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GNATHOSTOMULIDA FROM THE (SUB)TROPICAL NORTHWESTERN ATLANTIC

by

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ABSTRACT

STERRER, W., 1997. Gnathostomulida from the (sub)tropical northwestern Atlantic. *Studies Nat. Hist. Caribbean Region 74,* Amsterdam, 1998: 1-178.

Based on 1035 specimens of Gnathostomulida from 106 samples collected during the period 1968-1997 in the tropical and subtropical northwestern Atlantic, 45 species are presented, including one new family (Paucidentulidae nov. fam.), two new genera (*Vampyrognathia* nov. gen. and *Paucidentula* nov. gen.), and 13 new species: *Haplognathia belizensis, Cosmognathia aquila, Pterognathia alcicornis, P. pygmaea, Mesognatharia eastwardiae, Onychognathia rhombocephala, Vampyrognathia horribilis, V. minor, Paucidentula anonyma, Gnathostomula uncinata, Triplignathia (?) bathycola , Austrognatharia medusifera,* and *A. stirialis.*

Key words: Marine, free-living, meiofauna, taxonomy new genera, new species.

INTRODUCTION

Gnathostomulida are a small phylum of microscopic marine worms whose position among the lower Bilateria remains enigmatic. Traditionally seen as a sister taxon to Platyhelminthes (AX 1985, 1996), they have also been linked to Aschelminthes (STERRER *et al.* 1985), especially Gastrotricha (RIEGER 1976) and Rotatoria (RIEGER & TYLER 1995). NIELSEN (1994) denies them phylum status, incorporating them in Annelida (NIELSEN 1995). WALLACE *et al.* (1996), in their cladistic analysis of aschelminth morphology, conclude that among the chief issues to be resolved is the placement of Gastrotricha and Gnathostomulida. If indeed metazoan phyla have di-

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verged in the deep Precambrian, as suggested on molecular evidence by WRAY *et al.* (1996), then we need not be surprised at the difficulty of establishing conclusive relationships between superficially often rather similar vermiform taxa (LITTLEWOOD *et al.*, in press). Gnathostomulida have worldwide distribution, and in spite of lacking an obvious mechanism for long-range dispersal (STERRER 1973b) contain a surprising number of cosmopolitan or at least circumtropical species (STERRER 1991a, 1991b, 1991c, and this paper).

In the year when Gnathostomulida were first described (AX 1956), RUPERT RIEDL recorded an unusual, flatworm-like animal "with snapping jaws" from Puerto Rico (RIEDL 1966). And while European shores produced most new species in the 1960's, largely as a result of my finds in the North Sea and the Adriatic (STERRER 1965, 1966a, 1966b, 1969, 1971a, 1971b), the tropical northwestern Atlantic was to become the focus of gnathostomulid collecting over the past quarter century. KIRSTEUER (1964, 1969a, 1969b, 1970) recorded species from Venezuela, Barbados and the Bahamas; RIEDL (1969, 1970a, 1970b, 1971a, 1971b) from North Carolina and Florida; FARRIS (1973, 1977) from North Carolina and Bermuda; STERRER & FARRIS (1975) from Bermuda; and STERRER (1970a, 1971b, 1971c, 1973a, 1976, 1977, 1992) from North Carolina, Florida, Bermuda and Belize.

This paper summarizes and expands this work, relying on 1035 specimens of Gnathostomulida from 106 samples collected during the period 1968-1997 in the tropical and subtropical northwestern Atlantic, *i.e.*, the area between Bermuda, North Carolina, Florida, Belize, Panama and Puerto Rico. In addition, I had access to type material collected by ERNST KIRSTEUER in Barbados and the Bahamas, specimens collected by DÖRTE WESTPHALEN in Bermuda, and drawings made by RUPERT RIEDL and RICK FARRIS.

The 45 species treated here include 13 new species, with two new genera and one new family. An analysis of the global geographic distribution of Gnathostomulida is in preparation (STERRER, in prep.)

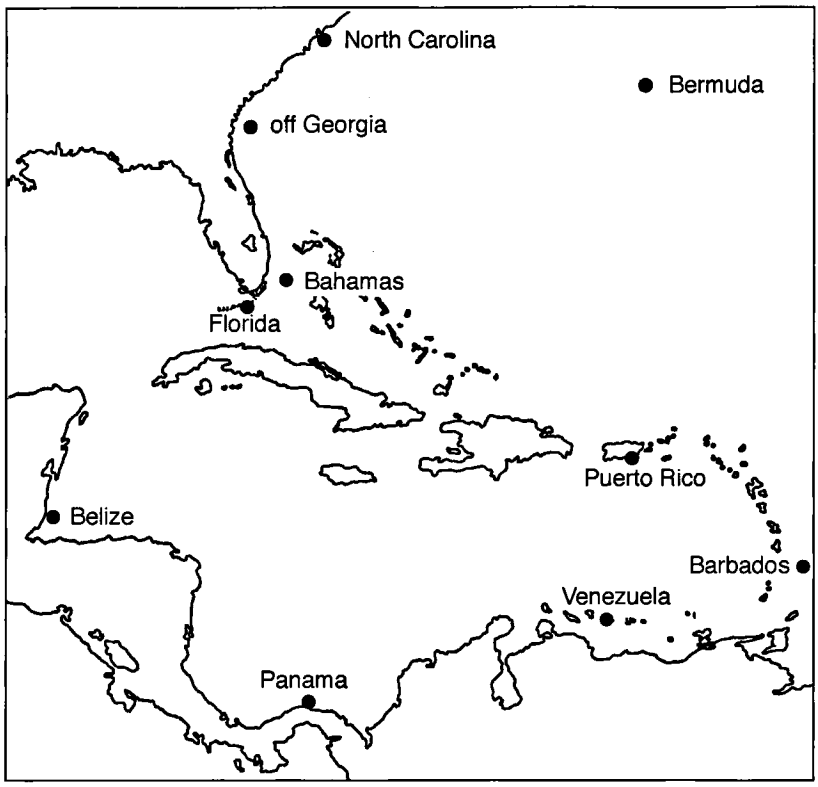


FIGURE 1. Localities in the (sub)tropical northwestern Atlantic where Gnathostomulida have been collected (*cf.* Tables 1 and 2).

LOCALITIES AND SAMPLES

Figure 1 shows the localities, and Table 1 lists the samples taken between 1968 and 1997 in North Carolina (NC), Bermuda (BDA), Georgia (GEO), Florida (FLO), Belize (BZE), Puerto Rico (PR) and Panama (PAN) that yielded Gnathostomulida which were subsequently analyzed and described in this paper. It omits the many more samples from which Gnathostomulida were extracted but not further studied, or which did not contain members of the phylum. Localities with a high gnathostomulid diversity were sampled repeatedly when possible. These are briefly summarized in the following, as being typical of gnathostomulid biota.

TABLE 1

NUMBERS, LOCALITIES AND DATES OF SAMPLES TAKEN IN THE (SUB)TROPICAL NORTHWESTERN ATLANTIC WHICH PRODUCED SPECIMENS OF GNATHOSTOMULIDA FOR THIS PAPER (*cf.* Fig. 1)

Sample #	Locality	Detail	Date	Sediment	Depth	Species	Specimens
	N. CAROLINA						
5	Wrightsville Beach	intracoastal waterway	2/1/1968	fine sand	intertidal	1	1
19	Wrightsville Beach	intracoastal waterway	4/1/1968	fine sand	intertidal	1	1
57	Wrightsville Beach	intracoastal waterway	10/10/1968	medium sand, upper cm	0.3 m	1	1
58	Wrightsville Beach	intracoastal waterway	10/10/1968	medium sand, 2-3.5cm below surface	0.3 m	3	9
59	Wrightsville Beach	intracoastal waterway	10/10/1968	coarse shell, 3-5cm below surface	supratidal pool	1	7
60	Wrightsville Beach	intracoastal waterway	10/10/1968	fine sand with detritus, 0-1cm below sand surface	intertidal	1	2
61	Wrightsville Beach	intracoastal waterway	10/10/1968	fine sand with detritus, 2.5-5cm below sand surface	intertidal	11	49
62	Wrightsville Beach	intracoastal waterway	10/10/1968	fine sand with detritus, 7.5-12.5cm below sand surface	intertidal	2	2
64	Wrightsville Beach	intracoastal waterway	10/10/1968	fine sand with detritus	intertidal	1	3
66	Wrightsville Beach	intracoastal waterway	11/6/1968	fine sand with detritus	0.6 m	1	1
70.1	Wrightsville Beach	intracoastal waterway	11/6/1968	fine sand with detritus, 0-0.5cm below sand surface	intertidal	1	3
70.2	Wrightsville Beach	intracoastal waterway	11/6/1968	fine sand with detritus, 0.5-1cm below sand surface	intertidal	2	3
70.3	Wrightsville Beach	intracoastal waterway	11/6/1968	fine sand with detritus, 1-2cm below sand surface	intertidal	4	6
70.4	Wrightsville Beach	intracoastal waterway	11/6/1968	fine sand with detritus, 2-3cm below sand surface	intertidal	4	10
70.6	Wrightsville Beach	intracoastal waterway	11/6/1968	fine sand with detritus, 4-5.5cm below sand surface	intertidal	1	2
70.10	Wrightsville Beach	intracoastal waterway	11/6/1968	fine sand with detritus, 11-13cm below sand surface	intertidal	1	1
76	34°45'N, 75°45'W	R/V EASTWARD Station 11030	11/25/1968	clean coarse sand with shell fragments	41 m	2	9
79	34°25'N, 76°13'W	R/V EASTWARD Station 10999	11/27/1968	clean coarse sand with shell fragments	31 m	3	4
111	Wrightsville Beach	intracoastal waterway	1/30/1969	fine sand with detritus		2	7
126(=E3)	R/V EASTWARD	off Morehead City	3/18/1969	sand		3	8
127(=E4)	R/V EASTWARD	off Morehead City	3/18/1969	sand	130 m	1	1
B1	Morehead City	Pine Knoll Shores	3/1/1969	medium sand		1	6
E	Morehead City	harbor turning basin	4/26/1969	medium sand	15 m	2	3
Pine KS	Morehead City	Pine Knoll Shores	2/12/1974	very fine sand with detritus	intertidal	2	10
24302	34°07.3'N, 75°57.7'W	R/V EASTWARD Station 24302	5/1/1974	fine sand	400 m	2	3
	BERMUDA						
17	Three Hill Shoals	below patch reef	11/27/1971	medium sand with much silt	10 m	2	2
18	Harrington Sound	between Trunk Island and Rabbit Island	2/7/1972	fine, muddy sand with detritus	3-4 m	3	3
25	Harrington Sound	between Trunk Island and Rabbit Island	4/28/1972	fine, muddy sand with detritus	3-4 m	7	13
28	Tucker's Town Cove	above sand bar	6/7/1972	fine, muddy sand with black layer	intertidal	1	1
29	Tucker's Town Cove	above sand bar	6/7/1972	fine, muddy sand with black layer	intertidal	4	7
54.3	Tucker's Town Cove	above sand bar	12/15/1972	fine sand with detritus	intertidal	3	33
54.5	Tucker's Town Cove	above sand bar	12/15/1972	fine sand with detritus	intertidal	1	1
61	Bailey's Bay	E side	2/1/1973	medium sand with detritus	0.5 m	1	2
70	Harrington Sound	between Trunk Island and Rabbit Island	4/30/1973	fine sand with detritus	4-5 m	1	1
TTX	Tucker's Town Cove	above sand bar	5/1/1973	fine sand with detritus	intertidal	1	4
EoN	Castle Harbour	E of Nonsuch Island, sand patch in Thalassia	11/9/1973	fine sand	1 m	1	1
111	Castle Harbour	E of Castle Roads, sand patch in Thalassia	8/21/1975	fine sand	3 m	2	10
117	Harrington Sound	Church Bay	9/3/1975	medium sand	2 m	1	1
119	Flatts Inlet	S of railway pillars	9/3/1975	medium sand with detritus	1-2 m	1	1
120	Flatts Inlet	N of railway pillars	9/3/1975	medium sand with detritus	2-3 m	1	3
126	Harrington Sound	Church Bay	11/19/1975	fine sand with detritus	4 m	4	44
127	Flatts Inlet	W of railway pillars	11/19/1975	consolidated medium sand with detritus	1 m	6	47
128	Shelly Bay	NW of old chimney	11/19/1975	heterogeneous shell gravel with silt	6 m	3	30
129	Harrington Sound	NW beach of Trunk Island	11/19/1975	fine gray sand	1 m	3	33
130	Flatts Inlet	Gibbons Bay	11/19/1975	medium sand with detritus	3 m	2	18
131	Castle Harbour	E of Nonsuch Island, sand patch in Thalassia	11/29/1975	fine sand	2 m	4	41
132	Castle Harbour	W of Nonsuch Island, sand patch in Thalassia	11/29/1975	consolidated sand	2 m	2	22
133	Bailey's Bay	E side	12/1/1975	medium sand	0.5 m	1	1
134	Harrington Sound	between Trunk Island and Rabbit Island	12/10/1975	fine sand with detritus	3 m	4	20
135	Harrington Sound	between Trunk Island and Rabbit Island	12/10/1975	fine sand with detritus	3 m	6	30
136	Tucker's Town Cove	below sand bar	12/17/1975	fine sand with detritus	1 m	2	33
137	Tucker's Town Cove	above sand bar	12/17/1975	fine sand with detritus	intertidal	3	27
D4A	Castle Harbour	E of Nonsuch Island, sand patch in Thalassia	6/1/1989	fine sand	1 m	2	2
D5B	Castle Harbour	E of Nonsuch Island, sand patch in Thalassia	6/1/1989	fine sand	1 m	3	5

