA | THECOSOMATA | 300 |
| THECOSOMATA UNKNOWN #1 " AEG " | THE. AEG1 | 319 |
| THEMISTELLA STEENSTRUPI | THE. STEENSTRUPI | 452 |
| THYROPUS EDWARDSI | THY. EDWARDSI | 831 |
| THYROPUS SIMILIS | THY. SIMILIS | 835 |
| THYROPUS SPP. | THYROPUS | 830 |
| THYROPUS TYPHOIDES | THY. TYPHOIDES | 832 |
| THYSANOESSA GREGARIA | THY. GREGARIA | 2012 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLK |
|---|---|---|
| THYSANOESSA INERMIS | THY. INERMIS | 200 |
| THYSANOESSA LONGICAUDATA | THY. LONGICAUDAT | 200 |
| THYSANOESSA RASCHII | THY. RASCHII | 200 |
| THYSANOESSA SP. | THYSANOESSA | 202 |
| THYSANOESSA SPP. | THYSANOESSA | 202 |
| THYSANOPODA ACUTIFRONS | THY. ACUTIFRONS | 201 |
| THYSANOPODA AEQUALIS | THY. AEQUALIS | 201 |
| TINTINNIDAE | TINTINNIDAE | 390 |
| TIRON ACANTHURUS | TIR. ACANTHURUS | 440 |
| TOMOPTERIDAE | TOMOPTERIDAE | 250 |
| TOMOPTERIS HELGOLANDICA | TOM. HELGOLANDIC | 250 |
| TOMOPTERIS SP. | TOMOPTERIS | 50 |
| TOMOPTERIS SPP. | TOMOPTERIS | 250 |
| TORTANUS DISCAUDATUS | TOR. DISCAUDATUS | 10 |
| TORTANUS SP. | TORTANUS | 410 |
| TORTANUS SPP. | TORTANUS | 400 |
| TRICHODESMIUM SPP. | TRICHODESMIUM | 910 |
| TRICHOPHOXUS EPISTOMUS | TRI. EPISTOMUS | 440 |
| TRYPHANA MALMI | TRY. MALMI | 81 |
| UAETIDEUS GIESBRECHTI | UAE. GIESBRECHTI | 16 |
| ULOTHRIX SPP. | ULOTHRIX | 905 |
| UNCIOLA IRRORATA | UNC. IRRORATA | 89 |
| UNDEUCHAETA MAJOR | UND. MAJOR | 400 |
| UNDEUCHAETA MINOR | UND. MINOR | 418 |
| UNDEUCHAETA PLUMOSA | UND. PLUMOSA | 408 |
| UNDEUCHAETA SPP. | UNDEUCHAETA | 412 |
| UNDINOPSIS BRADYI | UND. BRADYI | 18 |
| UNDINOPSIS SIMILIS | UND. SIMILIS | 11 |
| UNDINOPSIS SPP. | UNDINOPSIS | 400 |
| UNDINULA SP. | UNDINULA | 401 |
| UNDINULA VULGARIS | UND. VULGARIS | 401 |
| UNIDENTIFIED ZOOPLANKTON AND FRAGMENTS | ZOO. UNKNOWN | |
| UROCORYCAEUS LAUTUS | URO. LAUTUS | 414 |
| VIBILIA ARMATA | VIB. ARMATA | 43 |
| VIBILIA AUSTRALIS | VIB. AUSTRALIS | 43 |
| VIBILIA GRACILIS | VIB. GRACILIS | 43 |
| VIBILIA JEANGERARDI | VIB. JEANGERARDI | 43 |
| VIBILIA LONGIPES | VIB. LONGIPES | 43 |
| VIBILIA SP. | VIBILIA | 43 |
| VIBILIA SPP. | VIBILIA | 43 |
| VIBILIA VIATRIX | VIB. VIATRIX | 43 |
| VIBILLIDAE | VIBILLIDAE | 43 |
