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Records of Deep-Water Chaetognaths from the Northern Gulf of Mexico

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RECORDS OF DEEP-WATER CHAETOGNATHS
FROM THE NORTHERN GULF OF MEXICO

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ABSTRACT
Fourteen species of deep-water Chaetognatha were present in plankton samples collected between 200 and 677 m at five stations along the continental slope of the northern Gulf of Mexico. Samples were taken in conjunction with the MARFIN Geryon cruises of 1987 and 1988. New Gulf of Mexico records resulting from this study were Eukrohnia calliops, Eukrohnia proboscidea, Mesosagitta sibogae, and Sagitta megalophthalma. Other deep-water species present were Eukrohnia fowleri, E. bathypelagica, E. bathyantarctica, Caecosagitta macrocephala, Mesosagitta decipiens, M. minima, Solidosagitta planctonis, Krohnitta subtilis, Flaccisagitta hexaptera, and F. lyra. In addition, the normally epipelagic taxa, Pterosagitta draco, Serratosagitta serradentata, and Sagitta bipunctata occurred in some of the samples.

INTRODUCTION
Mesoplanktonic (those occurring between 200 and 1000 meters) and bathypelagic species of Chaetognatha (those occurring below 1000 meters) are mostly cosmopolitan in nature, being associated with and transported about by specific undersea currents. Although the coastal epipelagic Chaetognatha fauna of the northern Gulf of Mexico has been well documented (Pierce 1951, 1962; McLelland 1984), the deeper offshore species remain poorly known because of the difficulty and expense of gathering material for study. An opportunity to study deep-water chaetognaths recently arose when plankton samples were collected over the continental slope in the northern Gulf of Mexico as part of an effort to provide data on the distribution of larvae of the deep-water crabs, Geryon fowleri and G. quinquedens. This paper provides documentation of deep-water Chaetognatha species in the northern Gulf of Mexico by recording the presence and relative abundance of 14 deep-water species found in samples collected below 200 meters. In addition, three epipelagic (0-200 m) species also occurred in the samples.

RESULTS AND DISCUSSION
The bottom nets, being smaller in diameter and stationary, filtered less water and thus captured fewer numbers of Chaetognatha than the towed nets; however, they usually produced samples with a greater diversity of species than towed samples from the same areas. Of the 14 deep-water species recorded, six were present in at least 22 of the 32 samples analyzed: Mesosagitta sibogae (30 samples), Krohnitta subtilis (29 samples), Flaccisagitta hexaptera (29 samples), F. lyra (24 samples), F. decipiens (24 samples), and M. minima (22 samples). Of these, M. sibogae was most often the dominant species, with K. subtilis second and F. lyra third in abundance.

Materials and Methods
Plankton samples were collected at five sampling areas along the continental slope of the northern Gulf of Mexico (Figure 1) during the MARFIN Geryon cruises of 1987 and 1988. Closing nets (1 m, 333 μm mesh) equipped with Niskin double-trip devices were towed between 200 and 500 m to sample the water column above the crab traps. In addition, 0.3 m, 183 μm mesh nets designed to passively filter the current for 24 hours were attached to crab trap arrays resting on the bottom at 677 m. Catch data indicating distribution and relative abundance of Chaetognatha species caught during the Geryon cruises and hydrographic data collected near the bottom of the water column are presented in Table 1. Chaetognatha were removed, identified to species, and counted from a total of 32 samples, 27 towed and five bottom net. In some cases, numbers of specimens were estimated because of large, unmanageable sample volumes and damaged specimens.

The bottom nets, being smaller in diameter and stationary, filtered less water and thus captured fewer numbers of Chaetognatha than the towed nets; however, they usually produced samples with a greater diversity of species than towed samples from the same areas.

Eukrohnia bathypelagica, present at all five sampling areas (14 samples), was the most common of the five Chaetognatha species present, while the two rarest, E. bathyantarctica and E. proboscidea, occurred only once, in the same sample at Area 5. Three normally epipelagic species, Sagitta bipunctata, Pterosagitta draco, and Serratosagitta serradentata, occurred sporadically in the samples.
Figure 1. Locations of MARFIN - Geryon sampling areas in the Gulf of Mexico.
### Table 1

Station and Hydrographic Data for the MARFIN-Geryon deep-water plankton collections in the northern Gulf of Mexico and the relative abundance of chaetognaths in the samples

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<th>Station</th>
<th>Position</th>
<th>Date</th>
<th>Time</th>
<th>Bottom depth (m)</th>
<th>Sampling depth (m)</th>
<th>Towing time (min)</th>
<th>Bottom salinity (ppt)</th>
<th>Bottom temp (°C)</th>
<th>Chaetognath specimens per sample</th>
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<td>Area 1</td>
<td>29°02'N</td>
<td>8/8/87</td>
<td>0941</td>
<td>677</td>
<td>200-500</td>
<td>55</td>
<td>36.0 8.4</td>
<td>&gt;50</td>
<td>Eukrohnia bathypelagica</td>
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* = net accidentally dragged bottom  
** = 0.3 m nets attached to crab traps, passive samples  
NT = not taken  
+ = present but not counted