D7D	Castle Harbour	E of Nonsuch Island, sand patch in Thalassia	6/1/1989	fine sand	1 m	1	2
94.01	Castle Harbour	E of Nonsuch Island, sand patch in Thalassia	7/30/1994	fine sand	1 m	1	1
94.05	W of North Rock	sand patch on patch reef	8/16/1994	silty sand	5 m	2	2
94.06	W of North Rock	sand patch on patch reef	8/16/1994	silty sand	3 m	3	8
94.07	W of North Rock	between patch reefs	8/16/1994	sand on mud in Thalassia	2 m	1	1
	GEORGIA						
50m	R/V EASTWARD	off Georgia	10/8/1973	sand	50 m	3	5
	FLORIDA						
F1	Tarpon Springs	small sound	12/19/1968	fine sand with detritus	0.3 m	1	2
F6	Titusville	Indian River	12/21/1968	fine sand with silt	intertidal	1	1
F8	Lower Matecumbe Key	south side	12/28/1968	fine sand with detritus	intertidal	8	12
F10	Ohio Key	SE	12/28/1968	fine gray sand in seagrass	0.4 m	1	1
F14	Big Pine Key	beneath a patch reef	12/29/1968	fine sand	3 m	5	27
F15	Big Pine Key	beneath a patch reef	12/29/1968	clean coarse sand	0.5 m	9	53
	PUERTO RICO						
95.01	SE coast	SW of Maunabo	5/4/1995	fine sand between Thalassia in back reef	0.5 m	7	27
95.04	N coast	Playa de Vega Baja	5/6/1995	coarse siliceous sand in sheltered bay	1 m	3	6
	BELIZE						
75.9	Carrie-Bow Cay	sand trough in forereef	12/28/1974	medium-fine sand with Halimeda	20 m	1	1
84	Carrie-Bow Cay	sand trough in forereef	12/4/1984	fine sand with detritus	30 m	3	11
91.1	Coco Plum Cay	boat channel	4/3/1991	fine sand with little silt	1 m	2	14
91.3	Twin Cays	off West Bay	4/3/1991	heterogeneous sand with rubble	1 m	6	29
91.4	Carrie-Bow Cay	large sand patch in Thalassia, NW	4/3/1991	sand with silt	5 m	4	4
91.5	Carrie-Bow Cay	sand strip between back reef and Thalassia	4/4/1991	fine to medium sand with silt	5 m	4	5
91.6	Carrie-Bow Cay	large sand patch of short Thalassia, N	4/4/1991	medium to coarse sand	5 m	8	13
91.7	Carrie-Bow Cay	back reef area, N	4/4/1991	sand with reef rubble	2 m	2	2
91.8	Twin Cays, N of West Bay	sand strip between Rhizophora and Thalassia	4/6/1991	very fine sand with silt	0.2 m	1	2
91.9	Twin Cays, N of West Bay	sand with sparse Thalassia	4/6/1991	medium sand	1 m	3	5
91.10	Carrie-Bow Cay	south channel	4/7/1991	fine sand with ripple marks	6 m	3	5
91.11	Twin Cays	off West Bay	4/11/1991	heterogeneous sand with sparse Thalassia	1 m	5	15
91.12	Twin Cays	off West Bay	4/11/1991	fine, clean sand between Rhizophora roots	0.5 m	9	26
91.13	Twin Cays	off West Bay	4/15/1991	sand in Thalassia, a few meters off Rhizophora roots	1 m	3	5
91.14	Twin Cays	S of West Bay	4/15/1991	sand between Rhizophora roots	intertidal	1	4
91.18	Carrie-Bow Cay	large sand patch in back reef, N	4/17/1991	heterogeneous coarse sand with silt	3 m	2	6
91.19	Carrie-Bow Cay	large sand patch in back reef, N	4/17/1991	heterogeneous coarse sand with silt	4 m	1	1
91.20	Bread&Butter Cay	between two mangrove cays	4/18/1991	muddy sand between Thalassia and Halimeda	1 m	5	7
91.21	Southern Sandbores	near bottom of slope of sandbore	4/18/1991	heterogeneous sand with silt	9 m	7	22
91.23	Carrie-Bow Cay	sand trough in forereef	4/19/1991	fine sand	33 m	2	2
91.25	Southern Sandbores	near bottom of slope of sandbore	4/23/1991	heterogeneous sand with silt	9 m	1	1
92.2	Carrie-Bow Cay	near patch reef P 109, NW	5/3/1992	medium-fine sand	6 m	2	2
92.5	Southern Sandbores	near bottom of slope of sandbore	5/4/1992	sand with silt	5 m	1	1
92.4	Southern Sandbores	near bottom of slope of sandbore	5/4/1992	muddy sand	7 m	2	2
94.2	Coco Plum Cay	E of overwash	5/5/1994	fine sand	0.5-1 m	2	2
94.3	Coco Plum Cay	W of overwash	5/5/1994	very fine sand	0.5-1 m	2	2
94.4	Twin Cays	off West Bay	5/5/1994	medium sand	1-2 m	4	4
94.7	Southern Sandbores	near bottom of slope of sandbore	5/6/1994	fine sand with shell fragments	10-15 m	1	1
94.8	Carrie-Bow Cay	between sandbores	5/6/1994	sand	3 m	1	1
94.9	Pelican Cays	off Cat Cay, small sand hole in reef	5/7/1994	heterogenous sand	2 m	8	17
94.13	Carrie-Bow Cay	W of channel reef, sand between reefs & Thalassia	5/9/1994	fine sand	4 m	1	1
94.15	Pelican Cays	south end of Manatee Cay	5/12/1994	medium to coarse sand with short Thalassia	1.5 m	6	15
94.17	Coco Plum Cay	off northern end	5/13/1994	fine sand in depression among Thalassia	1 m	1	1
94.19	Coco Plum Cay	S of channel, sand patch in Thalassia	5/13/1994	medium sand	1 m	1	1
97.4	Twin Cays	off West Bay	4/21/1997	sand between Rhizophora roots	1 m	1	1
	PANAMA						
118	Galeta Field Station	sand flat behind Thalassia	2/1/1969	fine sand	1 m	5	33
94.P3	San Blas Archipelago	NE of field station, sand behind a shallow reef	5/31/1994	medium sand	1-2 m	13	34
94.P4	San Blas Archipelago	NE of field station, sand bordered by Thalassia	5/31/1994	fine sand	3 m	1	1
Samples					**106**		
Species						**45**	
Specimens							**1035**

TABLE 2

SPECIES AND NUMBERS OF SPECIMENS OF GNATHOSTOMULIDA COLLECTED FOR THIS PAPER

(*cf.* Table 1 and Fig. 1)

Genus	species	Author	NC	BDA	GEO	FLO	PR	BZE	PAN	BAH*	BAR**	VEN***	Specimens
Order Filospermoidea													
Family Haplognathiidae													
Haplognathia	asymmetrica	Sterrer, 1991b	10	2				6	3				21
	belizensis	n. sp.						2					2
	gubbarnorum	(Sterrer, 1969)	10										10
	lunulifera	(Sterrer, 1969)	1					1					2
	rosea	(Sterrer, 1969)	7	5		3		11					26
	ruberrima	(Sterrer, 1966)	18	6		3	2	15	5	+			49
Family Pterognathiidae													
Cosmognathia	aquila	n. sp.		3		1		20	6				30
	arcus	Sterrer, 1991a		6		1	1	1					9
	manubrium	Sterrer, 1991b		1			7	3	2				13
Pterognathia	alcicornis	n. sp.						1					1
	crocodilus	Sterrer, 1991a	1	3		1		1					6
	ctenifera	Sterrer, 1969	6	13		1		7	2				29
	pygmaea	n. sp.	1										1
	sorex	Sterrer, 1966	3										3
	swedmarki	Sterrer, 1966						1					1
	ugera	Sterrer, 1991c		1			1	15	1				18
Order Bursovaginoidea													
Suborder Scleroperalia													
Family Agnathiellidae													
Agnathiella	beckeri	Sterrer, 1971				3							3
	sp.	Sterrer, 1971	1										1
Family Clausognathiidae													
Clausognathia	suicauda	Sterrer, 1992						11	1				12
Family Gnathostomariidae													
Gnathostomaria	lutheri	Ax, 1956	8										8
Family Mesognathariidae													
Mesognatharia	bahamensis	Kirsteuer, 1969								+			0
	eastwardiae	n. sp.	4		1								5
Labidognathia	longicollis	Riedl, 1970a	15			1	5	8	5				34
Tenuignathia	rikerae	Sterrer, 1976	15	170		2		17	3				207

Genus	species	Author	NC	BDA	GEO	FLO	PR	BZE	PAN	BAH*	BAR**	VEN***	Specimens
Family Onychognathiidae													
Onychognathia	filifera	Riedl, 1971	1			6							7
	rhombocephala	n. sp.	1					16	1				18
Vampyrognathia	horribilis	n. g., n. sp.				15							15
	minor	n. sp.	4										4
Nanognathia	exigua	Sterrer, 1973	2			21							23
Family Problognathiidae													
Problognathia	minima	Sterrer & Farris, 1975	40										40
Family Paucidentulidae													
Paucidentula	anonyma	n. g., n. sp.						7					7
Family Gnathostomulidae													
Semaeognathia	sterreri	Riedl, 1970b	11			2							13
Gnathostomula	axi	Kirsteuer, 1964				11	4	10	7	+	+	+	32
	brunidens	Riedl, 1971c	+										
	jenneri	Riedl, 1971c	1										1
	mediocristata	Riedl, 1971c	+										
	microstyla	Riedl, 1971c	10										10
	nigrostoma	Riedl, 1971c	+										
	peregrina	Kirsteuer, 1969		130		3	1	11		+			145
	uncinata	n. sp.	2										2
Suborder Conophoralia													
Family Austrognathiidae													
Triplignathia	bathycola	n. sp.	1										1
Austrognathia	christianae	Farris, 1977	2	9	1	9	10	19	1				51
	microconulifera	Farris, 1977		44				11	12				67
Austrognatharia	hymanae	Kirsteuer, 1970									+		0
	kirsteueri	Sterrer, 1970	10										10
	medusifera	n. sp.				3		9	11				23
	sterreri	(Kirsteuer, 1969)		17				8	8	+			33
	stirialis	n. sp.	7			8							15
	strunki	Farris, 1973			3	2	2	19					26
	(?) sp.							1					1
Total species			**29**	**15**	**3**	**19**	**9**	**26**	**15**	**5**	**2**	**1**	**50**
Total specimens			**152**	**450**	**5**	**96**	**33**	**231**	**68**				**1035**

*Kirsteuer 1969
**Kirsteuer 1970
***Kirsteuer 1964

In North Carolina the principal locality, first explored by R. RIEDL in 1967 and subsequently also sampled by myself, was a set of sheltered intertidal fine-sand flats (locally called 'mud flats') located near Wrightsville Beach, north of Wilmington, NC. As described by RIEDL (1970b) such flats, which are often bordered by *Spartina* beds and which in some cases have large populations of the prosobranch *Nassarius obsoletus*, are typical of the sounds or inshore waterways along the US east coast, where sheltered conditions meet relatively high water exchange by tidal currents.
Wrightsville Beach 'mud flats' are the type locality for *Labidognathia longicollis* Riedl, 1970a; *Semaeognathia sterreri* Riedl, 1970b; and contained several other species (STERRER 1970a; RIEDL 1971a; RIEDL 1971b). These localities produced NC samples 19, 57-62, 64, 66, 70, 111, B1 and PKS. Samples 70.1 to 70.15 represented a vertical sediment profile of the main locality ('Ann McCrary's mud flat'), with 70.1 being the superficial sand layer (0-0.5 cm), and 70.15 the deepest (40-50 cm); not all contained gnathostomulids (see RIEDL 1971a: 242). Another set of samples was dredged by R/V EASTWARD on the continental shelf, mostly on training cruises (samples 76, 79, 126 and 127), as was the only sample from Georgia ('off Georgia'). NC sample 24302 comes from a R/V EASTWARD cruise specifically dedicated to deepwater meiofauna collecting (COULL 1977).

In Bermuda, repeated sampling concentrated on three inshore locations. Tucker's Town Cove (samples 28, 28, 54.3, 54.45, TTX, 136, 137) is one of Bermuda's few sheltered intertidal fine-sand flats. It produced the type specimens of *Problognathia minima* Sterrer & Farris, 1975; *Tenuignathia rikerae* Sterrer, 1976; and *Austrognathia microconulifera* Farris, 1977. The ecology and ecophysiology of Tucker's Town Cove meiofauna and some macrofauna has been studied, among others, by WIESER *et al.* (1974), OTT (1977), WIESER & SCHIEMER (1977), and HARTWIG *et al.* (1978). A second set of samples (18, 25, 70, 129, 134, 135) comes from the 2-3 m deep sandy shallows between Trunk Island and Rabbit Island in Harrington Sound. The third repeatedly sampled location (samples EoN, 131, 94.01) is shallow subtidal (1-2 m) sand in a patch of *Thalassia testudinum*, just off the north beach of Nonsuch Island. The same site was used by WESTPHALEN (1993) in her study of the meiofauna of stromatolitoid nodules, which produced samples D4A, D5B and D7D.

The most species-rich Florida samples (F14, F15) were collected near patch reefs off Big Pine Key, and yielded the type specimens of *Agnathiella beckeri* Sterrer, 1971, *Onychognathia filifera* Riedl, 1971, and *Nanognathia exigua* Sterrer, 1973. This is also the type locality of *Austrognatharia strunki* Farris, 1973.

Located on the barrier reef off Dangriga, Belize, and operated by the Smithsonian Institution, the field station of Carrie Bow Cay (RÜTZLER & MACINTYRE 1982) was the site of extensive gnathostomulid collecting between 1974 and 1997. A total of 25 species of Gnathostomulida was recorded, to date the largest number from such a small geographic area. Most samples came from the vicinity of Carrie Bow Cay, either from shallow sand between patch reefs and *Thalassia* (91.4-91.7, 91.10, 91.13, 91.18, 91.19, 92.2, 94.13) or from deep sand troughs (75.9, 84, 91.23). The nearby mangrove island of Twin Cays was sampled repeatedly (samples 91.3, 91.8, 91.9, 91.11-91.14, 94.4, 97.4). Sand from the base of the Southern Sandbores (91.21, 91.25, 92.4, 92.5, 94.7, 94.8), curious cone-shaped islets within the lagoon, produced the type specimens of *Clausognathia suicauda* Sterrer, 1992.

From a brief visit to Puerto Rico in May 1995 I brought back to Bermuda four sand samples of which two (95.01 and 95.04) contained 9 species of gnathostomulids.

The Atlantic coast of Panama, finally, was sampled twice: in 1969 (sample 118), and again in 1994 (samples 94.3, 94.4). In both cases, Gnathostomulida were found in shallow subtidal sand between patch reefs.

MATERIAL AND METHODS

With few exceptions, sampling was qualitative rather than quantitative, with the aim to take back to the lab as much sediment from a promising locality as was practical, usually a bucket-full. In the intertidal and subtidal (where snorkeling or SCUBA were used), the upper 5 centimeters of sediment were simply scooped into a bucket by hand; only few samples were dredged from deeper bottoms. Sediment-filled buckets were taken to the lab with a little overlying seawater, and kept loosely covered to prevent evaporation.

Extraction of meiofauna follows a simple protocol. A day or two after collecting, the superficial layer of sediment, about 500 ml, is scooped up and transferred to a 2000 ml plastic Erlenmeyer or other wide-mouth flask. Magnesium chloride ($MgCl_2$) or magnesium sul-

fate (Epsom Salt, $MgSO_4$) is dissolved in freshwater, and a solution of the same density as seawater is prepared with the help of a hydrometer. About 1,000 ml of this solution is added to the sediment sample, and the flask is inverted once so that sediment and solution are well mixed.

After a 10-minute rest (to allow for animals to be anaesthetized) the flask is held upside down and vigorously agitated, then put upright just long enough to let the sand settle; the supernatant fluid, together with suspended fine particles (and anaesthetized meiofauna) is poured through a 63 µm monofilament plankton net, glued to a plexiglass ring of 9 cm diameter and 3 cm height. This procedure is repeated twice, the first time using the anaesthetic solution, the second time using seawater.

The extract retained on the net is rinsed with filtered seawater, then the sieve is placed upright (not emptied!) into a petri dish filled with enough seawater to cover the extract. After an hour, the sieve is transferred to an alternate petri dish, and the meiofauna that has crawled through the meshes of the sieve can be examined at the bottom of the first dish. If covered with a lid, this two-petri-dish sample can be examined repeatedly over days.

This simple method, which relies mostly on the negative phototaxis and positive geo- and thigmotaxis of most sediment-dwelling meiofauna, regularly produces large numbers not only of Gnathostomulida but also Ciliata, Turbellaria, Gastrotricha, Archiannelida, Nematoda, Harpacticoida, Mollusca etc. At the University of North Carolina at Chapel Hill, RUPERT RIEDL, REINHARD RIEGER and I used to keep loosely covered buckets of sediment in an airconditioned basement, occasionally adding a bit of freshwater to compensate for evaporation. Such samples, especially those dredged from deeper waters (50-100 m), not only continued to contain live meiofauna, but produced previously unseen species, such as the enigmatic Lobatocerebridae (RIEGER 1980), up to 2 years (!) after they had been collected.

Biometric data are given in tabular form for each species and each locality. Where necessary, especially in biometric tables, localities are abbreviated as follows: Bahamas BAH, Barbados BAR, Bermuda BDA, North Carolina NC, Georgia GEO, Florida FLO, Belize BZE, Puerto Rico PR, Panama PAN, Venezuela VEN.

The way in which specimens and species are analyzed and described follows STERRER (1991a). This includes the use of a relative scale of 100 units (U) for the body length, various indices for length-width ratios, and the mean (X), standard deviation (SD), maximum (Max), minimum (Min), and number (n) of measurements. Measurements are defined as follows:

Body length = from anterior to posterior tip, including a tail when present.
Body width = the greatest diameter.
Body index = body length divided by body width.
Rostrum length = from anterior tip to anterior edge of jaws.
Rostrum width = the greatest diameter of the rostrum.
Rostrum index = rostrum length divided by rostrum width.
Basal plate length = from the anterior-most to the posterior-most contour.
Basal plate width = the greatest width (including lateral wings but excluding muscles).
Basal plate index = basal plate length divided by basal plate width.
Jaw length = from the anterior tip to the posterior edge of the symphysis (but excluding caudal appendages).

