

FIVE COLLECTIONS OF CUMACEA FROM THE ALASKAN ARCTIC

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Introduction

THE CUMACEA examined for this report were recovered from bottom and plankton samples taken by several United States scientific parties operating in northern Alaska, the Polar Basin, the Chukchi Sea and the Bering Sea as far south as Unimak Island in the Aleutians. Some of the other crustaceans from those collections have already been examined and documented by MacGinitie (1955), Shoemaker (1955), Barnard (1959) and Menzies and Mohr (1962), but the only recent account of the Cumacea has been that by MacGinitie (1955), who collected specimens from the Point Barrow region.

Except for the single specimen collected at T-3 (see Mohr 1959) and those mentioned by MacGinitie, the cumacean crustaceans collected by recent United States arctic operations will be reported on here for the first time. Despite this, most of the species recovered were not new to science, but had been previously described by biologists from the United States and other countries.

The purpose of this study is to add to the knowledge of the cumacean fauna of the north polar area by presenting new collection data and, in some cases, to extend the known geographic ranges of well-known species. Detailed environmental data is lacking in some instances, as physical analyses were not always performed on the sediments and waters from the specific collection sites. The available physical and geographic information is given, but in many cases it is limited to a general description of the region sampled. Each collecting operation is described briefly, including techniques of sampling and preservation. Detailed morphologic and taxonomic information on the species listed is found in a separate systematic section of this report.

The following recent United States collecting operations are included:

- Point Barrow, Alaska (MacGinitie 1948-1950)
- Fletcher's Ice Island, T-3 (Horvath 1952-1955)
- Cruise of the *Hugh M. Smith* (Tibbs 1960)
- Cruise of the U.S.C. & G.S. *LCM Red* (1953)
- Cruises of the *LCM William E. Ripley* (1954).

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Point Barrow, Alaska (MacGinitie 1948-1950)

The samples taken by Prof. MacGinitie at Point Barrow during the years 1948, 1949 and 1950 are the most completely documented of any reported on in this paper. Cumaceans were found in 18 of his 62 dredging stations (Fig. 1), as well as from a plankton tow and some accumulations of material washed ashore in the surf. Collection methods, daily water temperature, bottom types and other pertinent ecologic and physical data from these stations are detailed in his 1955 report.

The specimens were initially identified by Dr. Howard Feder (see MacGinitie 1955), and there are instances where his identification to genus or species was tentative, possibly due to the lack of adequate reference material for confirmation. Dr. Feder has lent me the collection for further study in the hope that some of the difficulties could be resolved through comparative study with specimens and references available to me through the Allan Hancock Foundation of the University of Southern California. In some instances this has been wholly or partly accomplished, but there still remain identifications which I, too, prefer to leave tentative.

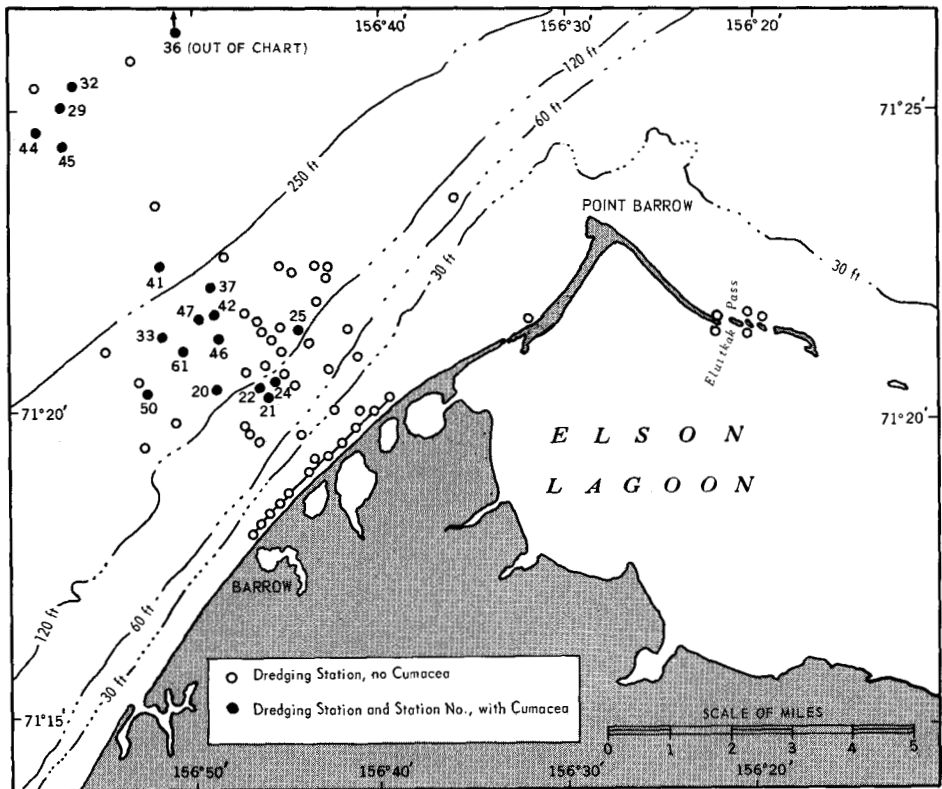


Fig. 1. Map of Point Barrow (adapted from MacGinitie 1955 Fig. 1), showing dredging stations containing Cumacea.

The Cumacea recovered from each station are listed below according to MacGinitie's station number. More detailed taxonomic discussion of the various species is in a separate systematic section.

- Sta. 20: 9 Sept. 1948 — 125 ft. *Cumella carinata*: 1 mutilated specimen.
 Sta. 21: 15 Sept. 1948 — 110 ft. *Cumella carinata*: 1 mutilated specimen.
 Sta. 22: 15 Sept. 1948 — 120 ft. *Cumella carinata*: 1 mutilated specimen.
 Sta. 24: 16 Sept. 1948 — 110 ft. *Diastylis dalli*: 1 ovigerous female, 21 mm.
 Sta. 25: 8 Aug. 1949 — 120 ft. *Diastylis dalli*: 1 female (mutilated), about 24 mm. *Diastylis bidentata*: 1 adult female, 9.7 mm.
 Sta. 29: 17 Aug. 1949 — 438 ft. *Diastylis dalli*: 2 females, 28.5 mm. and 26.5 mm. 1 male, 23.8 mm. *Cumella carinata*: 1 female, 4.0 mm.
 Sta. 32: 17 Aug. 1949 — 741 ft. (in a canyon). *Cumella carinata*: 22 specimens, including 15 juvenile and sub-adult females; 1 adult female, 2.0 mm., 1 adult male, 3.6 mm.; and 5 specimens of undetermined sex. *Diastylis dalli*: 1 female, 6.0 mm. *Brachydiastylis resima*: 10 adult females, 4 immature females, 1 immature male. *Leptostylis* (nr. *longimana*): 1 female, 7.1 mm.
 Sta. 33: 30 Aug. 1949 — 184 ft. *Diastylis dalli*: 1 female (mutilated).
 Sta. 36: 6 Sept. 1949 — 477 ft. *Brachydiastylis resima*: 1 male, 6.0 mm.
 Sta. 37: 6 Sept. 1949 — 217 ft. *Cumella carinata*: 1 female, 2.4 mm.; 1 male, 4.0 mm.
 Sta. 41: 6 Oct. 1949 — 295 ft. *Diastylis bidentata*: 1 female, 8.0 mm. *Cumella carinata*: 1 immature female, 2.5 mm.
 Sta. 42: 6 Oct. 1949 — 216 ft. *Leucon nasica*: 1 ovigerous female, 3.7 mm. *Cumella carinata*: 1 female, 4.1 mm. *Brachydiastylis resima*: 1 female, 5.0 mm. *Diastylis bidentata*: 1 female, 7.5 mm.
 Sta. 44: 11 Oct. 1949 — 453 ft. *Cumella carinata*: 6 adults, both sexes, up to 4.3 mm., 11 juveniles.
 Sta. 45: 11 Oct. 1949 — 341 ft. *Cumella carinata*: 1 specimen, sex undetermined, 2.3 mm.
 Sta. 46: 14 Oct. 1949 — 152 ft. *Diastylis bidentata*: 1 female, 8.0 mm.
 Sta. 47: 14 Oct. 1949 — 175 ft. *Petalosarsia declivis*: 1 ovigerous female, 3.4 mm. *Eudorellopsis derzhavini*: 1 juvenile, 2.8 mm. *Diastylis dalli*: 1 female, 19.5 mm.
 Sta. 50: 18 Feb. 1950 — 162 ft. *Leucon nasica*: 1 female, 3.0 mm. (Note: At this station holes were made in the ice and the dredge hauled by dog team).
 Sta. 61: 5 Aug. 1950 — 204 ft. *Diastylis bidentata*: 1 female, 13 mm.
 PBA base (Point Barrow, Alaska): 25 Aug. 1949. Found in debris on beach. *Diastylis* sp.: 1 female, 25 mm. (mutilated).
 PBA base. Plankton haul from churning surf, along shore, evening: 1 Sept. 1949. *Diastylis* (nr. *laevis*): 9 adult males, lengths to 10.8 mm.
 Elson Lagoon: in debris on shore — 20 Sept. 1949. *Diastylis* (nr. *laevis*): 1 adult male.
 PBA base: 22 Sept. 1949. *Diastylis* (nr. *laevis*): 4 adult males, lengths to 9.5 mm.
 PBA base: 24 Sept. 1949. *Diastylis* (nr. *laevis*): 1 male, washed ashore.