Ec = Eukrohnia callioups  
Eba = Eukrohnia bathypelagica  
Mn = Mesosagitta minima  
Fh = Flaccisagitta hexaperta  
Ep = Eukrohnia fowleri  
Cm = Caecosagitta macrocephala  
Sm = Sagitta megalepithaema  
Ss = Serratosagitta serratodentata  
Ebp = Eukrohnia proboscidea  
Ms = Mesosagitta szeguei  
Sp = Solidosagitta planicosma  
Fb = Flaccisagitta byrsa  
Ebp = Eukrohnia bathypelagica  
Md = Mesosagitta decipiens  
Ks = Krohnitta subtilis  
Pd = Pierosagitta draco
with the latter being the most common (24 samples). Their presence in the samples probably indicated either mixing of epipelagic water into the upper reaches of the sampled strata (200–500 m) or contamination of samples with material from upper waters. The bottom nets, which were continuously open, naturally captured a few specimens of epipelagic fauna during deployment and retrieval.

Four of the species obtained in this study, *Eukrohnia calliops*, *E. proboscidea*, *Mesosagitta sibogae*, and *Sagitta megalophthalma*, constitute new records for the Gulf of Mexico. The following list displays synonyms and selected descriptive references for the 17 deep-water and three epipelagic species found in the samples. See McLelland (1989b) for distribution records, ecological notes, meristic counts, and brief descriptions of these and other species occurring in the Gulf of Mexico.

**EUKROHNI A CALLIOPS** McLelland

*E. calliops* McLelland, 1989a (Figs. 2, 3, 4A, 5A,B)

*E. calliops*, McLelland 1989b (Figs. 2A–D).

**EUKROHNI A FOWLERI** Ritter-Zahony

*E. fowleri* Ritter-Zahony, 1909.

*E. fowleri*, Ritter-Zahony 1911a (Figs. 43,45); David 1958 (Figs. 2b, 3a,d); Colman 1959; Alvarino 1962 (Figs. 19b,e; 21c,d), 1967 (Figs. 3A, 3B), 1969 (Figs. 36,37); Ducret 1965 (Figs. 3c, 4d, 5–7); Furnestin 1965 (Figs. 4–6); Every 1968 (Pl. 2); Fagetti 1968; Silas and Srinivasan 1968 (Fig. 7G–K); Boltovskoy 1981 (Fig. 256/3); Kassatkina 1982 (Fig. 38B,C); Michel 1984 (Figs. 10), McLelland 1989a (Figs. 4D; 5G,H), 1989b (Figs. 3A–F).

**EUKROHNI A PROBOSCIDEA** Furnestin and Ducret

*E. proboscidea* Furnestin and Ducret, 1965 (Fig. 1).

*E. proboscidea*, Ducret 1965 (Figs. 3d, 4c, 9–12), 1975 (PL. 4B); Owre 1973; Michel 1984 (Figs. 13–15); Casanova 1986; McLelland 1989a (Figs. 4C; 5E,F), 1989b (Figs. 2E–G).

**EUKROHNI A BATHYPELAGICA** Alvarino

*E. bathy pelagica* Alvarino, 1962 (Figs. 18; 19c,d,f,g; 20)

*E. bathy pelagica*, Alvarino 1967 (Figs. 1,2), 1969 (Figs. 34,35); Ducret 1965 (Figs. 3b, 4b, 8); Silas and Srinivasan 1968 (Figs. 1M, 2E,H); Owre 1973; Boltovskoy 1981 (Fig. 256/2); Kassatkina 1982 (Fig. 35); Michel 1984 (Fig. 10); Casanova 1986 (Fig. 4d,e); McLelland 1989b.

**EUKROHNI A BATHYANTARCTICA** David

*E. bathyantarctica* David, 1958 (Figs. 2a, 3b,c)

*E. bathyantarctica*, Fagetti 1968 (Fig. 1); Alvarino 1969 (Figs. 32,33); Owre 1972, 1973 (Fig. 3); Boltovskoy 1981 (Fig. 256/1); Michel 1984 (Fig. 9); McLelland 1989b.

**CAECOSAGITTA MACROCEPHALA** (Fowler) Tokioka

*Sagitta macrocephala* Fowler, 1906 (Pl. 2, Figs. 66–72). *S. sibogae*, Pierrot-Bults 1979 (Figs. 1b, 5,6).

**MESOSAGITTA SIBOGAE** (Fowler) Tokioka

*Sagitta sibogae* Fowler, 1906 (Pl. 2, Figs. 66–72). *S. sibogae*, Pierrot-Bults 1979 (Figs. 1b, 5,6).