Pharyunx bulb length = from caudal edge of jaw symphysis to caudal edge of pharynx bulb.
Sperm length = total length of sperm (including tail) or conulus (excluding surrounding matrix); in the case of conuli this measurement is taken of the three largest conuli per specimen.
Sperm width = the greatest diameter (in filiform sperm measured to the nearest 0.3 μm)
Sperm index = sperm length divided by sperm width.

Type specimens have been deposited with the U.S. National Museum of Natural History, Washington, D.C., USA (USNMNH).

TAXONOMIC DESCRIPTIONS

Order FILOSPERMOIDEA Sterrer, 1972

Family **HAPLOGNATHIIDAE Sterrer, 1972**

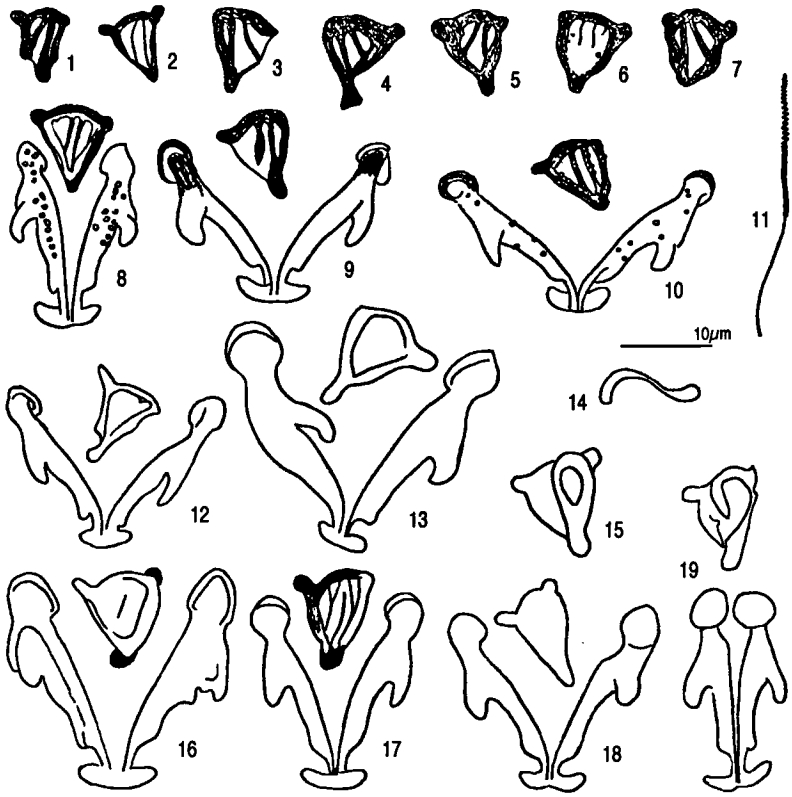
Haplognathia asymmetrica Sterrer, 1991

(Figs. 2-4; Table 3)

Material:
– North Carolina: 10 specimens (4 adults) from samples 61, 70.4, and E.
– Bermuda: One fragment and one juvenile from samples 25 and D4A.
– Belize: 3 juveniles and 3 fragments from samples 91.1, 91.20 and 94.15.
Distribution: Hawaii (STERRER 1991b).

Organization and behaviour: Colourless-transparent. A juvenile BDA specimen measured 2300 µm in length and 50 µm in width at U 21.7 whereas the only adult (from NC) was just 1300 µm long and 30 µm wide at U 40.0 (body index 43.33). Its rostrum was pointed, 165.0 µm long and 26.0 µm wide at U 8.8 (index 6.56).

Digestive tract: In all 18 specimens the basal plate was asymmetric; in some conspicuously so (*e.g.*, Fig. 2.4), in others only slightly (Fig. 2.8). Most basal plates have one of the rostro-lateral knobs missing or greatly reduced, but even in those that lack prominent knobs, *e.g.*, most of the NC specimens, the internal longitudinal ridges deviate from bilateral symmetry. Basal plate measurements range from 12.00 µm long and 9.50 µm wide (BZE) to 11.50 µm by 9.00 µm (BDA) and 9.20 µm by 7.70 µm (NC). The jaws are toothless, their anterior edges reinforced and rounded like kneecaps. Of the 10 NC specimens, 6 had jaws with varying degrees of grainy deterioration (Figs. 2.8, 2.10, 4.1) which was not observed in the two other localities. Measured jaw lengths ranged from 18µm to 26µm, with means from 24.00 µm (BDA) to 23.00 µm (BZE) and 21.30 µm (NC). The pharynx bulb (Fig. 3) is 3-7 (4.50) µm long.



FIGURES 2.1-2.19. *Haplognathia asymmetrica.* 2.1-2.7: Basal plates of NC specimens; 2.8-2.10: Basal plate and jaws of NC specimens; 2.11: Sperm of a NC specimen; 2.12-2.13: Basal plate and jaws of BDA specimens; 2.14. Left lateral view of basal plate of BZE specimen; 2.15: Basal plate of BZE specimen; 2.16-2.19: Basal plate and jaws of BZE specimens. – All to the same scale.

Male system: Testes and vasa deferentia are paired. Sperm was observed in 5 NC specimens (Fig. 2.11). The head is 8-12 (9.40) µm long and strongly spiralized. It grades into a 4-9 (7.00) µm long middle piece which fairly well-delimited from a 30-63 (31.80) µm long tail. The shortest tail (30 µm) was measured in one instance of 'partner's sperm', *i.e.*, sperm found in the gut cells of a juvelile, which presumably had resulted from a copulation.

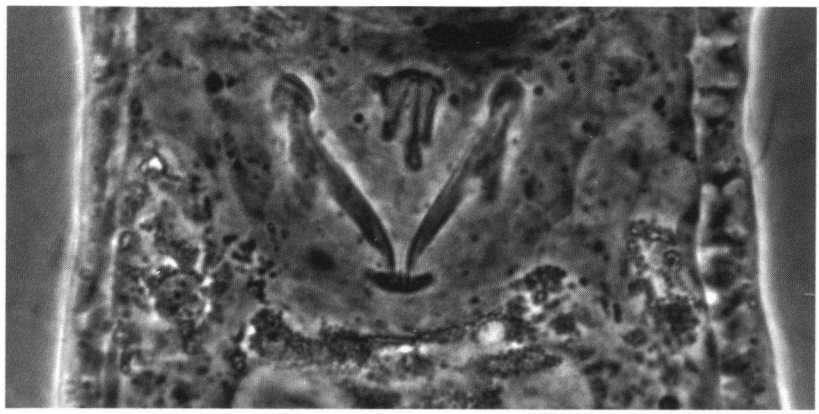
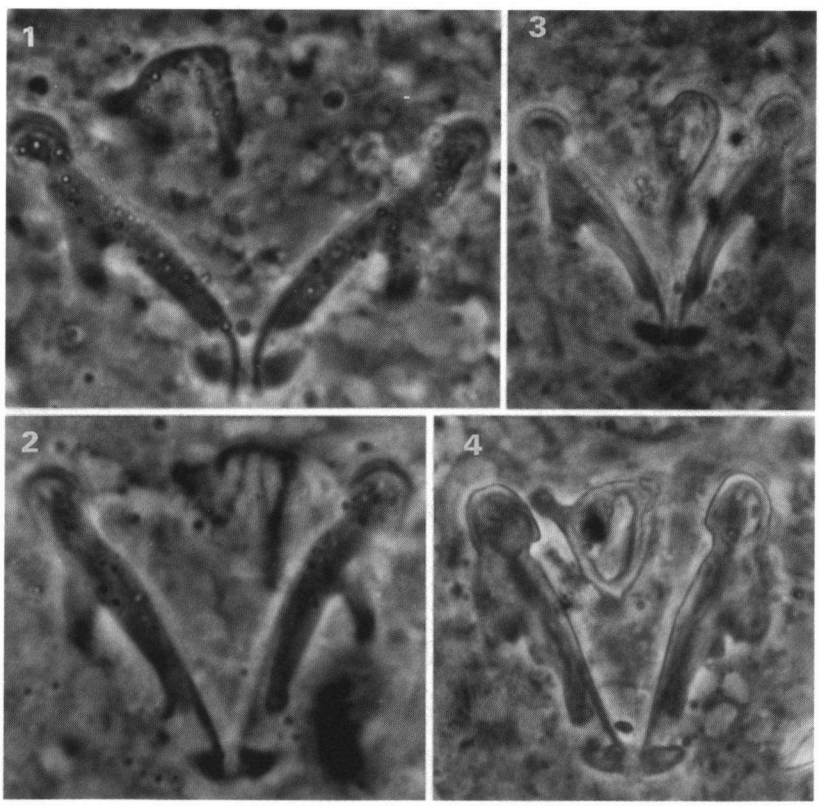


FIGURE 3. *Haplognathia asymmetrica.* Pharynx with basal plate and jaws of a NC specimen. – Phase contrast micrograph of live specimen.



FIGURES 4.1-4.4. *Haplognathia asymmetrica.* 4.1-4.2: Basal plate and jaws of NC specimens; 4.3-4.4: Basal plate and jaws of BZE specimens. – Phase contrast micrograph of live specimens.

TABLE 3

MORPHOMETRIC DATA FOR *HAPLOGNATHIA ASYMMETRICA*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	1300.00				1
Body width of adults	30.00				1
Body index of adults	43.33				1
Rostrum index of adults	6.56	1.97	7.95	5.17	2
Jaw length	21.30	1.34	23	18	10
Basal plate length	9.20	1.14	11	8	10
Basal plate width	7.70	0.67	9	7	10
Basal plate index	1.20	0.13	1.43	1.00	10
Sperm length	46.55	10.48	63	30	11
Sperm width	0.50	0.00	0.50	0.50	11
Sperm index	93.09	20.96	126.00	60.00	11

Bermuda	Mean	SD	Max	Min	n
Jaw length	24.00	2.83	26	22	2
Basal plate length	11.50	0.71	12	11	2
Basal plate width	9.80	0.00	9	9	2
Basal plate index	1.28	0.08	1.33	1.22	2

Belize	Mean	SD	Max	Min	n
Jaw length	23.00	0.00	23	23	6
Basal plate length	12.00	0.63	13	11	6
Basal plate width	9.50	1.05	11	8	6
Basal plate index	1.27	0.14	1.50	1.10	6

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	1300.00				1
Body width of adults	30.00				1
Body index of adults	43.33				1
Rostrum index of adults	6.56	1.97	7.95	5.17	2
Jaw length	21.93	1.73	26	18	14
Basal plate length	9.86	1.46	12	8	14
Basal plate width	8.14	0.95	10	7	14
Basal plate index	1.21	0.12	1.43	1.00	14
Sperm length	46.55	10.48	63	30	11
Sperm width	0.50	0.00	0.50	0.50	11
Sperm index	93.09	20.96	126.00	60.00	11

Discussion: The new records agree well with the original description from Hawaii (jaw length 25.67 µm, basal plate 12.00 µm by 8.50 µm). Sperm measurements of Hawaiian specimens were somewhat smaller (head 5 µm, middle piece 10 µm, tail 10-15 µm). The consistently asymmetric basal plate distinguishes this species from the closely related *H. simplex* (Sterrer, 1966).

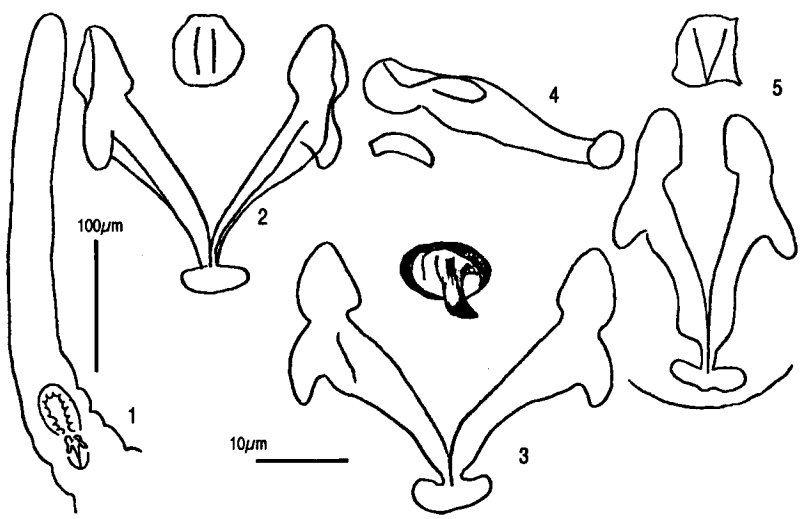
Haplognathia belizensis n. sp.

(Figs. 5-6; Table 4)

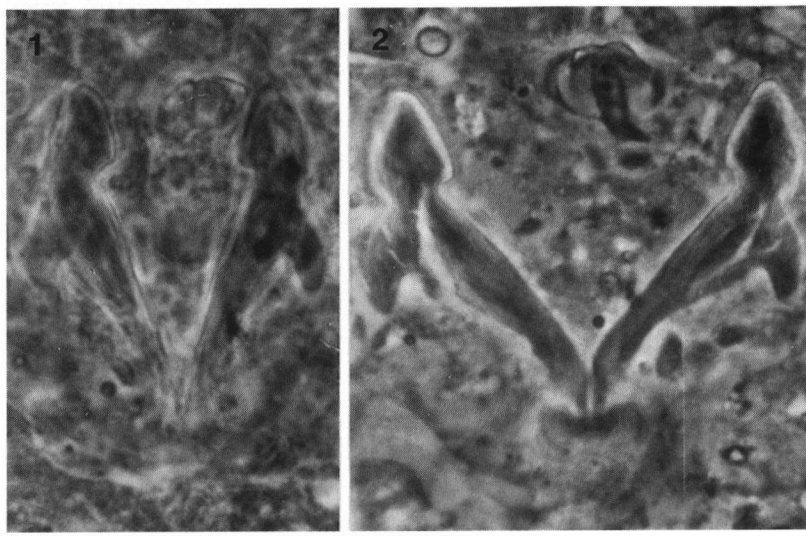
Holotype: One adult from Belize (sample 91.6) in squeeze preparation, USNMNH 178343.
Further material: One juvenile from the same sample.
Etymology: Found in Belize.
Distribution: Belize.

Diagnosis: Large, colourless *Haplognathia* with massive, toothless jaws (length 32.00 µm) and a delicate, square basal plate (length 9.00 µm, width 9.00 µm; index 1.01).

Organization and behaviour: Colourless-opaque, slow-moving. The adult was 3,600 µm long and 90 µm wide at U 36.1 (body index 40.0), whereas the juvenile measured 1550 µm by 100 µm at U 64.5. Rostrum (Fig. 5.1) slender, 335 µm long by 55 µm wide at U 8.3 in the adult (rostrum index 6.09).



FIGURES 5.1-5.5. *Haplognathia belizensis*. 5.1: Rostrum; 5.2: Basal plate and jaws; 5.3: Basal plate and jaws of same specimen, more strongly squeezed; 5.4: Basal plate and jaws of same specimen, left lateral view; 5.5: Basal plate and jaws of second specimen (holotype). – All to the same scale.



FIGURES 6.1-6.2. *Haplognathia belizensis*. 6.1: Basal plate and jaws of holotype; 6.2: Basal plate and jaws of a second specimen. – Phase contrast micrographs of live specimens.

Digestive tract: The basal plate is not well-defined and easily destroyed by squeezing. It is squarish, 9.00 µm by 9.00 µm (index 1.01), with two longitudinal ridges. The jaws appear dark brown-opaque in phase contrast. They are 32.00 µm long, compact, toothless, with nearly straight rostro-medial edges and a broad symphysis. Rostral apophyses are short and curved; caudal apophyses are not prominent. The pharynx measures 3 µm behind the symphysis.