Fletcher's Ice Island, T-3 (Horvath 1952-1955)

In 1952 the activities of Fletcher's Ice Island, T-3, were under the direction of the Alaskan Air Command. At this time it was decided that valuable information could be obtained by carrying out biological sampling as the drift station moved along its track. Mr. Charles Horvath of the University of Southern California was principal field biologist; Dr. John L. Mohr, also of that university, was responsible faculty member. Mr. Horvath occupied the drift station for a total of 14 months from 1952 to 1955, on three separate tours of duty. Except for the periods 6 to 19 March and 17 September to 23 October, he was there for all parts of a composite year.

After the loss of some essential collecting gear Mr. Horvath used a garbage (General Issue) can weighted to tip as a scoop; this he called a *G.I. dredge*. The disadvantages of this device were that it could be used only on soft bottoms and in relatively shallow water, and that the samples were not quantitative and were obviously subjected to much churning. However, large samples were taken.

During the tour of duty from 25 April to 16 September 1955, one cumacean was recovered, the only one in the collection:

Fletcher's Ice Island, T-3; Station 83: 19 July 1955 — $82^{\circ}49'N$, $93^{\circ}20'W$ — depth unknown — G.I. dredge haul — (no additional information is available on this station). *Diastylis* (nr. *aspera*): 1 specimen. (See: systematic section of this report for more detailed description.

Mohr (1959) states: "Order Cumacea: There is one cumacean, still unidentified, in the T-3 collection. The FRAM took none. NP 2 as reported by Lomakina (Somov, 1955) took one female *Diastylis rathkei sarsi* Norman at $78^{\circ}23'N$ on 11 July, 1950." (The FRAM is a drift station documented by Nansen in 1900-1906; NP 2 is the Russian drift station of 1950-1951.) Work done in later years on T-3 yielded no cumaceans.

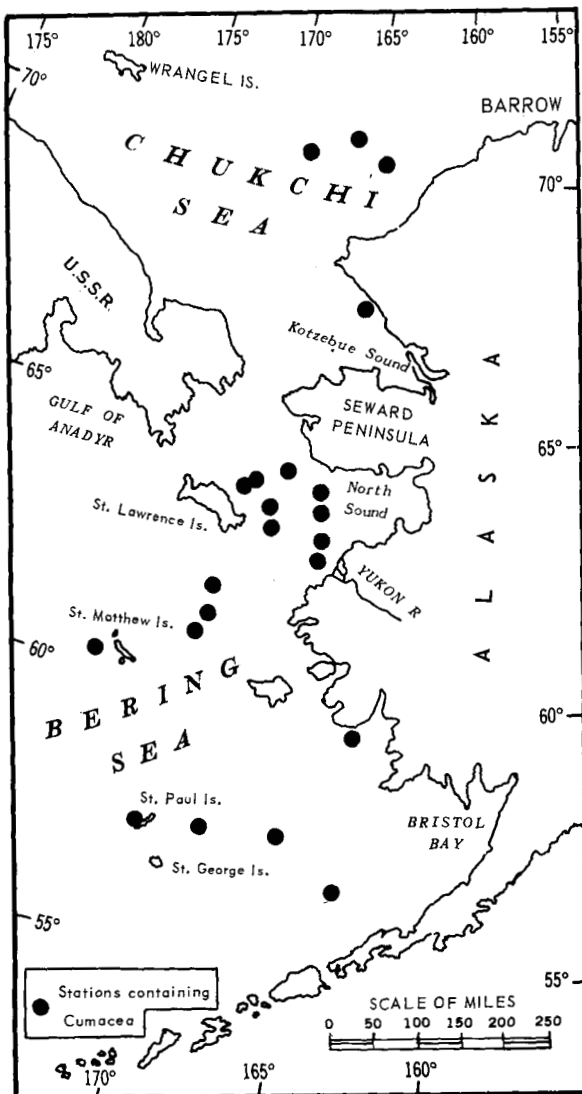


Fig. 2. Area of the 1960 cruise of the *Hugh M. Smith*, showing locations of stations from which Cumacea were recovered.

Cruise of the *Hugh M. Smith* (Tibbs 1960)

During the months of July and August, 1960, the R/V *Hugh M. Smith* was taken into the Bering and Chukchi seas by members of the United States Naval Electronics Laboratory (USNEL), Point Loma, California. Mr. John Tibbs of the University of Southern California, who accompanied the cruise as marine biologist, made collections with plankton net, snapper sampler and Hayward orange-peel grab, and processed material obtained by SCUBA divers at various locations (Fig. 2). Owing to the differences in sampling conditions and types of gear used, no attempt was made to measure the sample volumes or in any way quantify the recovered material. The preservation techniques used by Mr. Tibbs were most excellent, and as a result there were only one or two cases of specimen mutilation. Prompt removal of the animals from formalin into alcohol assured retention of carapace sculpturing and other taxonomically important features.

There were approximately 60 biological stations occupied on the cruise, 23 of which contained cumaceans. The station numbers used here are those established by Tibbs for the biological sampling and do not coincide with those used by the USNEL for their oceanographic work. The sediment analyses were made on bottom material from the general area in which the biological sample was taken, and not from the actual samples. The results of these analyses were made available by Dr. Edwin Hamilton of the USNEL.

The collection data includes: station number (of Tibbs), date, time, position, water depth in feet and gear used to obtain the biological sample. The sediment type and average grain size (MD or Median Diameter expressed in millimeters) will characterize the bottom in the sampling area. The Cumacea recovered are listed with numbers of specimens and their sexes; more detailed taxonomic discussions of the various species appear in the systematic section.

HMS-5: 12 July 1960 — 1400-1700 hrs. — 56°54'N, 163°45'W — 220 ft. (snapper). Bottom: silty sand; MD 0.058. *Eudorellopsis integra*: 1 female, 1 juvenile male.

HMS-7: 13 July 1960 — 1000 hrs. — 57°52'N, 165°12'W — 0-6 ft. (plankton); 144 ft. (snapper). Bottom: very fine sand; no MD available. *Eudorellopsis derzhavini*: 1 juvenile male.

HMS-17: 16 July 1960 — 1430 hrs. — 59°17'N, 163°28'W — 36 ft. (snapper); shallow (plankton). Temperature isothermal due to rough seas; water murky, turbulent. Bottom: very fine sand; no MD available. 2 specimens, very immature. No distinguishing features developed yet. Telson indicates possible affinity with *Lamprops* or *Hemilamprops*.