| XANTHOCALANUS SPP. | XANTHOCALANUS | 14 |
| ZAUS GOODSIRI | ZAU. GOODSIRI | 403 |
| ZAUS SP. | ZAUS | 401 |
| ZOOTHAMNIUM PELAGICUM | ZOO. PELAGICUM | 390 |

PLANKTON TAXONOMIC DATA BASE

| TAXNAM | PLKTAXNAM | PLK |
|---|---|---|
| THYSANOESSA INERMIS | THY. INERMIS | 200 |
| THYSANOESSA LONGICAUDATA | THY. LONGICAUDAT | 200 |
| THYSANOESSA RASCHII | THY. RASCHII | 200 |
| THYSANOESSA SP. | THYSANOESSA | 202 |
| THYSANOESSA SPP. | THYSANOESSA | 202 |
| THYSANOPODA ACUTIFRONS | THY. ACUTIFRONS | 202 |
| THYSANOPODA AEQUALIS | THY. AEQUALIS | 201 |
| TINTINNIDAE | TINTINNIDAE | 390 |
| TIRON ACANTHURUS | TIR. ACANTHURUS | 440 |
| TOMOPTERIDAE | TOMOPTERIDAE | 250 |
| TOMOPTERIS HELGOLANDICA | TOM. HELGOLANDIC | 250 |
| TOMOPTERIS SP. | TOMOPTERIS | 50 |
| TOMOPTERIS SPP. | TOMOPTERIS | 250 |
| TORTANUS DISCAUDATUS | TOR. DISCAUDATUS | 10 |
| TORTANUS SP. | TORTANUS | 410 |
| TORTANUS SPP. | TORTANUS | 400 |
| TRICHODESMIUM SPP. | TRICHODESMIUM | 910 |
| TRICHOPHOXUS EPISTOMUS | TRI. EPISTOMUS | 440 |
| TRYPHANA MALMI | TRY. MALMI | 81 |
| UAETIDEUS GIESBRECHTI | UAE. GIESBRECHTI | 18 |
| ULOTHRIX SPP. | ULOTHRIX | 905 |
| UNCIOLA IRRORATA | UNC. IRRORATA | 89 |
| UNDEUCHAETA MAJOR | UND. MAJOR | 400 |
| UNDEUCHAETA MINOR | UND. MINOR | 418 |
| UNDEUCHAETA PLUMOSA | UND. PLUMOSA | 408 |
| UNDEUCHAETA SPP. | UNDEUCHAETA | 412 |
| UNDINOPSIS BRADYI | UND. BRADYI | 18 |
| UNDINOPSIS SIMILIS | UND. SIMILIS | 11 |
| UNDINOPSIS SPP. | UNDINOPSIS | 400 |
| UNDINULA SP. | UNDINULA | 401 |
| UNDINULA VULGARIS | UND. VULGARIS | 401 |
| UNIDENTIFIED ZOOPLANKTON AND FRAGMENTS | ZOO. UNKNOWN | |
| UROCORYCAEUS LAUTUS | URO. LAUTUS | 414 |
| VIBILIA ARMATA | VIB. ARMATA | 43 |
| VIBILIA AUSTRALIS | VIB. AUSTRALIS | 43 |
| VIBILIA GRACILIS | VIB. GRACILIS | 43 |
| VIBILIA JEANGERARDI | VIB. JEANGERARDI | 43 |
| VIBILIA LONGIPES | VIB. LONGIPES | 43 |
| VIBILIA SP. | VIBILIA | 43 |
| VIBILIA SPP. | VIBILIA | 43 |
| VIBILIA VIATRIX | VIB. VIATRIX | 43 |
| VIBILLIDAE | VIBILLIDAE | 43 |
| XANTHOCALANUS SPP. | XANTHOCALANUS | 14 |
| ZAUS GOODSIRI | ZAU. GOODSIRI | 403 |
| ZAUS SP. | ZAUS | 401 |
| ZOOTHAMNIUM PELAGICUM | ZOO. PELAGICUM | 390 |