Male system: Testes and vasa deferentia are paired and converge in a rosette-shaped, subterminal male genital pore.

TABLE 4

MORPHOMETRIC DATA FOR *HAPLOGNATHIA BELIZENSIS*

Belize	Mean	SD	Max	Min	n
Body length of adults	3600.00				1
Body width of adults	90.00				1
Body index of adults	40.00				1
Rostrum index of adults	6.00				1
Jaw length	32.00	0.00	32	32	2
Basal plate length	9.00	0.00	9	9	2
Basal plate width	9.00	1.41	10	8	2
Basal plate index	1.01	0.16	1.13	0.90	2

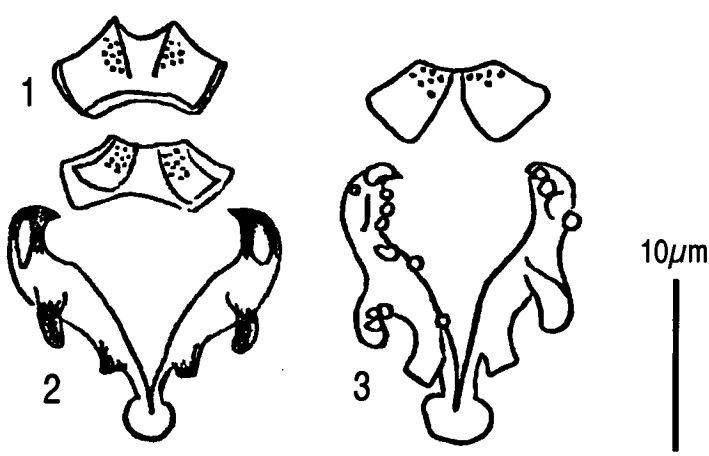
Discussion: Although known by only two specimens this species is sufficiently distinct to merit separate status. It is the largest species not only in the genus, but in the entire phylum. The large jaws closely resemble those of *H. simplex* (Sterrer, 1966) and *H. asymmetrica* Sterrer, 1991, but are more angular, with the rostral apophyses set more rostrally, and the rostro-medial edges long and straight rather than rounded. The basal plate, on the other hand, is not robust and deltoidal as in these species but most closely matches that of *H. rosea* (Sterrer, 1969), at least in its square outline and delicacy.

Haplognathia gubbarnorum (Sterrer, 1969)

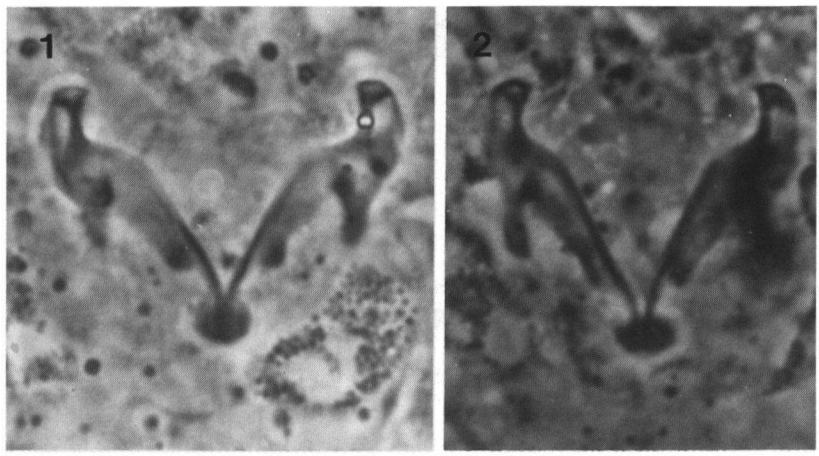
(Figs. 7.1-7.3, 8.1-8.2; Table 5)

Synonyms: *Pterognathia gubbarnorum* Sterrer, 1969,
Haplognathia lyra Sterrer, 1970.
Material: North Carolina: 11 specimens (3 adults) from sample 61.
Distribution: North Sea, Irish Sea, Adriatic (STERRER 1969).

Table 5 summarizes the material used for the description of *H. lyra.*



FIGURES 7.1-7.3. *Haplognathia gubbarnorum.* 7.1: Basal plate of a NC specimen; 7.2-7.3: Basal plate and jaws of two other NC specimens.



FIGURES 8.1-8.2. *Haplognathia gubbarnorum.* Basal plate and jaws of NC specimens.

TABLE 5

MORPHOMETRIC DATA FOR *HAPLOGNATHIA GUBBARNORUM*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	1030.00				1
Body width of adults	35.00				1
Body index of adults	29.43				1
Rostrum index of adults	5.75				1
Jaw length	16.80	1.03	18	15	10
Basal plate length	5.17	0.75	6.00	4.00	6
Basal plate width	10.17	0.75	11	9	6
Basal plate index	0.51	0.09	0.6	0.4	6
Sperm length	23.17	1.47	25	21	6
Sperm width	0.50	0.00	0.5	0.5	6
Sperm index	46.33	2.94	50	42	6

Discussion: As I stated in the original description of *Haplognathia lyra* "(this species) is very similar to *H. gubbarnorum* forma typica in most respects" (STERRER 1970a). Having separated *H. lyra* from *H. gubbarnorum* on the strength of their geographic rather than taxonomic distance I now consider the small differences in jaw length (16.8 µm in *H. lyra* versus 20.6 µm in *H. gubbarnorum* f. typica) as insufficient for maintaining a separate species.

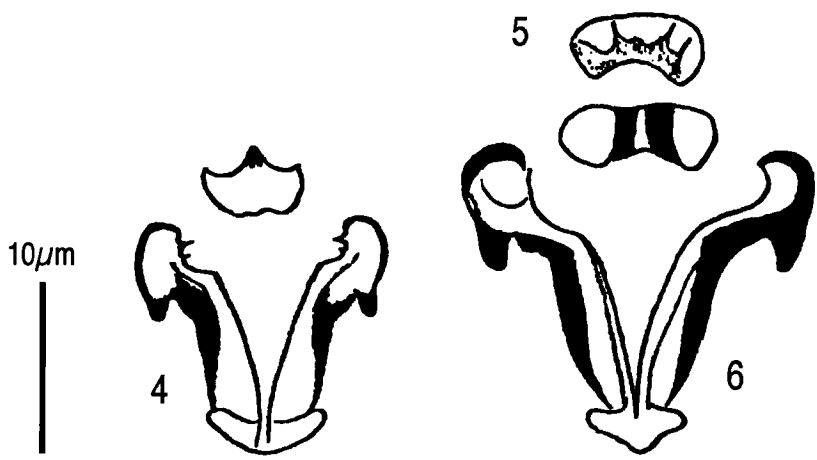
Haplognathia lunulifera (Sterrer, 1969)

(Figs. 7.4-7.6, 8.3-8.4; Table 6)

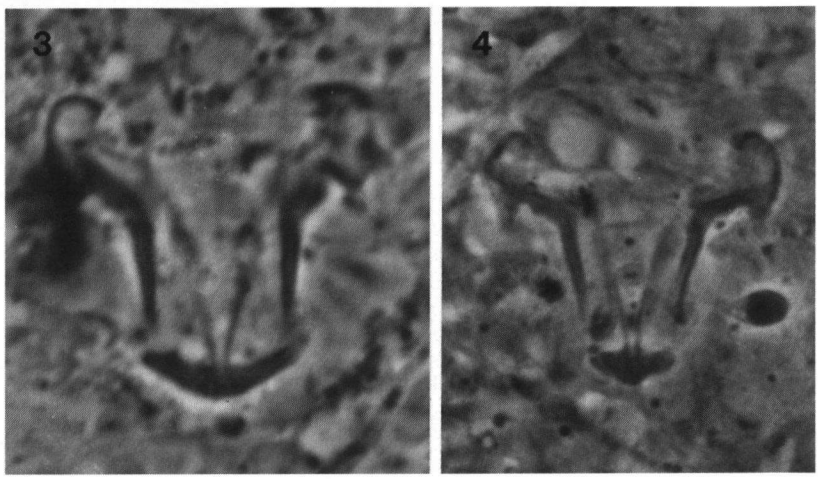
Synonyms: *Pterognathia lunulifera* Sterrer, 1969.
Material:
- North Carolina: One juvenile from sample 58.
- Belize: One anterior fragment from sample 91.6.
Distribution: North Sea, Irish Sea (Sterrer 1969).

Organization and behaviour: Body colourless-transparent.

Digestive tract: The NC specimen had a basal plate with a pointed rostral outline (Fig. 7.4); in the Belize specimen the basal plate rostral outline was slightly convex (Fig. 7.5). The jaws in the NC specimen showed two delicate teeth whereas the Belize specimen had but one short, blunt tooth.



FIGURES 7.4-7.6. *Haplognathia lunulifera*. 7.4: Basal plate and jaws of a NC specimen; 7.5: Basal plate of a Belize specimen; 7.6: Basal plate and jaws of the same specimen, more strongly squeezed. – All to the same scale.



FIGURES 8.3-8.4. *Haplognathia lunulifera*. 8.4: Jaws of NC specimen; 8.4: Jaws of BZE specimen. – Phase contrast micrographs of live specimens.

TABLE 6

MORPHOMETRIC DATA FOR *HAPLOGNATHIA LUNULIFERA*

North Carolina	Mean	SD	Max	Min	n
Jaw length	15.00				1
Basal plate length	4.00				1
Basal plate width	6.00				1
Basal plate index	0.67				1
Belize	**Mean**	**SD**	**Max**	**Min**	**n**
Jaw length	21.00				1
Basal plate length	4.00				1
Basal plate width	10.00				1
Basal plate index	0.40				1
ALL DATA	**Mean**	**SD**	**Max**	**Min**	**n**
Jaw length	18.00	4.24	21	15	2
Basal plate length	4.00	0.00	4	4	2
Basal plate width	8.00	2.83	10	6	2
Basal plate index	0.53	0.19	0.67	0.40	2

Discussion: Despite the small jaws of the NC specimen, both records can readily be assigned to this species, previously known from Sweden and N. Ireland (basal plate 6.7 µm by 7.7 µm, jaw length 20.2 µm). The species is easily recognized by its jaw architecture, especially the very short rostral apophyses and the uniquely elongated, gutter-shaped caudal apophyses.

Haplognathia rosea (Sterrer, 1969)

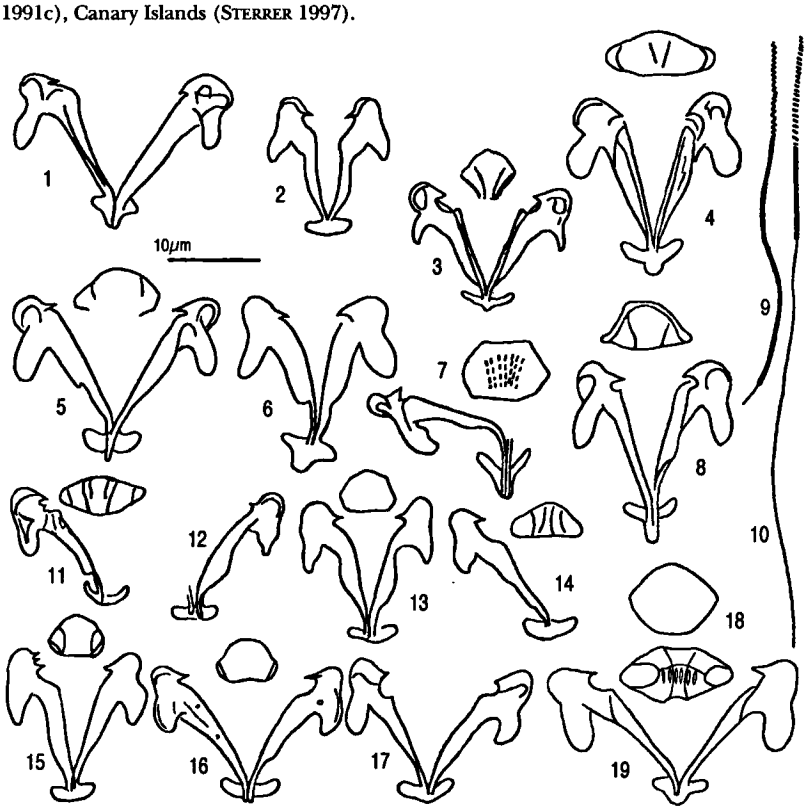
(Figs. 9-11; Table 7)

Synonyms: *Pterognathia rosea* Sterrer, 1969; *Haplognathia rosacea* Sterrer, 1970; *Haplognathia rosacea* in Sterrer (1972); *Haplognathia rosacea* in Sterrer (1985); *Haplognathia* cf. *rosacea* in Sterrer (1986).

Material:

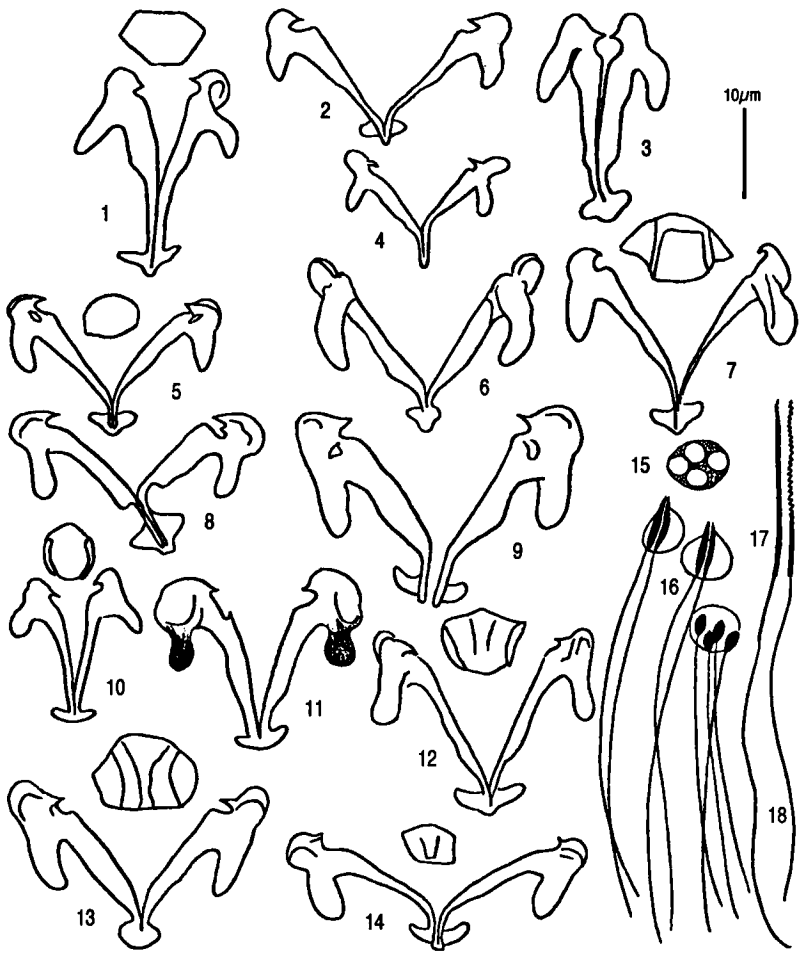
- North Carolina: 11 specimens (3 adults) from samples 61, 70.2, 70.4, 70.6 and 70.10.
- Bermuda: 5 juveniles from samples 17, 28, 29, 119 and 133.
- Florida: 3 anterior fragments from samples F8 and F10.
- Belize: 12 specimens (3 adults) from samples 84, 91.3, 91.9, 91.10, 91.21, 91.25, 94.4 and 94.19.
- Panama: 3 specimens (1 adult, 2 anterior fragments) from samples 94.P3 and 94.P4.

Distribution: North Sea, Irish Sea (STERRER 1969), Fiji (STERRER 1991a), Tahiti (STERRER 1991c), Canary Islands (STERRER 1997).