HMS-21: 18 July 1960 — 0400 hrs. — 57°39'N, 168°37.5'W — 222 ft. (snapper). Bottom: shelly silty sand; MD 0.058. *Eudorella* sp.: 4 females. *Eudorellopsis derzhavini*: 1 juvenile male.

HMS-22: 18 July 1960 — 2215 hrs., anchored at St. Paul Island, Village Cove, 57°07.7'N, 170°18.7'W (night plankton haul, 0-60 ft. *Lamprops fuscata*: approx. 800 males, 11 adult females. *Lamprops carinata*: 2 adult males. *Lamprops fasciata*: 1 adult male.

HMS-23: 19 July 1960 — 0600-0700 hrs. — same location as HMS-22 — (morning plankton haul, 0-6 ft., especially at 3 and 6 ft.); bottom sample at 60 ft. Bottom: fine sand; MD 0.134. (Cumacea was the dominant animal group at this station). *Lamprops fuscata*: 340 specimens, both sexes, including many adult males and ovigerous females. *Lamprops quadriplicata*: 12 females, some ovigerous; 6 adult males. *Diastylis bidentata*: 2 adult females, 14 immature specimens.

HMS-29: 22 July 1960 — 1230 hrs. — 60°13.5'N, 174°13.5'W — 300 ft. (orange-peel grab and snapper samples). Bottom: pebbles and medium silt; MD 0.009. *Eudorella* sp.: 1 large female.

HMS-33: 24 July 1960 — 0015 hrs. — 60°55'N, 169°53'W — 144 ft. (snapper). Bottom: coarse silt; MD 0.047. *Eudorella* sp.: 1 juvenile male.

HMS-34: 24 July 1960 — 0830 hrs. — 61°10'N, 168°52'W — 108 ft. (snapper). Bottom: very fine sand; MD 0.101. *Eudorellopsis derzhavini*: 3 males, 1 female. *Eudorella* sp.: 1 adult male.

HMS-35: 24 July 1960 — 1600-1715 hrs. — 61°43.5'N, 168°31'W — 0-6 ft. (plankton); 114 ft. (snapper). Bottom: shelly sandy silt; MD 0.058. *Leucon nasica* — 1 adult male, 1 juvenile male, 4 adult females, 1 immature specimen.

HMS-40: 26 July 1960 — 0800 hrs. — 64°02.8'N, 167°22.5'W — 96 ft. (large snapper sample). Bottom: fine sand; MD 0.165. *Eudorella* sp.: 4 juvenile males, 1 adult female.

HMS-41: 26 July 1960 — 1230 hrs. — 64°00'N, 168°00'W — 108 ft. (snapper). Bottom: silty sand; MD 0.125. *Leucon nasicooides*: 1 juvenile male.

HMS-43: 27 July 1960 — 2000 hrs. — 63°08'N, 167°11'W (Yukon Delta) — 120 ft. (snapper). Bottom: fine sand; MD 0.165. *Eudorellopsis derzhavini*: 1 juvenile male, 1 immature specimen. *Eudorella* sp.: 1 immature specimen. *Diastylis sulcata stuxbergi*: 6 specimens, all immature.

HMS-46: 28 July 1960 — 0240 hrs. — 62°45'N, 165°22'W — 48 ft. (snapper). Bottom: medium silt; MD 0.017. *Diastylis sulcata stuxbergi*: 1 adult female, 1 juvenile female, 2 immature specimens. *Leucon nasicooides*: 1 juvenile male.

HMS-47: 28 July 1960 — 0719 hrs. — 63°05.5'N, 165°12'W — 42 ft. (snapper). Bottom: medium silt; MD 0.031. *Diastylis sulcata stuxbergi*: 3 adult females, 8 juvenile males.

HMS-48: 28 July 1960 — 1126 hrs. — 63°22.5'N, 165°07'W — 40 ft. (snapper). Bottom: coarse silt; MD 0.039. *Diastylis sulcata stuxbergi*: 5 immature specimens. *Leucon nasicooides*: 1 juvenile male. *Leucon* sp.: 5 specimens, probably juvenile males. Undetermined: 1 specimen, mutilated beyond recognition.

HMS-49: 28 July 1960 — 1610 hrs. — 63°37'N, 165°15'W — 75 ft. (snapper sample, plankton haul, SCUBA collection). Bottom: coarse silt; MD 0.034. *Leucon fulvus*: 1 ovigerous female. *Leucon profundus*: 1 ovigerous female. *Leucon* sp.: 6 specimens. *Leucon* sp.: 1 specimen.

HMS-50: 28 July 1960 — 2200 hrs. — 63°52.4'N, 165°15.3'W — depth unknown (snapper). Bottom: coarse silt; MD 0.051. *Leucon nasica*: 1 female, 1 juvenile male. *Leucon* sp.: 1 juvenile male, 2 juvenile females. *Diastylis sulcata stuxbergi*: 1 adult female, 1 immature specimen. *Diastylis alaskensis*: 1 adult male, 1 adult female. *Eudorellopsis integra*: 1 adult male.

HMS-52: 28 July 1960 — 1820 hrs. — 64°00'N, 167°00'W — 107 ft. (snapper). Bottom: silty sand; MD 0.117. *Eudorella* sp.: 1 adult male.

HMS-57: 31 July 1960 — 1433-1650 hrs. — 67°43.3'N, 164°55'W — 90 ft. (SCUBA station, also large orange-peel grab sample). Bottom: silty sand, gravel, cobbles; MD 0.058. *Leucon* sp.: 1 juvenile male.

HMS-58: 1 Aug. 1960 — 2300 hrs. — 70°02'N, 168°44'W — 150 ft. (snapper). Bottom: sandy silt, gravel; MD 0.014. *Brachydiastylis resima*: 1 ovigerous female. *Diastylis sulcata stuxbergi*: 1 immature specimen.

HMS-59: 2 Aug. 1960 — 0900 hrs. — 70°21'N, 166°22'W — 140 ft. (snapper). Bottom: silty sand; MD 0.060. *Leucon nasicooides*: 5 juvenile females, 7 juvenile males. *Eudorella* sp.: 2 adult females.

HMS-60: 2 Aug. 1960 — 1630-1800 hrs. — 70°07.5'N, 164°48.5'W — 120 ft. (plankton haul and snapper). Bottom: silty sand; MD 0.069. *Brachydiastylis resima*: 7 immature specimens. *Eudorella* sp.: 6 specimens. *Eudorellopsis integra*: 1 juvenile male, 1 juvenile female. *Leucon nasica*: 1 juvenile male.

Cruise of the U.S.C. & G.S. LCM *Red* (Wilimovsky 1953)

From 9 to 12 August 1953 the United States Coast and Geodetic Survey LCM *Red* made a routine resupply and beacon-checking cruise in the Beaufort Sea from Barter Island, Alaska to Point Barrow, Alaska. Through the courtesy of the U.S.C. & G.S. (Cdr. Max G. Ricketts), N. J. Wilimovsky and Adair Fehlman (ichthyologists) and Charles Horvath (invertebrate zoologist) were invited to accompany the cruise and make hydrographic and biological observations. Eighteen stations were occupied during the cruise, and the Cumacea listed below were recovered from bottom samples at 3 of them (see Fig. 3). The benthic sampling was done by dredge and a small beam trawl with plankton and hydrographic samples taken concurrently.