**MESOSAGITTA DECIPIENS** (Fowler) Tokioka

*Sagitta decipiens* Fowler, 1906 (Pl. 5, Figs. 32–35)

**MESOSAGITTA MINIMA** (Grassi) Tokioka

*Sagitta minima* Grassi, 1881 (Figs. 27–29); Almeida-Prado 1961 (Figs. 10,12,14,15); Alvarino 1967 (Figs. 37,37); Colman 1959; Alvarino 1967 (Figs. 28,29), 1969 (Figs. 75,76); Every 1968 (Pl. 7B); Boltovskoy 1981 (Fig. 256/15); Michel 1984 (Figs. 28,29).

**SAGITTA MEGALOPHTHALMA** Dallot and Ducret

*S. megalophthalma* Dallot and Ducret, 1969 (Figs. 1,2).

*S. megalophthalma*, Dallot 1970 (Figs. 5d, 7a); Michel 1984 (Figs. 30–33); McLelland 1989b (Figs. 10A–C).
SOLIDOSAGITTA PLANCTONIS (Steinhaus) Tokioka

Sagitta planctonis Steinhaus, 1896
S. zetesios Fowler, 1905
S. zetesios, Colman 1959; Alvarino 1967 (Figs. 30,31), 1969 (Figs. 81,82); Dallot 1970 (Figs. 1–3, 5a, 7f); Boltovskoy 1981 (Fig. 256/23).
S. planctonis forma zetesios, Pierrot-Bults 1975; Michel 1984 (Figs. 3,36).
Solidosagitta zetesios, Tokioka 1965; Kassatkina 1982 (Fig. 57).
S. planctonis, McLelland 1989b (Figs. 10D–F).

KROHNITTA SUBTILIS (Grassi) Ritter-Zahony

Sagitta subtilis Grassi, 1881
K. subtilis, Ritter-Zahony 1911a (Figs. 49–51); Vannucci and Hosoe 1952 (PL. 3, figs. 5.6; PL. 4, figs. 7.8); Suárez-Cabro 1955 (PL. 7, Figs. A–E); Suárez-Cabro and Madruga 1960 (Fig. 3B); Colman 1959; Vega-Rodriguez 1965 (Fig. 8); Alvarino 1967 (Figs. 9,10), 1969 (Figs. 42,43); Every 1968 (PL. 1A); Boltovskoy 1981 (Fig. 256/6); Michel 1984 (Figs. 4,41); McLelland 1989b (Figs. 5A–D).

FLACCISAGITTA HEXAPTERA (d’Orbigny) Tokioka

Sagitta hexaperta d’Orbigny, 1843 (Figs. 4.5)
S. hexaperta, Ritter-Zahony 1911a (Fig. 1), 1911b (Figs. 6,7); Vannucci and Hosoe 1952 (PL. 1, fig.4; PL. 2, figs. 2–4); Suárez-Cabro 1955 (PL. 1, Figs. A–E); Colman 1959; Vega-Rodriguez 1965 (Figs. 3A,B); Alvarino 1967 (Figs. 15,16), 1969 (Figs. 54,55); Every 1968 (PL. 5); Boltovskoy 1981 (Fig. 256/12); Michel 1984 (Fig. 25).
Flaccisagitta hexaperta, Tokioka 1965; Kassatkina 1982 (Fig. 91); Thuesen and Bieni 1987 (Figs. 1–9); McLelland 1989b (Figs. 7B,C; 12A).

FLACCISAGITTA LYRA (Krohn) Tokioka

Sagitta lyra Krohn, 1853
S. lyra, Ritter-Zahony 1911a (Figs. 3,8), 1911b (Fig. 8); Colman 1959; Alvarino 1967 (Figs. 13,14), 1969 (Figs. 50,5); Every 1968 (PL. 3A); Silas and Srinivasan 1968 (Fig. 7A–F); Boltovskoy 1981 (Fig. 256/14); Michel 1984 (Fig. 27).
Flaccisagitta lyra, Tokioka 1965; Kassatkina 1982 (Fig. 91); McLelland 1989b (Figs. 7D,E; 12B).

PTEROSAGITTA DRACO (Krohn) Costa

Sagitta draco Krohn, 1853
P. mediterranea, Costa 1869
Lower epiplanktonic – Upper mesoplanktonic

Flaccisagitta enflata
Krohnitta pacifica
Serratosagitta serratodentata
Pterosagitta draco
Sagitta bipunctata

Eukrohnia hamata
Eukrohnia bathyanartica
Bathybelos typhlops

Mesoplanktonic (200–1000 m)

Flaccisagitta lyra
Mesosagitta sibogae
Mesosagitta decipiens
Sagitta megalophthalma
Solidosagitta planctonis

Mesosagitta minima
Flaccisagitta hexaptera
Eukrohnia calliops
Eukrohnia fowleri
Eukrohnia proboscidea
Eukrohnia bathypelagica
Caecosagitta macrocephala


DEEP-WATER CHAETOGNATHS OF THE GULF OF MEXICO