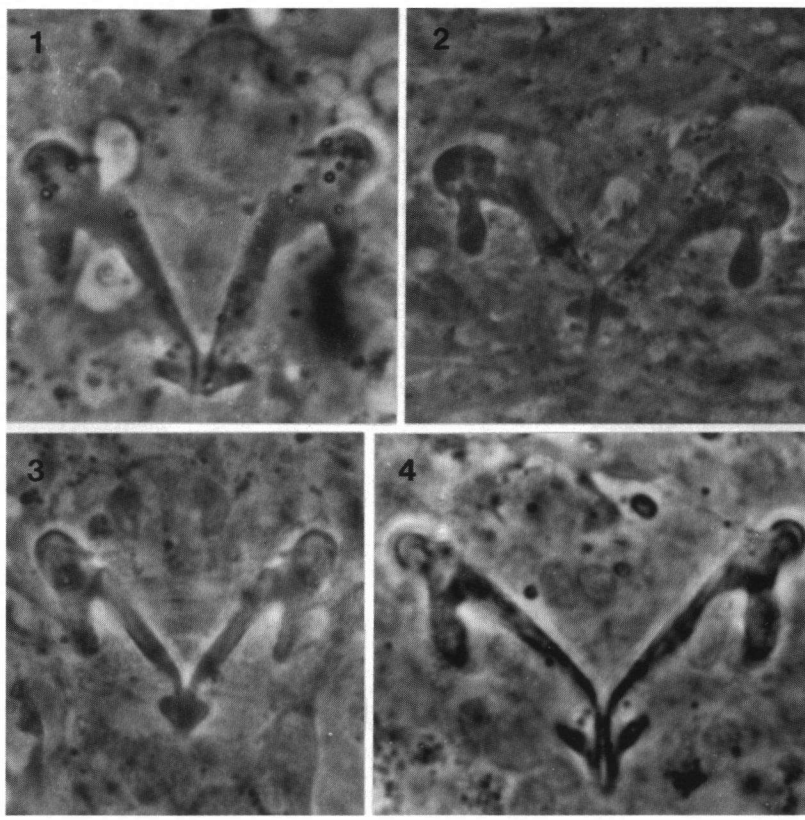


FIGURES 9.1-9.19. *Haplognathia rosea*. Basal plates, jaws and sperm. 9.1-9.3: FLO specimens; 9.4-9.8: BDA specimens; 9.9-9.19: NC specimens. – All to the same scale.

Emend. diagnosis: Crimson, pink or colourless *Haplognathia* with 15-23 µm long jaws whose rostral apophyses are horn-like and short, less than half as long as the jaws (index 0.50 or smaller). Jaws with one strong tooth. Basal plate small, 3-8 µm long and 4-12 µm wide, vertically sculpted, with longitudinal ridges but without thorns.



FIGURES 10.1-10.18. *Haplognathia rosea*. Basal plates, jaws and sperm. 10.1-10.3: PAN specimens; 10.4-10.18: BZE specimens; 10.15-10.17: Spermiogenesis stages from the same BZE specimen. – All to the same scale.



FIGURES 11.1-11.4. *Haplognathia rosea.* Basal plates and jaws. 11.1: NC specimen; 11.2-11.3: BZE specimens; 11.4: BDA specimen. – Phase contrast micrographs of live specimens.

Organization and behaviour: Adults to 2500 µm long and 60 µm wide at U 35 (index 41.34). Rostrum pointed, 145-220 µm long and 25-35 µm wide at U 6 (index 6.13-6.56). Body crimson, or pale pink to colourless-translucent; in many specimens the colouration is uneven, with the rostrum frequently blotchy, and the tip colourless.

Digestive tract: The basal plate is delicate, and difficult to resolve. It measures 3-8 µm in length and 4-12 µm in width (index 0.67). Its outline changes, possibly in response to squeezing, from trapezoidal to broadly triangular; in its most typical configuration (Figs. 9.15, 16) it is somewhat

hexagonal, with reinforced lateral edges, and often with two pairs of longitudinal ridges. The basal plate never carries teeth or thorns, except in one specimen which combined typical *H. rosea* jaws (Fig. 9.7) with a typical *H. ruberrima* basal plate; possibly an interspecific hybrid. Jaws 15-23 (18.89) µm long, with one tooth that does not seem to be surrounded by needle-shaped smaller teeth (as in *H. ruberrima*). The rostral apophyses are usually slender and fairly short. In most specimens the apophysis length (as measured from the anterior tip of the jaws to the posterior tip of the apophysis) is less than half the jaw length (apophysis index 0.45). The pharynx length is 4-15 (7.93) µm. There is a pair of granular pharyngeal glands flanking the symphysis; each gland is 8-15 µm in diameter, and contains a large vacuole with a dark center.

Male system: Testes paired. The sperm always has a spiral head, but the proportions between head, middle piece and tail vary. Of three sperm measured of each of two NC specimens, one had a ratio of 13:9:50 µm (Fig. 9.10), and another 10:31:3 µm (Fig. 9.9). The ratio for a Belize specimen was 14:4:40 µm (Fig. 10.18), and another 3:17:50 µm (Fig. 10.17). Spermiogenesis stages first show a cell with four round nuclei (Fig. 10.15); in later stages the nuclei become spindle-shaped, and a long tail appears (Fig. 10.16).

TABLE 7

MORPHOMETRIC DATA FOR *HAPLOGNATHIA ROSEA*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	1270.00				1
Body width of adults	50.00				1
Body index of adults	25.40				1
Jaw length	18.64	1.43			11
Apophysis index	0.44	0.05	0.50	0.36	11
Basal plate length	4.17	0.41	5.00	4.00	6
Basal plate width	8.00	1.26	10.00	7.00	6
Basal plate index	0.53	0.11	0.71	0.40	6
Sperm length	56.43	13.43	72.00	43.00	7
Sperm width	0.50	0.00	0.50	0.50	7
Sperm index	112.86	26.85	144.00	86.00	7

Bermuda	Mean	SD	Max	Min	n
Jaw length	20.60	1.14	22.00	19.00	5
Apophysis index	0.43	0.04	0.47	0.36	5
Basal plate length	5.25	1.26	7.00	4.00	4
Basal plate width	10.50	1.00	12.00	10.00	4
Basal plate index	0.51	0.15	0.70	0.33	4

TABLE 7 (Continued)

Florida	Mean	SD	Max	Min	n
Jaw length	18.33	3.21	22.00	16.00	3
Apophysis index	0.44	0.03	0.47	0.41	3
Basal plate length	6.00				1
Basal plate width	6.00				1
Basal plate index	1.00				1

Belize	Mean	SD	Max	Min	n
Body length of adults	2083.33	637.05	2500.00	1350.00	3
Body width of adults	50.00	13.23	60.00	35.00	3
Body index of adults	41.34	3.63	45.45	38.57	3
Rostrum index of adults	6.56	1.95	8.80	5.18	3
Jaw length	18.77	2.62	23.00	15.00	13
Apophysis index	0.47	0.06	0.57	0.39	13
Basal plate length	5.43	1.90	8.00	3.00	7
Basal plate width	7.29	2.98	11.00	4.00	7
Basal plate index	0.85	0.45	1.75	0.36	7
Sperm length	35.33	6.43	40.00	28.00	3
Sperm width	1.00	0.00	1.00	1.00	3
Sperm index	35.33	6.43	40.00	28.00	3

Panama	Mean	SD	Max	Min	n
Rostrum index of adults	6.13				1
Jaw length	18.00	1.73	19.00	16.00	3
Apophysis index	0.42	0.05	0.47	0.38	3
Basal plate length	4.00				1
Basal plate width	7.00				1
Basal plate index	0.57				1
Sperm length	58.00	7.07	63.00	53.00	2
Sperm width	1.00	0.00	1.00	1.00	2
Sperm index	58.00	7.07	63.00	53.00	2

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	1880.00	660.25	2500.00	1270.00	4
Body width of adults	50.00	10.80	60.00	35.00	4
Body index of adults	37.36	8.50	45.45	25.40	4
Rostrum index of adults	6.45	1.61	8.80	5.18	4
Jaw length	18.89	2.13	23.00	15.00	35
Apophysis index	0.45	0.05	0.57	0.36	35
Basal plate length	4.95	1.39	8.00	3.00	19
Basal plate width	8.11	2.33	12.00	4.00	19
Basal plate index	0.67	0.32	1.75	0.33	19
Sperm length	51.42	14.31	72.00	28.00	12
Sperm width	0.71	0.26	1.00	0.50	12
Sperm index	84.33	41.28	144.00	28.00	12

Discussion: The cosmopolitan species *H. rosea* and *H. ruberrima* often vary widely, in colouration and morphometric characters of mouth parts, within the same sample, and even more so between localities. Considering

that most other species of *Haplognathia* are rather narrowly defined, in spite of their often worldwide distribution, this presents the 'conundrum of the red *Haplognathia* species', as discussed in the following.

Discovered in 1964 on the Swedish west coast and described as *Pterognathia ruberrima* (STERRER 1966a), *Haplognathia ruberrima* was only the first of six species known to date that have red pigment in the epidermis. To follow were *H. rubromaculata* (Sterrer, 1969), *H. rosea* (Sterrer, 1969), *Pterognathia grandis* Kirsteuer, 1969, *Haplognathia rosacea* Sterrer, 1970, and *Haplognathia rufa* Sterrer, 1991. Of these, *P. grandis* has been shown here to be a synonym of *H. ruberrima*. *H. rosacea*, which I had described from N. Carolina as "almost identical with *H. rosea* found in Sweden" except for a difference in sperm length, is herewith made a synonym of *H. rosea*, since I consider filiform sperm length too unreliable a character to base a species diagnosis upon. Of the four valid species, *H. rubromaculata*, described from a single juvenile but subsequently recorded by MÜLLER & AX (1971) from Sylt (North Sea), has an unmistakable transverse basal plate, and *H. rufa*, found only in Hawaii so far, is well-characterized by slender jaws with 3-5 uniformly thin, long teeth.

The two remaining species, *Haplognathia ruberrima* and *H. rosea*, are as ubiquitous as they are problematic. In my redescription of *H. ruberrima* from Sweden and the northern Adriatic (STERRER 1969) I already distinguished a 'Small North Sea Form' (the type form of the species) from a 'Large North Sea Form' and an 'Adriatic Form'. At that time, however, I thought that the two species could be reliably distinguished on the following grounds: *H. ruberrima* is dark crimson red; has larger jaws with one strong terminal tooth surrounded by many thin needles, and with long, shovel-like rostral apophyses whose lateral contour shows no or very little constriction; and has a large, flat basal plate whose dorsal surface is set with longitudinal rows of thorns. Conversely, *H. rosea* is pink or almost colourless; has smaller jaws with one strong tooth but no surrounding needles, and with short, horn-like rostral apophyses whose lateral contour is usually constricted; and it has a small, vertically sculpted basal plate that may have longitudinal ridges but no thorns.

In examining material from the Pacific (STERRER 1991a, 1991b, 1991c) I first noticed that this simple distinction was being blurred. While there were specimens that clearly belonged to *H. ruberrima* (see STERRER 1991a, fig. 2D; STERRER 1991b, fig. 3), many others, especially those from Tahiti,

displayed "a 'hybrid' combination of pharyngeal hard parts" (STERRER 1991c, fig. 2). The situation was further complicated when LAMMERT (1986), in his detailed ultrastructural analysis of *Haplognathia rosea*, described the jaws as provided with needle-like teeth, and the basal plate as carrying regularly arranged needle-like structures, *i.e.*, characteristics of *H. ruberrima*.

In an earlier paper, however, the same author pointed out (LAMMERT 1981: 3) that *H. rosea* was chosen for the study because, "it can be distinguished from related species already under the low-power scope with reasonable assurance on the basis of its carmine colouration" (my translation) – which suggests he may have been dealing with *H. ruberrima*, or both.

My material from the tropical and subtropical NW Atlantic contains 84 specimens of 'red' *Haplognathia*. Instead of clarifying the species distinction, as I had hoped this relatively large sample might, it muddles it further. As before, it is comparatively easy to identify some specimens as typical *H. ruberrima*, whereas typical *H. rosea* specimens are much rarer, and intermediate types are common. This is not the rule for other species in this genus. Of the 9 valid species in the genus *Haplognathia*, only *H. gubbarnorum* (which now also comprises *H. lyra*) has shown some variability in both structure and size of its mouth parts, yet to a considerably lesser degree than these two red species (STERRER 1969, 1970a). The following explanations ought to be considered:

1. *There is only one highly variable 'red' species.* This is contradicted by the very low degree of variability in other *Haplognathia*, and indeed all filospermoidean species.
2. *There are not just two but several species of sympatrically occurring 'red' Haplognathia, which a larger material will eventually allow to separate.* Although I do not exclude the possibility of one or two more species, the range of intermediate types found is too continuous to support this hypothesis.
3. *There are indeed two species, which hybridize.* Hybridization has been shown by HUMMON (1977) as the probable mechanism responsible for the occurrence of specimens of *Tetranchyroderma* (Gastrotricha) that were morphologically intermediate between two species. I am inclined to accept hybridization as the most likely mechanism to account for the intermediate character combinations in red *Haplognathia*. For the purpose of species identification I give more weight to jaws than to the basal plate, because they are more robust and richer in detail.

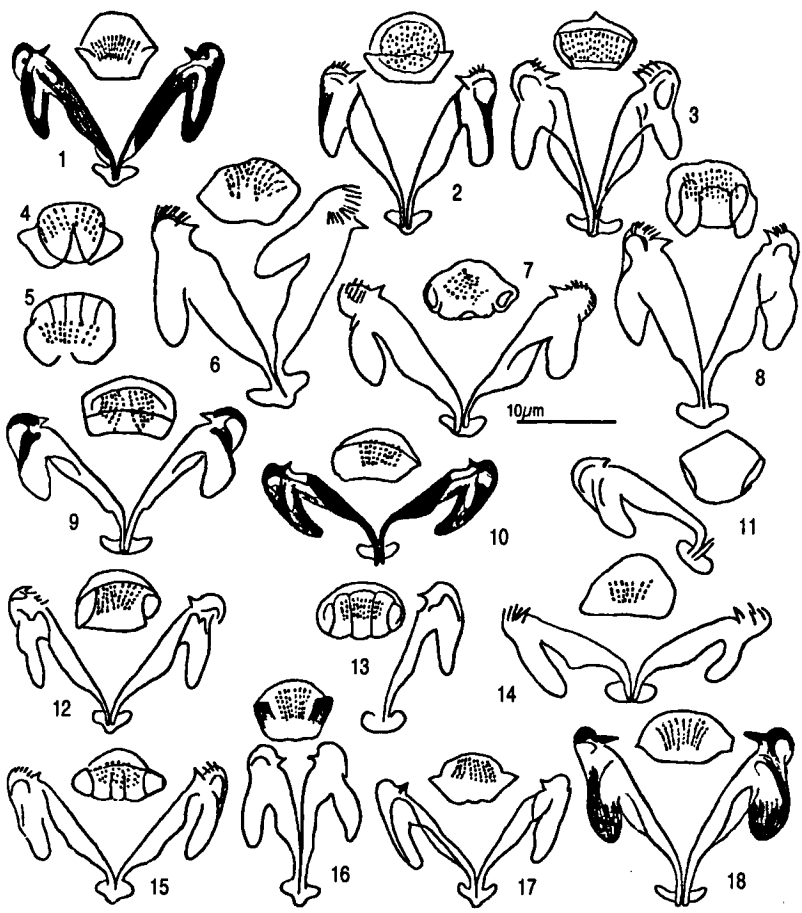
Haplognathia ruberrima (Sterrer, 1966)

(Figs. 12-15; Table 8)

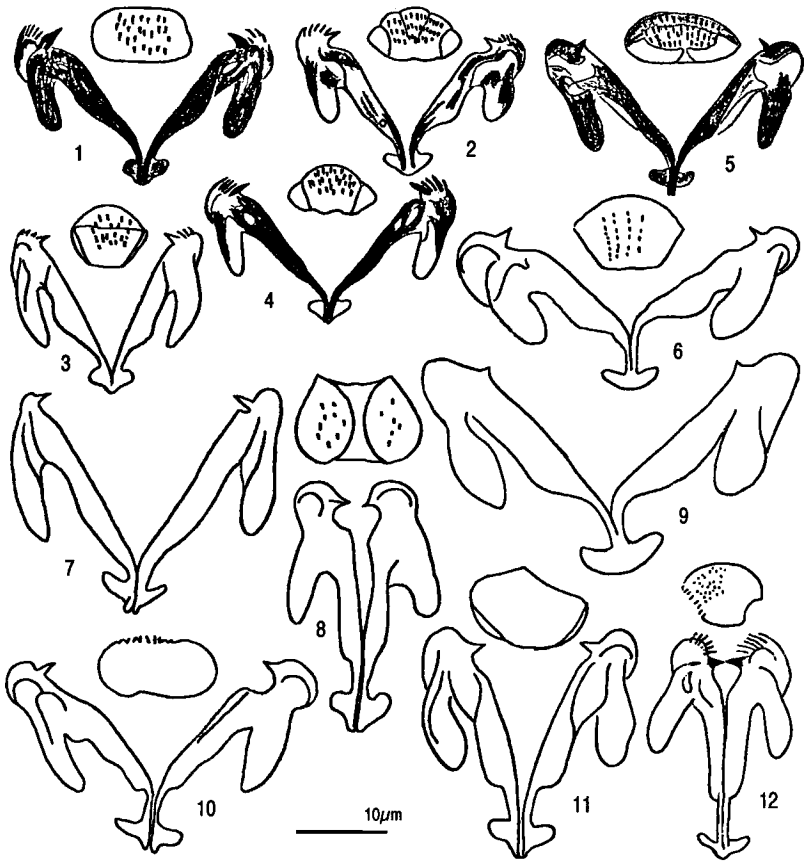
Synonyms: *Pterognathia ruberrima* Sterrer, 1966; *Haplognathia rosea* in LAMMERT (1986); *Pterognathia grandis* Kirsteuer, 1969; *Haplognathia* cf. *ruberrima* in SCHIEMER (1973).