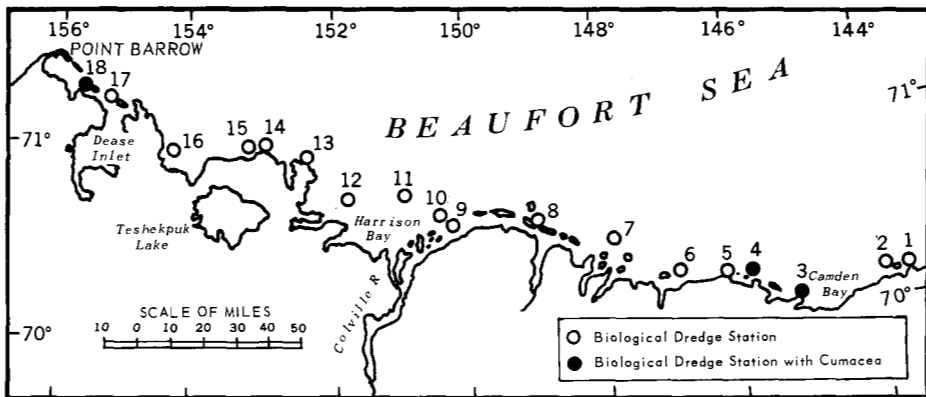


Fig. 3. Map of biological stations occupied by the U.S.C.&G.S. LCM Red, August, 1963, showing locations of the 18 stations and noting those which contained Cumacea. (Adapted from Mohr *et al* 1957, Fig. 1).

A report of the cruise was submitted by Wilimovsky (1953). As the entire crew of the vessel took part in the occupation of the stations, the principal investigator requested that the collector be referred to impersonally as LCM Red.

LCM Red-3: 9 Aug. 1953 — 2155 hrs. — off Kangigivik Point, Alaska, 70°13'N, 145°14'W — 24 ft. Bottom: sand. *Diastylis sulcata* (*typica*): 1 adult male. *Diastylis rathkei* (?): 1 adult female, 1 juvenile male.

LCM Red-4: 10 Aug. 1953 — 0000 hrs. — off Brownlow Point, 70°12'N, 145°55'W — 42 ft. Bottom: sand. *Diastylis rathkei* (?): 1 specimen, mutilated, appears to be the remains of a female. (See LCM Red-3).

LCM Red-18: 12 Aug. 1953 — 1745 hrs. — Elson Lagoon southwest of Cooper Island, 71°13'N, 155°48'W — 12 ft. Bottom: sand, clay. *Diastylis sulcata stuxbergi*: 9 juvenile females, 1 juvenile male, 2 casts. *Diastylis* sp. (*nr. laevis*): 1 adult male.

Cruises of the LCM *William E. Ripley* (Wilimovsky 1954)

In the summer of 1953 one of a group of surplus LCM's taken over by the Arctic Research Laboratory was modified for marine scientific work. It was named for Mr. William E. Ripley of the California Department of Fish and Game who, in lending an 8-foot beam trawl greatly increased the effectiveness of bottom sampling. Eight cruises were made with this vessel in 1954, for benthic and hydrographic study. Bottom samples were taken with dredges, and Cumacea were recovered from 4 samples on 2 of the 8 cruises (See Fig. 4).

A number of biologists used the "William E. Ripley" and the LCM "Goldie" (modified by the U.S.C. & G.S. as a tender) on an expedition between the Arctic Research Laboratory at Point Barrow and Kuk Inlet, west of Wainwright. The invertebrate zoologists were Drs. John L. Mohr and Emery F. Swan, and Mr. Charles Horvath.

Station data for these 8 cruises of the *William E. Ripley* were compiled by Wilimovsky (1954). In enumerating below the 4 stations containing Cumacea roman numerals denote the cruise number and arabic the station number on that cruise.

LCM *William E. Ripley* II-5: 6 Aug. 1954—1730-1800 hrs.—Wainwright Inlet, 70°36'N, 160°07.7'W—6-20 ft. (small beam trawl). Bottom: sand. For Cumacea see following station.

LCM *William E. Ripley* II-6: 7 Aug. 1954—1200-1215 hrs.—Wainwright Lagoon, 70°35.3'N, 160°04.2'W—7 ft. (epibenthic dredge). Bottom: sand, some mud. The specimens of Cumacea from stations II-5 and II-6 were combined with no indication of the station from which they came. *Diastylis sulcata stuxbergi*: over 750 specimens mostly immature; most of the adults are females, none ovigerous. *Lamprops sarsi*: 6 immature specimens. Diastylidae: 1 adult male (mutilated), with a curiously sculptured carapace and 2 large and widely spread apical telsonic spines.

LCM *William E. Ripley* II-21: 10 Aug. 1954—1220-1224 hrs.—Wainwright Inlet, 70°36'N, 160°07.7'W—20-24 ft. (epibenthic dredge). Bottom: sand, some mud. *Lamprops sarsi*: 116 specimens, including ovigerous and non-ovigerous females, adult males and immature specimens.

LCM *William E. Ripley* III-4: 14 Aug. 1954—1430-1453 hrs.—9.25 mi. north of Point Barrow—71°31.3'N, 156°23'W—522 ft. (4-foot dredge). Bottom: no data available. *Diastylis dalli*: 16 females, 7 juvenile males. One female measured 31 mm. (including telson), believed to be a size record.

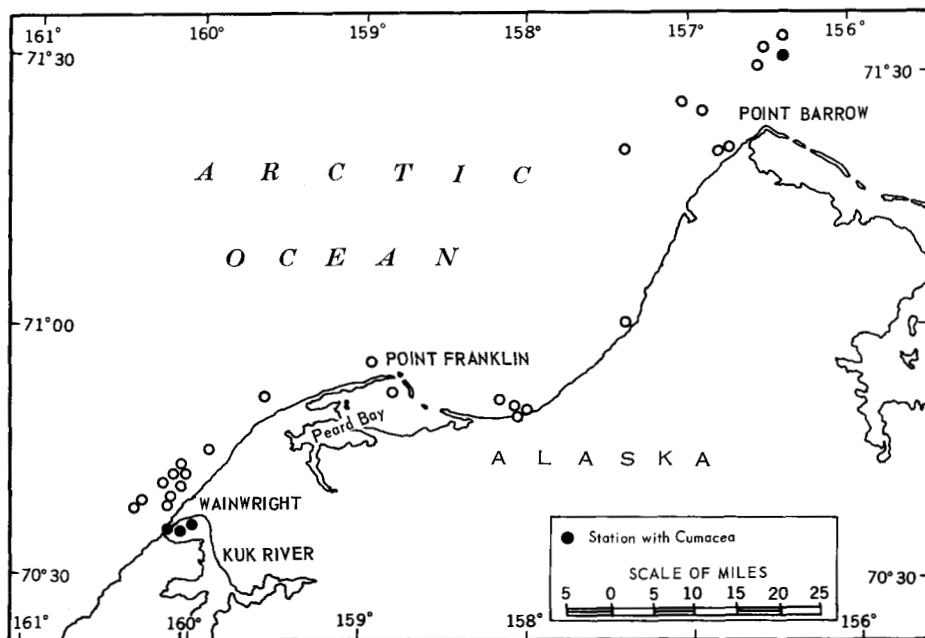


Fig. 4. Hydrobiological stations taken on the 1954 cruise of the LCM *William E. Ripley*, noting stations containing Cumacea. (Adapted from Wilmovsky 1954).

Distribution and Systematics

Distribution

The purpose of this paper is to introduce into the literature several collections of cumacean crustaceans from recent United States expeditions in the Alaskan Arctic. The diverse collecting methods, the lack of sufficient accompanying ecologic data, and some doubtful species determinations precludes a detailed zoogeographic analysis here of the Cumacea of the Arctic Basin. General distribution data are given for the species treated, followed

by their recent occurrences in the Alaskan Arctic. Depth ranges, for the recent occurrences, are in the units of measure used by the individual collectors, with approximate metric equivalents given for continuity with the general distribution data.

Systematics

Most of the species encountered have been described previously. In the study of such large collections as these, however, certain variations among individuals of a known species are often evident and may merit comment, especially if the variations are taxonomically significant. Such comments, when made available to specialists in the group, aid in the establishment of more accurate taxonomic parameters for the species involved. For that reason a section on the systematics is included here, supplementing the station data and species listings already presented.

I hesitate to make positive species identifications from examination of a single specimen, or of immature forms, especially in situations where the original descriptions are based on the adults of both sexes. Such tentative or doubtful species determinations are indicated by the question mark (?) and refer *only* to the specimens in the *present* collection, with no reflection on the accuracy of the original work. In this, as in past works, I use the taxonomic system devised by Stebbing (1913) (see Given, 1964).

FAMILY LAMPROPIDAE

Five species of the genus *Lamprops* represent the family in these collections. Some of the species do not conform exactly to the original descriptions but lie well within the range of variation for the characters in question.

Lamprops fasciata Sars 1863

One specimen, adult male. Follows the original description closely, possessing the characteristic pigment bands, etc., but differs in having 3 and 4 lateral telsonic spines (see Fig. 5A) instead of the single pair indicated by Sars. There is evidence, however, of similar variation of telson spines in other species of this genus (see *Lamprops quadriplicata*, this paper).

Distribution: southern Barents Sea, White Sea, Baltic and North Seas, shores of Norway and Great Britain — to 70 m.

Occurrence: HMS-22 (St. Paul Island, the Pribilofs) — 60 ft. (18 m.).

Lamprops fuscata Sars 1864

The early morning plankton tows at HMS-22 and HMS-23 yielded large numbers of both sexes of this species. They follow the original description rather well, and adhere even more closely to the redescription and illustration by Sars (1900, p. 20, pl. 11). The males are easily identified by the characteristic prehensile nature of the flagellum of the second antenna, the thickened proximal articles being armed with small teeth. The differences in the spacing of the lateral telsonic spines between male and female are exactly as shown by Sars. The female has a larger, more globose body; the eyes are present, but inconspicuous, in both sexes.

Distribution: Barents Sea, White Sea, Franz-Joseph Land, western Novaya Zemlya, western Greenland, Atlantic coast of Europe and North America, Alaska, Vancouver, B.C. — 4 to 112 m.

Occurrence: HMS-22 and HMS-23 — 60 ft. (18 m.).

Lamprops quadriplicata Smith 1879

(see also Calman 1912 and Stebbing 1913)

There has been much discussion of the lateral spination on the telson of this species. Calman (1912, p. 629) considers the Atlantic specimens he examined to be close to the *Lamprops fasciata* which Sars found in Europe, but observes that while the European forms of *Lamprops quadriplicata* have only one pair of lateral spines on the telson, the American variety has at least 2 pairs, following the original description. Stebbing (1913, p. 156) states that there are either 2 or 3 pairs; Lomakina (1958) has split the species into 3

subspecies using numbers of pairs of lateral telson spines as one of the distinguishing characters, with the numbers ranging from 2 to 5 pairs. The specimens examined from the present collections show extreme variability, and cast serious doubt on the usefulness of the number of lateral telson spines as a definitive taxonomic character. Most of the males here have 3 pairs of lateral spines, but some have 2 spines on one side of the telson and 3 on the other. Similarly, most of the females have 2 pairs of lateral telson spines, but some have 2 spines on one side and 3 on the other.

Calman (1912) also comments on the tendency toward variability in the distinctness of the first oblique carapace ridge. The Arctic forms examined here exhibit this variation in both the first and last of these ridges, especially noticeable in the males of the species.

Distribution: shores of Kamchatka, the Kuriles, Peter the Great Bay, Vancouver, B.C., Atlantic coast of North America — 13 to 67 m.

Occurrence: HMS-23 (St. Paul Island, the Pribilofs) — 60 ft. (18 m.).

Lamprops carinata Hart 1930

Adheres closely to the original description, and while resembling *L. fuscata* Sars in gross morphology is distinguished by the arrangement of the 5 apical spines on the telson, the tuft of setae on the first antenna and the setation on the peduncle of the long second antenna of the adult male. Two adult males examined.

Distribution: Vancouver, B.C. — 25 to 120 m.

Occurrence: HMS-22 (St. Paul Island, the Pribilofs) — 60 ft. (18 m.).

Lamprops Sarsi Derzhavin 1926

Taken in relatively large numbers in the Kuk Inlet region. The specimens recovered include ovigerous and non-ovigerous adult females, males, and juveniles. The adults differ from the original (Derzhavin 1926) and later (Lomakina 1958) descriptions in having the pseudorostral lobes slightly less pointed. This species is easily recognized by the prominent eyelobe and lack of telsonic spination.

Distribution: found in large numbers in the Bay of Tatarsk, the northern Okhotsk Sea, eastern Kamchatka and Kodiak, Alaska — 20 m.

Occurrence: LCM *William E. Ripley* II-5, II-21 — 7 to 24 ft. (2-7 m.).

FAMILY PSEUDOCUMATIDAE

This rather aberrant family was erected by Stebbing in 1912 to include 6 genera. It is represented here by the genus *Petalosarsia*, separated from the other genera by the fusion of the third and fourth articles and extreme dilation of the fifth article, on pereopod 1.

Petalosarsia declivis (Sars 1865)

(see also: *P. declivis* in: Stebbing 1893, p. 308 and Sars 1900, pp. 77, 108)

One ovigerous female (3.4 mm. long) collected by MacGinitie at Point Barrow, Alaska. It follows the descriptions of *P. declivis* closely, including the presence of the strong lateral carina on the carapace, dividing it into a somewhat flattened "dorsal" portion and an almost vertical "lateral" portion. In the classic descriptions of the adult female, however, the "lateral" area is smooth and unsculptured, while in this specimen there are two thin but definite secondary carinae on each side of the carapace. They originate separately at the posterior carapace edge, run parallel but separately following the curve of the lower carapace margin for about half its length, then proceed antero-laterally and approach the large primary lateral carina where it meets the base of the pseudorostrum (see Fig. 5B). The adult male (see Sars 1900, pl. 54) does exhibit a second ridge below the large upper carina, but the female shows no evidence of this secondary carination.

Distribution: Barents, Karsk, White and Okhotsk Seas; Bay of Peter the Great, shores of Spitzbergen, Iceland, Norway, northern England, Helgoland, the Skagerak, in North America from Cape Cod to Newfoundland, Davis Bay — 18 to 430 m.

Occurrence: MacGinitie station 47 — 175 ft. (53 m.).

FAMILY DIASTYLIDAE

This large and complex family is represented here by three genera (*Diastylis*, *Brachydiastylis*, *Leptostylis*).

Diastylis bidentata Calman 1912

Females and immature forms only recovered. The adults follow Calman's description closely, especially in carapace sculpture and dentition.

Distribution: widely distributed in the Bering, Okhotsk and northern Japan Seas; Alaska, Pacific coast of North America north of Puget Sound — from 9 to 1000 m.

Occurrence: HMS-23; also off Point Barrow, Alaska, at MacGinitie stations 25, 41, 42, 46, 61 — from 60 to 295 ft. (18-90 m.).

Diastylis alaskensis Calman 1912

Owing to the excellent preservation of these large animals, the taxonomic characters of both sexes were readily compared with the original description and found to correspond in all details.

Distribution: Okhotsk, Chukchi, northern Japan Seas; Alaska — from 8 to 196 m. Occurrence: HMS-50 (near Norton Sound) — depth unknown.

Diastylis sulcata Calman 1912

The only specimen recorded here is an adult female, easily separated from the related *D. sulcata* var. *stuxbergi* Zimmer by the presence of the prominent ventrolateral carapace ridge and grooves. In this specimen the telson is longer than the uropodal peduncle.

Distribution: a widely distributed Arctic form, found in western Barents and White Seas, the Bering Straits and northern Alaska, Anadyr Bay and the Chukchi Sea — 5 to 89 m.

Occurrence: LCM Red-3 (Kangigivik Point, Alaska) 24 ft. (7 m.).