Material:

- North Carolina: 18 specimens (1 adult) from samples 60, 61, 64, 70.3, 70.4, 71 and 76.
- Bermuda: 7 juveniles and anterior fragments from samples TB, 25, 127, 131, 134, 135 and 94.05.



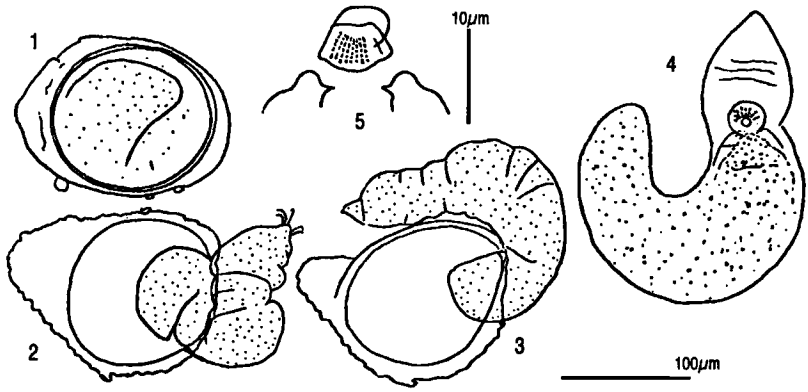
FIGURES 12.1-12.18. *Haplognathia ruberrima*. Basal plates and jaws. 12.1-12.3: FLO specimens; 12.4-12.8: BDA specimens; 12.9-12.18: NC specimens. – All to the same scale.



FIGURES 13.1-13.12. *Haplognathia ruberrima*. Basal plates and jaws. 13.1-13.4: PAN specimens; 13.5-13.11: BZE specimens; 13.12: BAHAMAS specimen (paratype of *Pterognathia grandis* Kirsteuer). – All to the same scale.

– Florida: 3 juveniles and anterior fragments from samples F8 and F15.
– Bahamas: Two preserved paratype specimens (AMNH 568) of *Pterognathia grandis* Kirsteuer, 1969.
– Belize: 14 juveniles and anterior fragments from samples 75.9, 84, 91.4, 91.5, 91.6, 91.10, 91.20, 91.21, 94.9 and 94.15.
– Puerto Rico: 2 anterior fragments.
– Panama: 3 juveniles and 2 anterior fragments from sample 118.

Distribution: North Sea, Adriatic (STERRER 1969), Fiji (STERRER 1991a), Hawaii (STERRER 1991b), Canary Islands (STERRER 1997).

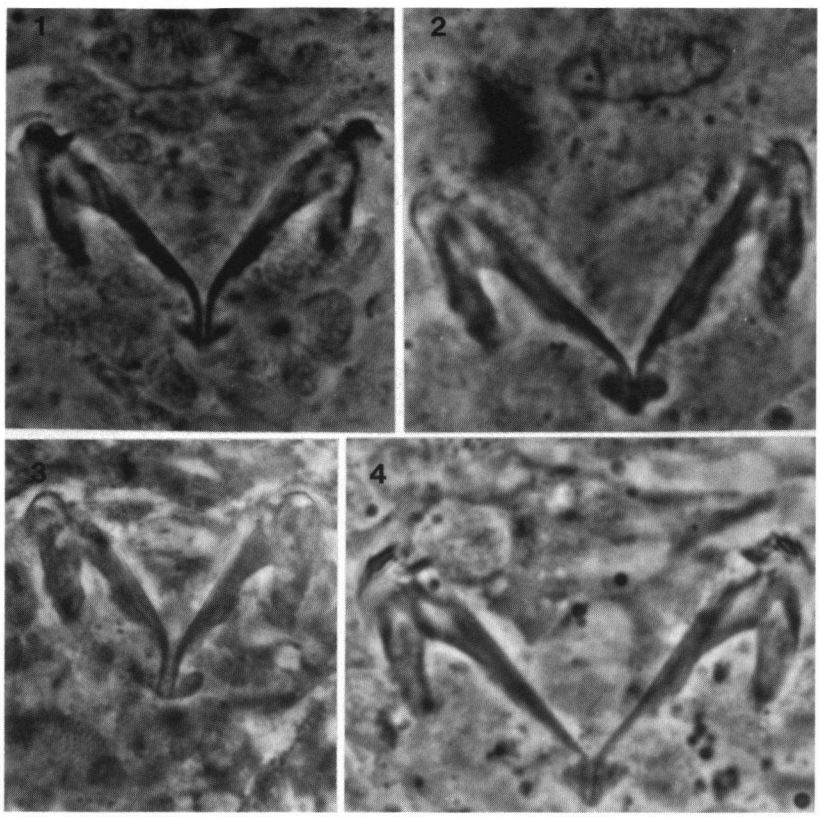


FIGURES 14.1-14.5. *Haplognathia ruberrima.* Juvenile during hatching. 14.5. Basal plate and jaw anlagen. – One scale applies to 12.1-12.4, the other to 14.5.

Emend. diagnosis: More or less uniformly brick-red or pink *Haplognathia* with 16-30 µm long jaws whose rostral apophyses are at least half as long as the jaws (index 0.50 or greater). Jaws with one strong tooth flanked by many needle teeth. Basal plate flat, transverse-oval to rectangular, 5-8 µm long by 5-13 µm wide; always carrying longitudinal rows of dorsocaudally pointing thorns on dorsal surface.

Organization and behaviour: Adults reach 3500 µm in length and 140 µm in width (index 25; KIRSTEUER 1969a). Most specimens are uniformly brick-red, reddish-brown or pink; only occasionally the coloration is blotchy, or the midbody region has rings of lighter pigment. Rostrum slender, pointed. An animal that has been isolated from the sediments usually coils up by muscular action, then slowly uncoils again by means of its cilia, often from both ends simultaneously, with the rostrum pulling forward and the posterior end pulling backward. Once the animal is more or less straight, the forward motion of the anterior body portion predominates over the continuing backward stroke of the tail cilia.

Digestive tract: The flat, flexible and delicately outlined basal plate is best studied before heavy squeezing because it tends to get so deformed as to become invisible. Its most characteristic feature is a set of 7-10 longitudinal rows, each composed of 5-7 dorsocaudally pointing thorns, which



FIGURES 15.1-15.4. *Haplognathia ruberrima.* Basal plates and jaws. 15.1-15.2: NC specimens; 15.3: BZE specimen; 15.4: PAN specimen. – Phase contrast micrographs of live specimens.

adorn the dorsal surface. The basal plate is often divided into 5 fields by 4 longitudinal ridges; its outline may be transversely oval or rectangular, and variously but always symmetrically scalloped. The jaws are equally variable, but characterized by large, often shovel-shaped rostral apophyses whose length always equals or surpasses half of the jaw length. Each jaw usually carries one strong tooth which is rostrally flanked by 8, sometimes many more, needle-like teeth.

Two preserved paratype specimens of *Pterognathia grandis* Kirsteuer were treated with dilute chlorine bleach to expose basal plate and jaws. The resulting preparation (Fig. 13.12) leaves no doubt that these were specimens of *H. ruberrima.*

Female system: One BDA specimen contained coiled bundles of sperm presumed to be from a copulation. A single sperm measured had a head-middle piece of 36 µm length with a delicate apical spiral, and a tail of 14 µm.

Development: A NC sample yielded an egg capsule with a juvenile of which I published two micrographs earlier (STERRER 1974: fig 6a, b). The ovoid capsule (Fig, 14.1), 170µm by 120µm, was colourless and incrusted with small sediment particles. Inside, the reddish-brown juvenile was slowly rotating by means of its ciliary beat. Three hours after the capsule had been placed under a cover slip, the juvenile began to hatch (Fig. 14.2); it pierced the capsule wall with the tip of its rostrum, and then emerged slowly, taking a 5-10 minute rest between successive efforts (Fig. 14.3). The hatchling (Fig. 14.4) was fully ciliated, 330 µm long and 60 µm wide, with a rostrum 90 µm long and 40 µm wide. The gut was without a lumen, and filled with yolk granules. The posterior part of the doughnut-shaped pharynx contained a fully formed basal plate, 5 µm long by 8 µm wide, complete with 9-10 longitudinal rows of thorns. Of the jaws, only the anteriormost contour could be discerned (Fig. 14.5).

TABLE 8

MORPHOMETRIC DATA FOR *HAPLOGNATHIA RUBERRIMA*

North Carolina	Mean	SD	Max	Min	n
Jaw length	20.00	1.85	25.00	16.00	18
Apophysis index	0.57	0.04	0.63	0.50	17
Basal plate length	6.53	0.74	8.00	5.00	15
Basal plate width	9.80	1.15	11.00	8.00	15
Basal plate index	0.67	0.08	0.78	0.55	15
Sperm length	68.00				1
Sperm width	0.50				1
Sperm index	136.00				1
Bermuda	Mean	SD	Max	Min	n
Jaw length	22.00	1.73	25.00	20.00	7
Apophysis index	0.60	0.07	0.72	0.52	7
Basal plate length	6.83	1.17	8.00	5.00	6
Basal plate width	9.83	2.48	12.00	5.00	6
Basal plate index	0.73	0.17	1.00	0.55	6
Sperm length	50.00				1
Sperm width	0.50				1
Sperm index	100.00				1

TABLE 8 (Continued)

Florida	Mean	SD	Max	Min	n
Jaw length	21.67	0.58	22.00	21.00	3
Apophysis index	0.55	0.05	0.59	0.50	3
Basal plate length	7.67	0.58	8.00	7.00	3
Basal plate width	10.00	0.00	10.00	10.00	3
Basal plate index	0.77	0.06	0.80	0.70	3
Bahamas	Mean	SD	Max	Min	n
Jaw length	24.50	2.12	26.00	23.00	2
Apophysis index	0.55	0.08	0.61	0.50	2
Belize	Mean	SD	Max	Min	n
Jaw length	25.08	2.72	30.00	20.00	13
Apophysis index	0.56	0.03	0.61	0.52	11
Basal plate length	6.67	1.53	8.00	5.00	3
Basal plate width	11.67	0.58	12.00	11.00	3
Basal plate index	0.57	0.11	0.67	0.45	3
Puerto Rico	Mean	SD	Max	Min	n
Jaw length	20.50	2.12	22.00	19.00	2
Apophysis index	0.56	0.02	0.58	0.55	2
Basal plate length	5.50	0.71	6.00	5.00	2
Basal plate width	11.00	1.41	12.00	10.00	2
Basal plate index	0.51	0.13	0.60	0.42	2
Sperm length	32.00				1
Sperm width	0.50				1
Sperm index	64.00				1
Panama	Mean	SD	Max	Min	n
Jaw length	22.40	1.52	24.00	21.00	5
Apophysis index	0.60	0.06	0.68	0.54	5
Basal plate length	5.57	0.50	6.00	5.00	4
Basal plate width	10.00	0.82	11.00	9.00	4
Basal plate index	0.58	0.07	0.67	0.50	4
ALL DATA	Mean	SD	Max	Min	n
Jaw length	22.14	2.84	30.00	16.00	50
Apophysis index	0.57	0.05	0.72	0.50	47
Basal plate length	6.55	0.97	8.00	5.00	33
Basal plate width	10.09	1.42	12.00	5.00	33
Basal plate index	0.66	0.12	1.00	0.42	33
Sperm length	50.00	18.00	68.00	32.00	3
Sperm width	0.50	0.00	0.50	0.50	3
Sperm index	100.00	36.00	136.00	64.00	3

Discussion: The high variability of this species over the tropical NW Atlantic parallels that encountered in the NE Atlantic and the Adriatic (STERRER 1966a, 1969, 1997). This applies to jaw length (17-29 µm there vs. 16-30 µm here) as much as to basal plate outline and dimensions (5-8 µm by

5-13 µm there vs. 5-8 µm by 5-12 µm here). In addition, there are indications that hybridization with *H. rosea* may occur (see above). Examination of the two paratype specimens (Fig. 13.12) of *Pterognathia grandis* Kirsteuer, 1969, makes it likely that this red species is conspecific with *H. ruberrima.*

Family **PTEROGNATHIIDAE Sterrer, 1972**

Cosmognathia aquila n. sp.

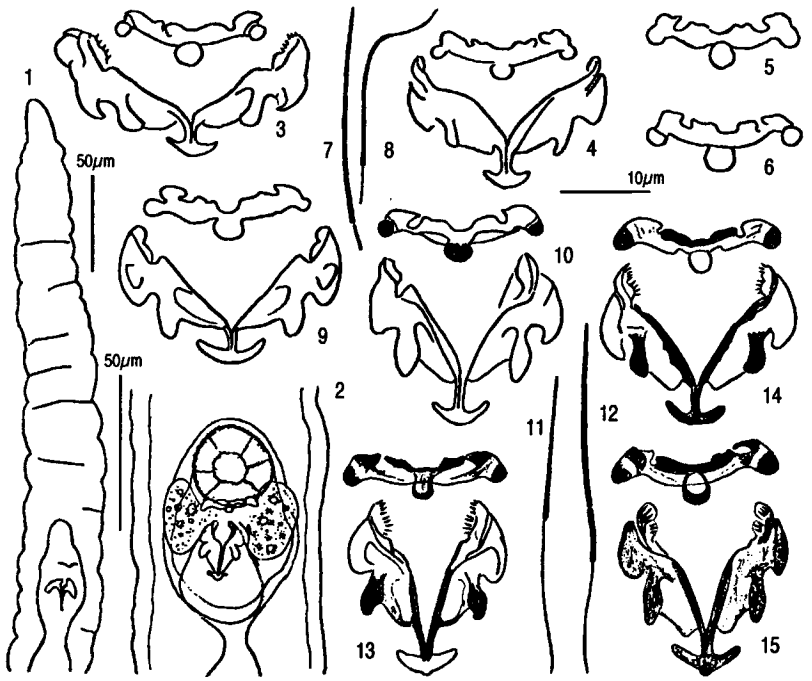
(Figs. 16-17; Table 9)

Holotype: One juvenile from Florida (sample F8) in squeeze preparation, USNMNH 178344.
Further material:
– Bermuda: Two juveniles and one anterior fragment from samples 127 and D5B.
– Belize: 20 specimens (5 adults) from samples 91.3, 91.5, 91.6, 91.12, 91.21, 94.4 and 94.15.
– Panama: 6 specimens (2 adults) from samples 94.P3.
Etymology: From Lat. *aquila* = eagle, in reference to the shape of the basal plate.