Diastylis sulcata var. *stuxbergi* Zimmer 1926

Well represented in the collection from the "Hugh M. Smith", by adults, juveniles and immature specimens. This affords an opportunity for some observations on developmental changes. The adult and nearly-adult specimens (HMS-47) are all large, robust and well-calcified; they correspond closely to Zimmer's description of this variety. The immature forms, however, possess taxonomic characters found in two of the genera of the family Diastylidae — *Leptostylis* and *Diastylis*. They all have the rudiments of the carapace dentition typical of *D. sulcata stuxbergi*, and show no trace of the carapace ridge (the lack of which separates them from *D. sulcata typica* Calman). Another feature, the produced posterolateral corner of the fifth pedigerous segment (Fig. 5C, D), places them in the genus *Diastylis* and eliminates them from *Leptostylis*. The telson of these same immature individuals is, however, typical of the genus *Leptostylis*, being comparatively short and having two apical spines with only one pair of lateral spines (Fig. 5C'). The fifth pedigerous segment lacks an appendage (Fig. 5C); this phenomenon, according to Calman (1904 p. 40) has occurred in several species in widely separated families, among them *Leptostylis manca* Sars (Diastylidae).

Further examination of the more advanced juvenile specimens showed that the telson does eventually elongate and become more spinous (Fig. 5D', E), the fifth pedigerous segment does produce an appendage (Fig. 5D), and the forward carapace dentition typical of the species becomes well-developed.

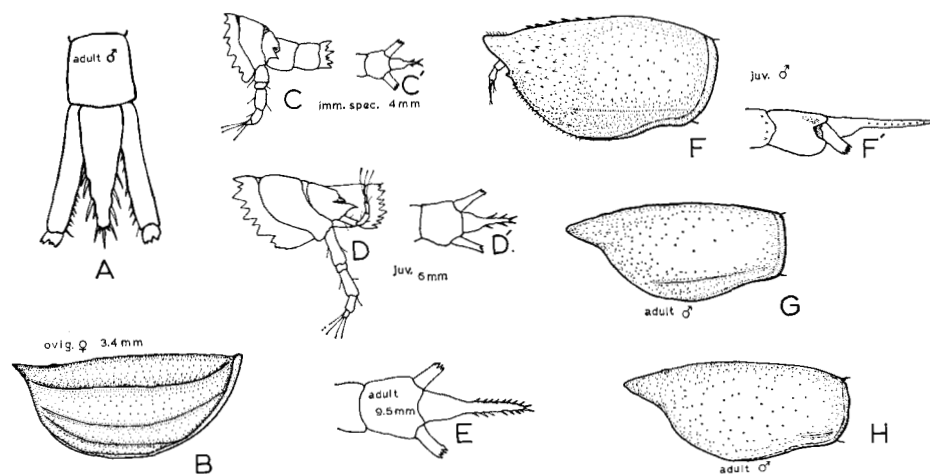


Fig. 5. A. Telson and uropodal peduncle of *Lamprops fasciata*, adult male, noting lateral spination; B. Lateral view, carapace of *Petalosarsia declivis*, female, showing secondary carination; C, C' Fifth pedigerous segment and telson, immature *Diastylis sulcata stuxbergi*; D, D' Fifth pedigerous segment and telson, juvenile *Diastylis sulcata stuxbergi*; E. Last segment and telson, adult *Diastylis sulcata stuxbergi*; F, F' Carapace and posterior portion of juvenile male *Diastylis rathkei* (?); G, H. Carapaces of two adult males, *Diastylis* sp. (nr. *laevis*) noting differences in lower carinae.

Distribution: in many estuaries and river mouths discharging into the White and Barents Seas; also at Cape Collingson (Alaska) — 5 to 31 m.

Occurrence: LCM *William E. Ripley* II-5, II-6 — 7 ft. (2 m.); LCM *Red-18* — 12 ft. (3.6 m.); HMS-43, 46, 47, 48, 50, 58 — 150 ft. (46 m.), extending the known depth range of the species from 31 to 46 m.

Diastylis dalli Calman 1912

Most of these large, robust animals range in length from 20 to 25 mm., but one female (measured from pseudorstrum to tip of telson) was 31 mm., a possible size record for the species. They are all extremely well preserved, heavily calcified, and adhere closely in all details to the original description. Calman (1912 p. 637) states: "This fine species, one of the largest of the Cumacea, may be appropriately associated with a name famous in the history of the scientific exploration of Alaska, that of Dr. W. H. Dall."

Distribution: Bering Straits; Chukchi, Okhotsk and Bering Seas — from 24–203 m. (but in the Bay of Peter the Great extending to 1128 m.; Alaska).

Occurrence: LCM *William E. Ripley* III-4; MacGinitie stations 24, 25, 29, 32, 33, 47 — from 110 to 741 ft. (33–226 m.).

Diastylis rathkei (Krøyer 1841) (?)

The specific identification of this cumacean is somewhat questionable here, the "*Diastylis rathkei*-group" being a subject of much discussion and controversy among systematists. The taxonomy is based chiefly on the arrangement of the carapace teeth, or spines, and in some cases the separation of species on this basis seems to be somewhat arbitrary.

The two specimens found in the collection from LCM *Red-3* are definitely assigned to the genus *Diastylis*, and fall into the "*rathkei*-group" in general appearance and possession of the characteristic denticles on the carapace. The adult female closely resembles "*Diastylis rathkei* var." described and illustrated by Sars (1900, p. 107, pl. 70) as an example of the variation potential in this species. The juvenile male shows many intermediate characters: no tuft on antenna 1; telson not bent up in the middle (Fig. 5F'); some evidence of loss of carapace spines and the formation of a serrated lower carapace ridge (Fig. 5F). The pleopods are small, and antenna 2 has not yet emerged from under the posterior edge of the carapace. The possession of such intermediate characters are typical of the juvenile males in most species in the order, when they look more like adult females than males. There is the possibility, however, that this particular juvenile male is not of the same variety as is the female from this same collection site, because it has two spines on the last article of the uropodal endopod (as in the *typica* form), not three as in the "*D. rathkei* var." form in Sars (1900).

Occurrence: LCM *Red-3* — 24 ft. (7 m.).

Diastylis sp. (near *laevis* Norman 1869)

This form is being tentatively allied with *Diastylis laevis* Norman, although in some specimens the resemblance to *Diastylis tumida* (Lilljeborg 1855) is strong. No definite identification could be given by either Dr. Feder or myself because of the great variability indicated in the specimens examined here. A discussion of this variability is presented here as a guide to further work on this important species.

1) Nine adult males — from the surf — Point Barrow, 1 Sept. 1949.

In the family Diastylidae carapace ridges (carinae) are diagnostic. The nine males are approximately the same size, yet the characteristic ridge on the lower part of the carapace ranges from being well-defined (as seen in *D. laevis*) to being inconspicuous (as seen in *D. tumida*) (Fig. 5G, H). In some of the specimens the ridge is not visible for more than half the distance forward from the trailing edge of the carapace. None of the specimens has the projection on the ischial article of pereopod 2 (*D. laevis* also lacks this, but it is present in *D. tumida*). The telson of all nine specimens examined is as in Sars 1900 (pl. 39) description of *D. rostrata* (now *laevis*).

2) One adult male — Elson Lagoon, Alaska — 20 Sept. 1949

Feder calls this specimen "*rostrata*" or "*tumida*" (unpublished report). It resembles *D. tumida* in general form, especially as regards the latter carapace carina which is characteristically inconspicuous. It differs from *D. tumida* in having the last article of pereopod 1 long and with pereopod 2 lacking the dentiform process on the ischium. There is a slight swelling of the carapace on each side of the base of the pseudorostral projection, which partially obscures the lower part of the eye in lateral view.

3) Four adult males — Point Barrow — washed ashore — 22 Sept. 1949

Feder (unpublished report) again questions the identity of these forms, although both he and I agree that they adhere more closely to the description of *D. laevis* than to *D. tumida*. On 24 Sept. 1949 a single male similar to the above specimens was collected in the same area. The remarks directed to the four males from Point Barrow also apply to that specimen.

4) One adult male — LCM Red-18

This individual has fully developed second antennae and pleopods. It is similar in many respects to *D. tumida*, but differs in the following: pereopod 1 has the last article the longest; the abdominal segments are all toothed on the dorsal and lateral surfaces, and the penultimate abdominal segment has a strong backward-pointing spine just forward of the ventrolateral margin (not seen in *D. tumida*). The uropodal exopods are longer than the endopods; the first joint of the endopods is long and the last joint has 4 spines (2 in *D. tumida*). The telson is subequal in length to the uropodal peduncle.

Diastylis sp. (near *aspera* Calman 1912)

One intermediate male, the only cumacean collected on Fletcher's Ice Island, T-3. This specimen lacks any specific taxonomic characters which would place it in a definite species category. There are denticles on the carapace, which appear to increase in size anteriorly, with a very faint lateral dentition on one side of the carapace only. Pereopod 1 is heavily toothed but not bristled. The pedigerous segments are well armed, and there are two faint grooves in the posterior region of the carapace, starting dorsally and curving anterolaterally.

Diastylis sp. (?)

One mutilated female, washed ashore at Point Barrow on 25 Aug. 1949, was recovered by MacGinitie. It bears strong resemblance to the genus *Diastylis*, but the absence of the uropodal rami and lack of any spines or dentition precludes further identification at this time. A short description may be of value for future study.

Body (25 mm. long) heavily calcified, brood pouches undeveloped, both uropodal rami missing. Telson spinous, tapering, longer than the uropodal peduncle. Carapace globose, lacking any spines, teeth, ridges or sculpturing. Pleon completely naked of hairs, bristles, setae or spines. Pereopods with a few heavy bristles, short spines on the telson and uropodal peduncles. Pereopods 3 and 4 lack exopods. Eyelobe much reduced, heavily calcified; pseudorostrum short with a few minute, rounded denticles on the margins. Anterior carapace margins with a few medium-sized denticles, rest of margin smooth and thickened. Pedigerous segment 5 produced backward to a long projection (seen in many species of the genus *Diastylis*).

Brachydiastylis resima (Krøyer 1846)

The adult female from HMS-58 corresponds closely to Sars (1900, pl. 47) illustration, but is generally less denticulate. It does, however, show the important spine on the second article of pereopod 3 and the long terminal seta on the uropodal endopod, as seen by Hansen (1920, p. 69) and Hart (1939, p. 65) but not by Sars (1900, p. 65). The immature forms from HMS-60 are similar to the adult female above but are too juvenile to exhibit any well-developed carapace processes necessary for species confirmation. The specimens collected by MacGinitie at Point Barrow follows Sars' (1900, pl. 47) illustration and redescription.

Distribution: Barents, White, Bering and Okhotsk Seas; Norway, Baltic Straits, Scotland, Greenland, and the Atlantic shores of North America — from 6 to 352 m.

Occurrence: HMS-58, HMS-60; MacGinitie stations 32, 36, 42 — from 120 to 741 ft. (37-226 m.).

Leptostylis (near *longimana* (Sars 1869))

One mutilated female (7.1 mm. long) collected by MacGinitie at Point Barrow. Corresponds to *L. longimana* in lacking the emarginations of pedigerous segments 2 and 3, and by having a few scattered hairs clothing the carapace and a minutely denticulate edge to the carapace. The basal article of the uropodal endopod is equal in length to the second and third articles combined. The poor condition of the carapace precludes a positive statement of carapace dentition other than that of the margins. The taxonomically important first pereopods (extremely long in *L. longimana*) are also missing. For these reasons species determination of this specimen remains tentative.

Occurrence: MacGinitie station 32, to 741 ft. (226 m.).

FAMILY LEUCONIDAE

Three genera in the family Leuconidae are represented in these collections.

Eudorella Norman 1868

This genus is extremely common in the "Hugh M. Smith" samples but in none of the other collections reported in this paper. There are probably several species involved, but in the light of the recent paper by Barnard and Given (1961), questioning the existing taxonomic criteria, I hesitate to place positive species identities on these specimens at this time. The key suggested in that paper, using the fusion or articulation of the apical endopodal spine, was based mostly on literature descriptions and was intended only as a *suggested alternative* to the carapace-dentition-based taxonomy. The condition of the endopodal spine as a useful criterion has not been investigated or tested in enough

species or specimens to make it reliable yet. In short, it seems that the entire genus needs revision, with the present taxonomic criteria being closely re-examined and enough specimens studied to make the resulting species separations statistically significant. However, such a study is neither necessary nor pertinent here, and I will not pursue identification beyond the generic level, except to suggest similarities to existing species descriptions where they seem obvious.

The same variations in anterior carapace marginal dentition found by Barnard and Given are evident in the specimens examined here. All will be classified as *Eudorella* sp. and identified with the *Hugh M. Smith* station(s) at which they were collected.

Eudorella sp.

HMS-21: Somewhat resembles *E. dentata* Lomakina but the anterior carapace margin has a large, squared sinus not seen in that species. In this limited respect the specimens here exhibit a resemblance to *E. pacifica* Hart as characterized by Lomakina (1955 p. 124, figs. 2, 3).

HMS-29: Specimen is close to *E. emarginata* (Krøyer) (see also Sars 1900, p. 36, pl. 27, 28), but has a simple anterior carapace margin and no conspicuous upper sinus. The lower sinus is squared (as in *Eudorella* sp. from HMS-21), and has two downward-pointing teeth on one side, three on the other. Lacks the long setae on pleon segment 5 as seen in *E. emarginata*, (Krøyer) there is an extremely long, slender bristle at the distal end of the uropodal peduncle.

HMS-33, HMS-60: Similar to the specimens from HMS-21, but being juvenile males they have many confusing intermediate characters.

HMS-34: An adult male, completely lacking a subrostral sinus and showing no other usable taxonomic characters.

HMS-40: All the juvenile males from this station have many intermediate characters, but are advanced enough to have lost the subrostral sinus. They somewhat resemble *E. pacifica* Hart as depicted by Lomakina (1955). The adult female examined has a large, squared lower subrostral sinus, as seen in the specimens from HMS-21.

HMS-59: Two females, both with large, squared lower subrostral sinuses and an upper sinus with both upper and lower dentition (see the description of *E. gracilis* Sars by Lomakina 1958, p. 223).

Leucon Krøyer 1846

The genus is represented by many immature specimens in these collections, making definite species identification difficult. The *Leucon* "nasica-nasicoides" group shows much variation in taxonomic features, and references to the subspecific categories of *orientalis* and *typicus* are made here with reservation.

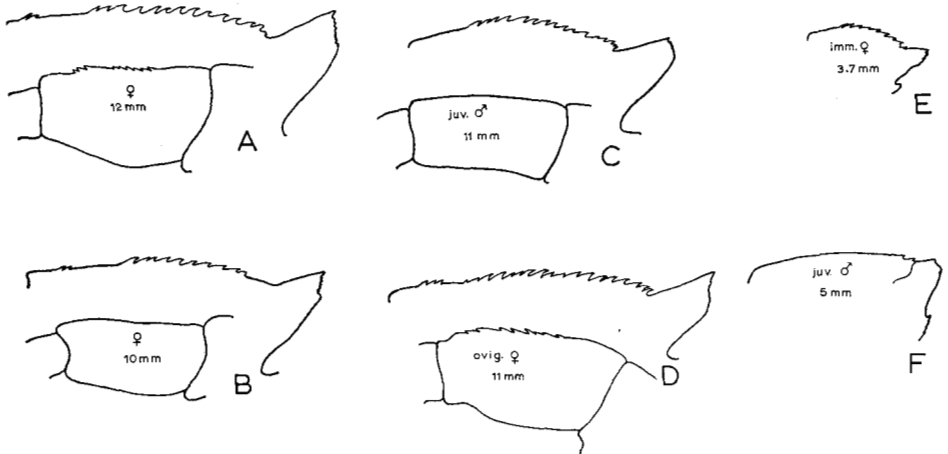


Fig. 6. A. *Leucon nasica*, female, carapace and fifth pleon segment; B. *Leucon nasica*, female, carapace and fifth pleon segment; C. *Leucon nasica*, juvenile male, carapace and fifth pleon segment; D. *Leucon nasica*, ovigerous female, carapace and fifth pleon segment; E. *Leucon nasica*, immature female, carapace crest; F. *Leucon nasicoides*, juvenile male, showing carapace dentition.