Diagnosis: *Cosmognathia* with basal plate in the shape of a headless flying eagle (5.50 µm long, 17.57 µm wide, index 0.31). Jaws 19.18 µm long, with 6-8 teeth.

Organization and behaviour: Adults are colourless-opaque to dull reddish or brownish in transmitted light except for the rostrum which is mostly transparent; small juveniles are entirely translucent. The largest adult (from Belize) was 2,800 µm long and 60 µm wide at U 33.9 (index 46.67). The rostrum is pointed, 165-200 (173.33) µm long and 30-50 (37.67) µm wide at U 6.05.

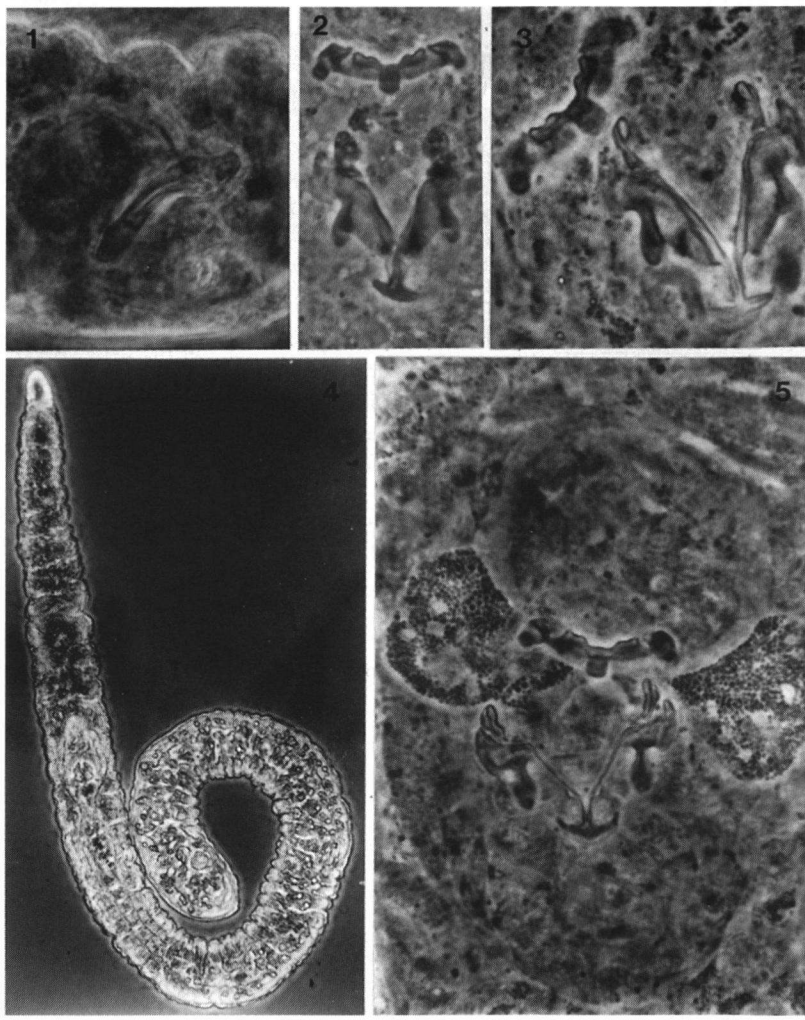
Digestive tract: The basal plate reminds of the silhouette of a (headless) flying eagle. It is 4-7 µm long and 16-19 µm wide (index 0.28-0.33). Its rostral contour is gently concave and incised by a pair of deep notches. The lateral edges are rounded, reinforced, and point caudo-laterally at about 45°. The caudal outline is slightly convex, and carries a rounded, reinforced medial process. The jaws are 16-21 µm long, compact, with flar-



FIGURES 16.1-16.15. *Cosmognathia aquila.* 16.1: Rostrum; 16.2: Pharynx; 16.3-16.8: Basal plates, jaws and sperm of PAN specimens; 16.9-16.12: Basal plates, jaws and sperm of BZE specimens; 16.13: Basal plates and jaws of FLO specimen; 14.14-16.15: Basal plates and jaws of BDA specimens. – One scale applies to 16.1, another to 16.2, and a third to the remaining figures.

ing dorsal cristae. Rostral apophyses short, connecting broadly to the jaw axis by means of a horizontal lamella. Symphysis crescent-shaped. Mediorostrally each jaw carries 6-8 very delicate teeth in two groups: an anterior, more rostrally pointing group of 3-4 teeth, and a posterior, more medially pointing group of 4-5 teeth. Rostro-laterally the jaws are flanked by a pair of conspicuous, globular glands (Fig. 16.2). The pharynx bulb is 13-20 µm long behind the symphysis.

Male system: There is probably only one testis, but paired vasa deferentia. Sperm was observed in 2 BZE and 2 PAN specimens. In BZE specimens (Fig. 16.11-16.12) sperm consisted of a 16-20 µm long non-spiral head and 16-17 µm long tail. Sperm of PAN specimens had a 21-23 µm



FIGURES 17.1-17.5. *Cosmognathia aquila*. 17.1: Pharynx of BZE specimen, right lateral view 17.2-17.3: Basal plate and jaws of BZE specimens; 17.4: Habitus of a juvenile FLO specimen 17.5: Pharynx region of BZE specimen. – Phase contrast micrographs of live specimens.

long head and a 3-4 µm long tail. It has to be kept in mind, though, that the proportions of head : middle piece : tail are not only difficult to ascertain but also may change during spermatogenesis; they are therefore of only limited taxonomic value.

TABLE 9

MORPHOMETRIC DATA FOR *COSMOGNATHIA AQUILA*

Bermuda	Mean	SD	Max	Min	n
Jaw length	20.67	0.58	21	20	3
Basal plate length	5.67	0.58	6	5	3
Basal plate width	18.67	0.58	19	18	3
Basal plate index	0.30	0.02	0.32	0.28	3

Florida	Mean	SD	Max	Min	n
Jaw length	20.00				1
Basal plate length	5.00				1
Basal plate width	18.00				1
Basal plate index	0.28				1

Belize	Mean	SD	Max	Min	n
Body length of adults	2376.67	425.01	2800	1950	3
Body width of adults	66.67	11.55	80	60	3
Body index of adults	36.31	9.08	46.67	29.95	3
Rostrum index of adults	4.61	0.38	5.00	4.25	3
Jaw length	19.06	1.39	21	16	18
Basal plate length	5.56	0.70	7	4	18
Basal plate width	17.78	1.11	19	16	18
Basal plate index	0.31	0.05	0.44	0.22	18
Sperm length	35.50	2.65	38	32	4
Sperm width	0.50	0.00	0.5	0.5	4
Sperm index	71.00	5.29	76.00	64.00	4

Panama	Mean	SD	Max	Min	n
Jaw length	18.67	0.82	19	17	6
Basal plate length	5.33	0.52	6	5	6
Basal plate width	16.33	0.52	17	16	6
Basal plate index	0.33	0.03	0.38	0.29	6
Sperm length	25.50	1.05	27	24	6
Sperm width	0.50	0.00	0.50	0.50	6
Sperm index	51.00	2.10	54.00	48.00	6

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	2376.67	425.01	2800	1950	3
Body width of adults	66.67	11.55	80	60	3
Body index of adults	36.31	9.08	46.67	29.75	3
Rostrum index of adults	4.61	0.38	5.00	4.25	3
Jaw length	19.18	1.31	21	16	28
Basal plate length	5.50	0.64	7	4	28
Basal plate width	17.57	1.17	19	16	28
Basal plate index	0.31	0.04	0.44	0.22	28
Sperm length	29.50	5.44	38	24	10
Sperm width	0.50	0.00	0.5	0.5	10
Sperm index	59.00	10.88	76.00	48.00	10

Discussion: *C. aquila* is the fourth species in the genus, after *C. arcus* Sterrer, 1991, *C. bastillae* Sterrer, 1991 and *C. manubrium* Sterrer, 1991, all of which were originally described from the Pacific (STERRER 1991a, 1991b, 1991c). They are almost identical in appearance and anatomy, including jaw architecture, except for the basal plate. With its concave rostral outline and turned-back lateral edges, the *C. aquila* basal plate most resembles that of *C. bastillae* but lacks the rostral ridges of that species.

Cosmognathia arcus Sterrer, 1991

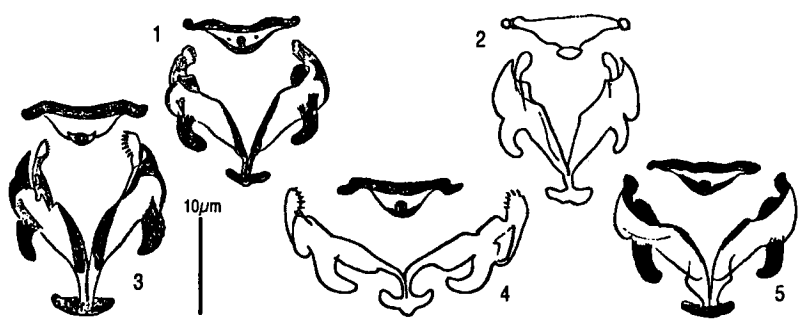
(Figs. 18, 19.1; Table 10)

Material:
- Bermuda: 6 juveniles from samples 117, D5B and D7D.
- Florida: 1 anterior fragment from sample F8.
- Belize: 1 juvenile from sample 97.4.
- Puerto Rico: 1 anterior fragment from sample 95.01.

Distribution: Fiji (STERRER 1991a), Hawaii (STERRER 1991b).

Organization and behaviour: Colourless-translucent. The only specimen measured, a BDA juvenile, was 2,200 µm long and only 50 µm wide at U 31.8 (body index 44.00). Its rostrum was 200 µm long by 35 µm wide at U 8.18 (index 5.71).

Digestive tract: The basal plate measured 3-5 µm in length and 11-14 µm in width. The jaws, 16-20 µm long, separate readily under squeezing



FIGURES 18.1-18.5. *Cosmognathia arcus*. Basal plates and jaws. 18.1: FLO specimen; 18.2: PR specimen; 18.3-18.5: BDA specimens. – All to the same scale.

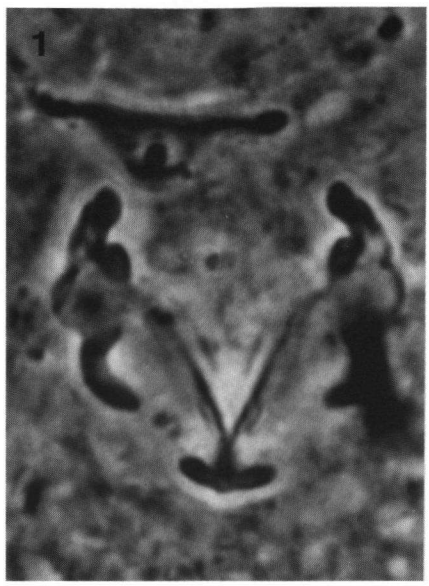


FIGURE 19.1. *Cosmognathia arcus.* Basal plate and jaws of FLO specimen.

into two parts; the medial part is usually set with 5-7 very delicate teeth at its medio-rostral contour whereas the lateral part ends in one strong tooth. In one of the BDA juveniles both basal plate and jaws showed signs of granular degeneration. Pharynx bulb length is 12.5 µm.

TABLE 10

MORPHOMETRIC DATA FOR *COSMOGNATHIA ARCUS*

Bermuda	Mean	SD	Max	Min	n
Jaw length	18.67	1.03	20	17	6
Basal plate length	4.33	0.82	5	3	6
Basal plate width	12.67	0.82	13	11	6
Basal plate index	0.34	0.06	0.38	0.23	6
Florida	Mean	SD	Max	Min	n
Jaw length	16.00				1
Basal plate length	4.00				1
Basal plate width	14.00				1
Basal plate index	0.29				1
Belize	Mean	SD	Max	Min	n
Jaw length	16.00				1
Basal plate length	3.00				1
Basal plate width	13.00				1
Basal plate index	0.23				1

TABLE 10 (Continued)

Puerto Rico	Mean	SD	Max	Min	n
Jaw length	17.00				1
Basal plate length	4.00				1
Basal plate width	13.00				1
Basal plate index	0.31				1
ALL DATA	**Mean**	**SD**	**Max**	**Min**	**n**
Jaw length	17.89	1.45	20	16	9
Basal plate length	4.11	0.78	5	3	9
Basal plate width	12.89	0.78	14	11	9
Basal plate index	0.32	0.06	0.38	0.23	9

Discussion: The basal plate distinguishes this species from the very similar *C. manubrium*. In *C. arcus* it is shaped like an upside-down coathanger whose lateral edges taper and point rostro-laterally, rarely caudolaterally; the mediocaudal contour encloses a small, usually crescent-shaped knob. The basal plate of *C. manubrium* is shaped like a bicycle handlebar whose lateral edges are rounded-knobby and point caudo-laterally, and whose mediocaudal contour encloses a spherical knob. The Atlantic specimens of *C. arcus* only slightly expand earlier measurements (jaw length 17-19 µm, basal plate 3-4 µm by 12-15 µm) from Fiji (STERRER 1991a) and Hawaii (STERRER 1991b).

Cosmognathia manubrium Sterrer, 1991

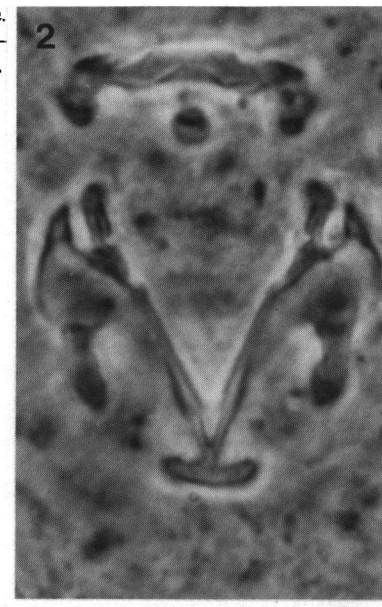
(Figs. 19.2-19.3, 20; Table 11)

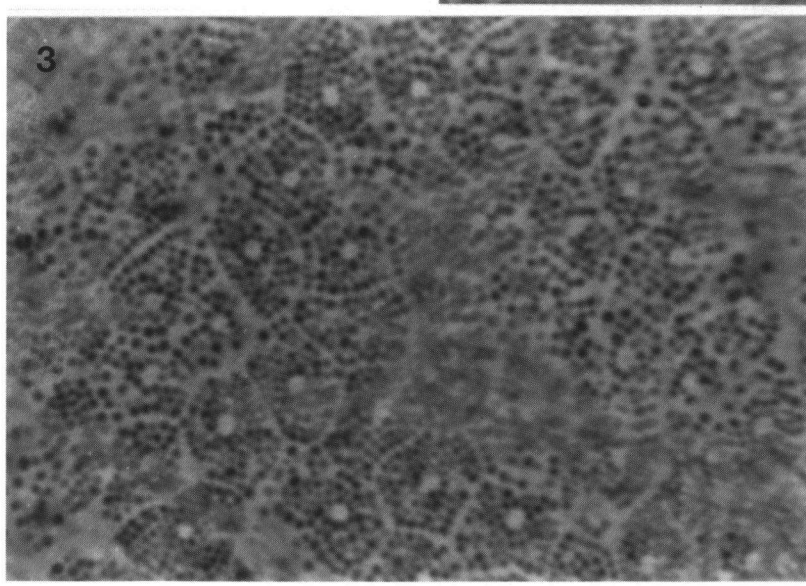
Material:
- Bermuda: 1 juvenile from sample 25.
- Belize: 2 juveniles from samples 92.4 and 94.15.
- Puerto Rico: 3 juveniles and 4 anterior fragments from sample 95.01.
- Panama: 2 specimens (1 adult) from sample 94.P3.