Leucon nasica (Krøyer 1841)

MacGinitie station 42: an immature female (3.7 mm.) with no crest on pleon segment 5 and with the dorsal carapace crest uninterrupted but not complete, that is, not extending to the posterior carapace margin (Fig. 6E).

MacGinitie station 50: a mutilated specimen, probably female, with no crest on pleon segment 5 and with the dorsal carapace crest uninterrupted but not complete.

HMS-35: Seven specimens assigned to this species, and tentatively to the subspecies *orientalis* Lomakina 1952, although there is notable variation in the dentition of the dorsal carapace crest and the crest on pleon segment 5. In some specimens the carapace crest is interrupted (as in *L. nasica typicus* (Krøyer)), the animals still possessing the dentate crest on pleon segment 5 (Fig. 6A); others possess the same interrupted carapace crest but lack the dentition on pleon segment 5 (Fig. 6B). Still others show the carapace crest *uninterrupted* anteriorly but not extending to the posterior carapace margin (Fig. 6C). The adult male from this station has no dentition on either carapace or pleon.

HMS-50: One ovigerous female with the serrated crest on pleon segment 5 (as in *L. nasica orientalis*) and the dorsal carapace crest interrupted but continuing posteriorly with 3 teeth after the break (as in *L. nasica typicus*) (Fig. 6D).

HMS-60: An intermediate male with medium-sized exopods on pereopod 4 but no pleopod rudiments or any strong development of the second antennae. The carapace crest is incomplete and there is no crest on pleon segment 5.

Leucon nasicooides Lilljeborg 1855

All of the specimens assigned to this species from the present collections are juveniles.

HMS-41, HMS-48: Juvenile males with the two extremely anteriorly placed teeth (Fig. 6F) on the dorsal crest, as depicted by Sars' (1900, pl. 23) illustration of an *L. nasicooides* adult male. The two ensiform appendages on pereopod 3 in Sars' description are not present here, possibly due to the immaturity of the specimens.

HMS-59: All juveniles; the females with two lateral denticles on the carapace, males with no sign of developing pleopods even though they are nearly adult in size.

Leucon profundus Hansen 1920

A large, ovigerous female, differing from the original description of this species only in that the uropodal endopods are not as strikingly extended beyond the exopods as indicated in Hansen's original illustrations. They are, in fact, nearly equal in length.

Distribution: Arctic deep-water form. Found in New Siberian shallows (60 m.); Bay of Davis (2258 to 2702 m.).

Occurrence: HMS-49 — 75 ft. (23 m.).

Leucon fulvus Sars 1865

An ovigerous female, adheres closely to Sars' (1900, p. 32) redescription of the species.

Distribution: Arctic boreal form. Northern Atlantic and Pacific, Novaya Zemlya, Iceland, Davis Bay, Norway, Vancouver Island — from 9 to 2258 m.

Occurrence: HMS-49 — 75 ft. (23 m.).

Leucon sp.

For various reasons (mutilation, obvious aberrancy or immaturity) some of the specimens from these collections are assigned simply to the genus *Leucon* with no further attempt at identification. A short discussion is given to assist future investigators.

HMS-48: Juvenile males, large and robust, with well developed exopods on pereopod 4 but still showing many female characters. There is no evidence of rudimentary pleopods or the usual strong development of the second antennae, both of which would be expected in specimens of this size and apparent maturity of other male characters.

HMS-49: 6 specimens, very immature, with no definite taxonomic characters developed. All have a dorsal carapace crest and exopods on pereopod 4, but lack pleopods. The adult female in this sample is mutilated, but the pseudorostrum is seen to be very short and upturned, with a large shallow subrostral sinus.

HMS-50: 3 specimens, all immature, somewhat resembling *L. nasica*.

HMS-57: Juvenile male, close to *Leucon pallidus* (see Sars 1900, pl. 25), but lacking the three ensiform appendages on pereopod 3.

Eudorellopsis Sars 1883

A very distinctive genus, with two species represented here.

Eudorellopsis integra (S.I. Smith 1879)

Adheres closely to the original description. The adult males are easily recognized by the extremely long plumose seta on the uropodal exopod.

Distribution: Widely distributed in the Okhotsk, Bering and Japan Seas; also Alaska, Vancouver Island, the Atlantic coast of north America and western Greenland — from 9 to 791 m.

Occurrence: HMS-5, HMS-50, HMS-60 — from 5 to 220 ft. (1.5-67 m.).

Eudorellopsis derzhavini Lomakina 1952

Most of the specimens here are juveniles, but even the most immature possess the characteristic pseudorostrum and carapace ridges of the species. The juvenile males seem to retain the character of the female pseudorostrum until quite late in their development.

Distribution: Okhotsk and Japan Seas, western Kamchatka — from 29 to 390 m.

Occurrence: HMS-7, HMS-21, HMS-34, HMS-43; MacGinitie station 47 — from 108 to 222 ft. (33-68 m.).

FAMILY NANNASTACIDÆ

Cumella carinata (Hansen 1887)

(also see: *Cumellopsis carinata* Calman 1904; *Cumella* (?) *carinata* Calman 1912;

Cumella carinata (Hansen 1920))

This species was first described by Hansen as *Campylaspis carinata* on the basis of one specimen. Other workers (Sars 1900, Calman 1912) suggested its closer relation to the genus *Cumella* in the family Nannastacidae. Hansen (1920, p. 31) discusses these later works, especially the query (?) used by Calman in 1912. Hansen and Calman both agreed to drop the query. Lomakina (1958, p. 253) places it in the genus *Cumella* with no (?) indicated.

The specimens examined here follow the previous descriptions closely. Feder (1950, unpublished report) leaves his determination at *Cumella* sp., but further research on comparative material and literature unavailable to Feder at that time convinces me of its specific identity as *Cumella carinata*.

Distribution: An Arctic boreal form, found in the Bering Sea, western and eastern Greenland, the Kanadcki archipelago and Labrador — from 4 to 163 m.

Occurrence: MacGinitie stations 20, 21, 22, 29, 32, 37, 41, 42, 44, 45 — from 110 to 453 ft. (33-138 m.).

Acknowledgements

Recognition and appreciation for the scientific and technical assistance involved in making the collections has already been expressed in the individual expedition reports. It remains for me to acknowledge the help of those who made possible my examination of the cumaceans from those collections and the assembling of the accompanying taxonomic and ecologic data.

Howard Feder lent me MacGinitie's Point Barrow collection, and his personal unpublished notes; Thomas Bowman coordinated the loan of certain United States National Museum specimens from that collection. Stephen Geiger of the University of Southern California located and assembled the cumaceans from the "William E. Ripley", "Red", T-3 and "Hugh M. Smith" expeditions: a truly monumental task. John Tibbs of that same university made valuable additions to the collection data from the cruise of the "Hugh M. Smith"; Edwin Hamilton of the USNEL, Point Loma, California, provided the sediment analyses from that cruise.

I am most deeply indebted to John L. Mohr, who provided support under the Office of Naval Research, National Science Foundation and Arctic Institute of North America grants, supplied many pieces of pertinent and unpublished information (especially about the cruises of the "William E. Ripley" and the "Red"), and read and edited the final drafts of this paper with uncommon patience and thoroughness.

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