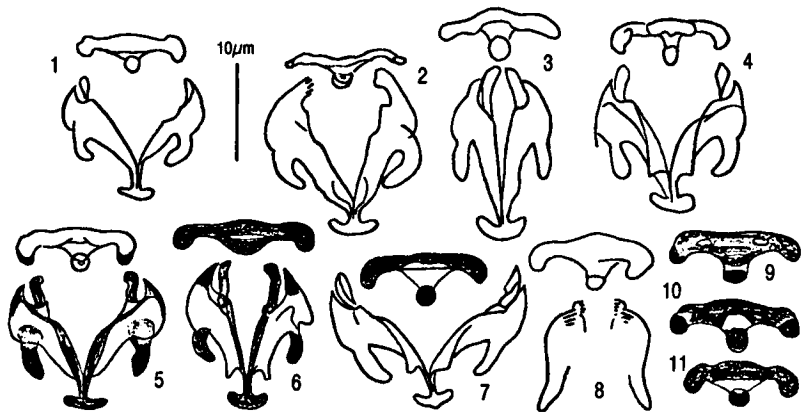
Distribution: Hawaii (STERRER 1991b), Tahiti (STERRER 1991c).

Organization and behaviour: Colourless-translucent. The only adult (from Panama) was 2,010 µm long and 80 µm wide at U 39.8 (body index 25.13). The rostrum in this specimen measured 175 µm by 55 µm at U 8.0 (rostrum index 3.18); in some juveniles the rostrum was longer (200 µm) and thinner (30-40 µm), giving a rostrum index of 5.5-6. In spite of

FIGURES 19.2-19.3. *Cosmognathia manubrium.* 19.2: Basal plate and jaws; 19.3: Epidermis. – Phase contrast micrographs of live specimens.







FIGURES 20.1-20.11. *Cosmognathia manubrium.* Basal plates and jaws. 20.1-20.2: PAN specimens; 20.3-20.4: BZE specimens; 20.5: BDA specimen; 20.6-20.11: PR specimens. – All to the same scale.

not being pigmented the epidermis cells are easily distinguished because of a dense layer of dark blisters immediately under the cell surface (Fig. 19.3). Only a circular area in the middle of the cell surface remains blister-free; from its center the single cilium emerges.

Digestive tract: Shaped somewhat like a bicycle handlebar, the basal plate is 4-5.5 µm long and 11.5-15 µm wide. The jaws range from 14 to 20 µm in length. Under squeezing they readily separate into two parts: a medio-dorsal, rostrally rounded part that may carry 4-6 extremely delicate teeth, and a latero-ventral part that ends in one strong tooth. The pharynx bulb measures 12-18 (15.00) µm in length.

Female system: A mature egg extended was 310 µm long, extending from U 48.3 to U 63.7.

TABLE 11

MORPHOMETRIC DATA FOR *COSMOGNATHIA MANUBRIUM*

Bermuda	Mean	SD	Max	Min	n
Jaw length	16.00				1
Basal plate length	5.00				1
Basal plate width	13.00				1
Basal plate index	0.38				1
Belize	Mean	SD	Max	Min	n
Jaw length	18.50	2.12	20	17	2
Basal plate length	5.50	0.71	6	5	2
Basal plate width	14.00	0.00	14	14	2
Basal plate index	0.39	0.05	0.43	0.36	2
Puerto Rico	Mean	SD	Max	Min	n
Jaw length	16.29	1.50	18	14	7
Basal plate length	4.71	0.49	5	4	7
Basal plate width	13.14	1.07	15	12	7
Basal plate index	0.36	0.05	0.42	0.27	7
Panama	Mean	SD	Max	Min	n
Body length of adults	2010.00				1
Body width of adults	80.00				1
Body index of adults	25.13				1
Rostrum index of adults	3.18				1
Jaw length	17.50	2.12	19	16	2
Basal plate length	4.00	0.00	4	4	2
Basal plate width	11.50	0.71	12	11	2
Basal plate index	0.35	0.02	0.36	0.33	2
ALL DATA	Mean	SD	Max	Min	n
Body length of adults	2010.00				1
Body width of adults	80.00				1
Body index of adults	25.13				1
Rostrum index of adults	3.18				1
Jaw length	16.83	1.70	20	14	12
Basal plate length	4.75	0.62	6	4	12
Basal plate width	13.00	1.13	15	11	12
Basal plate index	0.37	0.04	0.43	0.27	12

Discussion: Described from Hawaii (STERRER 1991a) and subsequently encountered in Tahiti (STERRER 1991c), this species is remarkably homogeneous throughout its vast range (Pacific specimens measured 17-20 µm in jaw length, and 5-7 µm by 13-17 µm in basal plate length by width; index 0.40-0.41).

Pterognathia alcicornis n. sp.

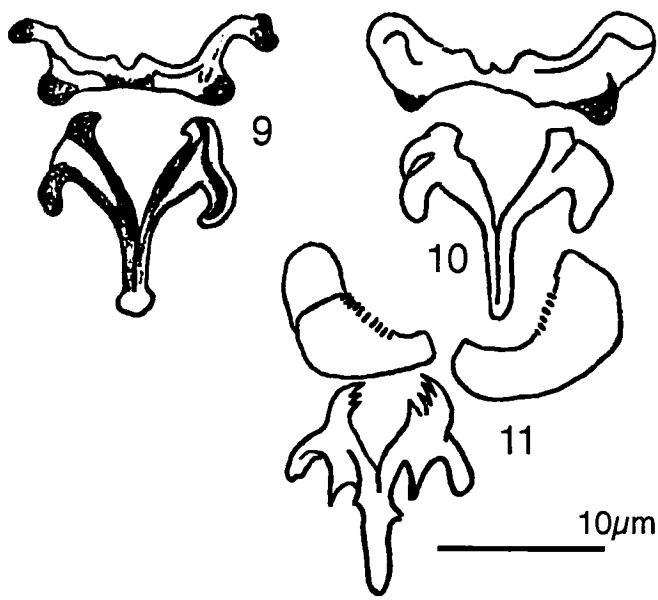
(Figs. 21.9-21.11)

Holotype: One juvenile from Belize (94.9) in squeeze preparation, USNMNH 178345
Etymology: From Lat. *alces* = elk, in reference to the antler-like basal plate.

Diagnosis: *Pterognathia* with short jaws (length 13 µm) with about 3 teeth, and with an elk antler-shaped basal plate 6 µm long and 17 µm wide (index 0.35).

Organization and behaviour: Colourless-translucent. (The single specimen was prematurely squeezed, whence the paucity of data).

Digestive tract: The basal plate is 6 µm long and 17 µm long (index 0.35). Its median contour is deeply convex, with a central notch; rostro-lat-



FIGURES 21.9-21.11. *Pterognathia alcicornis*, holotype specimen from BZE. 21.9: Basal plate and jaws; 21.10: The same, more strongly squeezed; 21.11: The same, drawn from preserved wholemount. – One scale applies to 21.1, another to 21.2-21.3, and a third to the remaining figures.

erally it extends into short, rounded, caudo-laterally pointing wings. The medio-caudal outline is gently concave. The jaws are 13 µm long, simple, with short, caudo-medially pointing rostral apophyses and a small, round symphysis. The presence of a crista is probable (Fig. 21.10). No teeth could be made out on the freshly squeezed specimen. A re-examination of the permanently mounted holotype, however, gave a somewhat different picture (Fig. 21.11): the rostro-lateral outline of the basal plate is set on either side with up to 10 delicate teeth, and each jaw also bears at least 3 teeth.

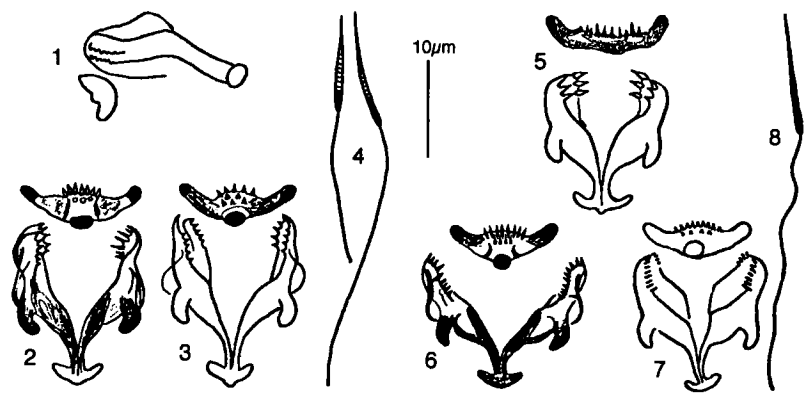
Discussion: The single juvenile is distinctive enough to describe a new species. It most resembles (and actually occurred in the same sample as) *P. ugera*, but differs from it in the smaller size, and especially the shape of the basal plate.

Pterognathia crocodilus Sterrer, 1991

(Figs. 22, 23.1; Table 12)

Material:
- North Carolina: One juvenile from sample 61.
- Bermuda: 3 specimens (1 adult) from samples 17, 18 and 135.
- Florida: One juvenile from sample F8.
- Belize: One adult from sample 94.9.

Distribution: Fiji (STERRER 1991a).



FIGURES 22.1-22.8. *Pterognathia crocodilus*. Basal plates, jaws and sperm. 22.1-22.4: BDA specimens; 22.5: The aberrant NC specimen; 22.6: FLO specimen; 22.7.-22.8: BZE specimen. - All to the same scale.

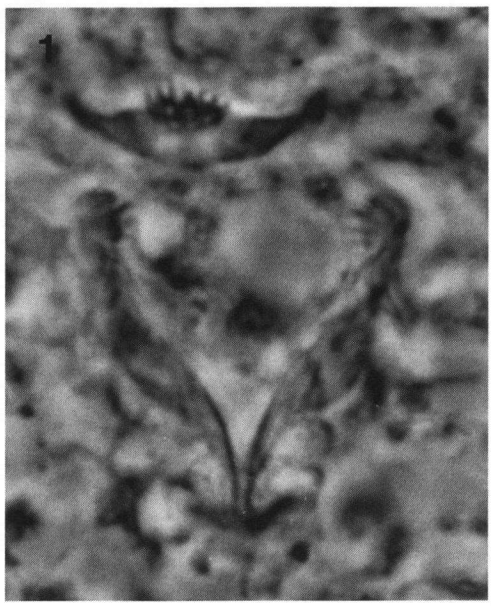


FIGURE 23.1. *Pterognathia crocodilus.* Basal plate and jaws of BDA specimen.

Organization and behaviour: Colourless-translucent. The largest adult (from BDA) was 1,500 µm long and 60 µm wide at U 36.7 (index 25.00). The only other adult (from BZE) was 1,350 µm long and 40 µm wide at U 25.9 (index 33.75); its rostrum measured 160 µm by 25 µm at U 11.1 (index 6.40), and it had a tapered tail region about 100 µm long.

Digestive tract: The basal plate is transverse rod-shaped, 4-5 µm long and 12-13 µm wide (index 0.33-0.36). Its reinforced lateral wings point rostro-laterally; the caudo-medial edge is convex and reinforced into a knob. The rostro-medial edge carries a total of 12-14 sharp, conical teeth arranged in 2-3 transverse rows. Jaws are 17-20 µm long, rather slender, with medio-caudally curving rostral apophyses and a lunuliform symphysis. Each jaw bears 5-9 sharp teeth in a dorsal, and 6-8 sharp teeth in a ventral arc. The pharynx is 8-12 µm long.

One juvenile specimen from NC (Fig. 22.5) was so aberrant in its mouth parts that I suspect it is a separate species; for the time being, however, I call it 'Specimen A' and provisionally list it with *P. crocodilus.* The basal plate was 4 µm by 14 µm (index 0.29), with abruptly forward-turned lateral wings

and a gently convex medio-caudal edge. The median edge, over a width of 8 µm (as opposed to 4 µm in typical *P. crocodilus*), carried 9 robust teeth in 2 transverse rows. Jaws were 16 µm long, nearly identical with *P. crocodilus* except that teeth were more thick-rooted, and each jaw had only 3 teeth each per ventral and dorsal part. The pharynx bulb of Specimen A measured 12 µm.

Male system: In the mature BZE specimen the single testis was 200 µm long, extending from U 74.1 to U 88.9. It emptied into an equally unpaired vas deferens. The male pore in this specimen was at U 92.6, *i.e.*, about 100 µm anterior to the tail end. In both the BDA and the BZE specimens, sperm was observed to have a delicate, spindle-shaped head-middlepiece 12-14 µm long, with a delicate spiral. The tail was 16-28 µm long in BDA specimens (Fig. 22.4), and 30 µm in the only sperm recorded in a BZE specimen (Fig. 22.8).

TABLE 12

MORPHOMETRIC DATA FOR *PTEROGNATHIA CROCODILUS*

North Carolina	Mean	SD	Max	Min	n
Jaw length	16.00				1
Basal plate length	4.00				1
Basal plate width	14.00				1
Basal plate index	0.29				1
Bermuda	Mean	SD	Max	Min	n
Body length of adults	1500.00				1
Body width of adults	60.00				1
Body index of adults	25.00				1
Jaw length	19.33	1.15	20	18	3
Basal plate length	4.67	0.58	5	4	3
Basal plate width	13.00	0.00	13	13	3
Basal plate index	0.36	0.04	0.38	0.31	3
Sperm length	33.33	7.57	42	28	3
Sperm width	0.50	0.00	0.5	0.5	3
Sperm index	66.67	15.14	84.00	56.00	3
Florida	Mean	SD	Max	Min	n
Jaw length	17.00				1
Basal plate length	4.00				1
Basal plate width	12.00				1
Basal plate index	0.33				1

TABLE 12 (Continued)

Belize	Mean	SD	Max	Min	n
Body length of adults	1350.00				1
Body width of adults	40.00				1
Body index of adults	33.75				1
Rostrum index of adults	6.40				1
Jaw length	17.00				1
Basal plate length	4.00				1
Basal plate width	12.00				1
Basal plate index	0.33				1
Sperm length	43.00				1
Sperm width	1.00				1
Sperm index	43.00				1

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	1425.00	106.07	1500	1350	2
Body width of adults	50.00	14.14	60	40	2
Body index of adults	29.38	6.19	33.75	25.00	2
Rostrum index of adults	6.40				1
Jaw length	18.00	1.67	20	16	6
Basal plate length	4.33	0.52	5	4	6
Basal plate width	12.83	0.75	14	12	6
Basal plate index	0.34	0.04	0.38	0.29	6
Sperm length	35.75	7.85	43	28	4
Sperm width	0.63	0.25	1.00	0.50	4
Sperm index	60.75	17.11	84.00	43.00	4

Discussion: First described from Fiji on the basis of only two juveniles (STERRER 1991a), *P. crocodilus* now joins the ranks of the cosmopolitan species, without the need to modify its diagnosis (Fiji measurements: jaw length 18-19 µm, basal plate 3-4 µm by 12 µm).

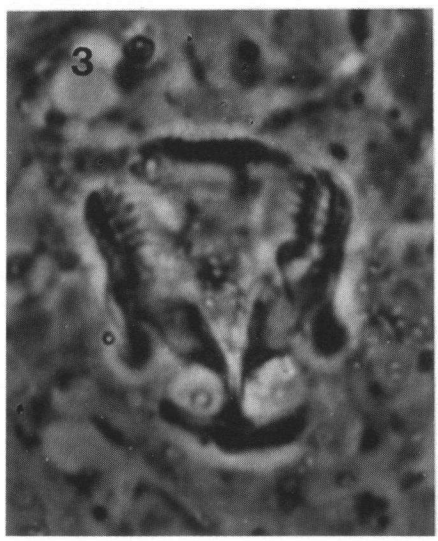
Pterognathia ctenifera Sterrer, 1970

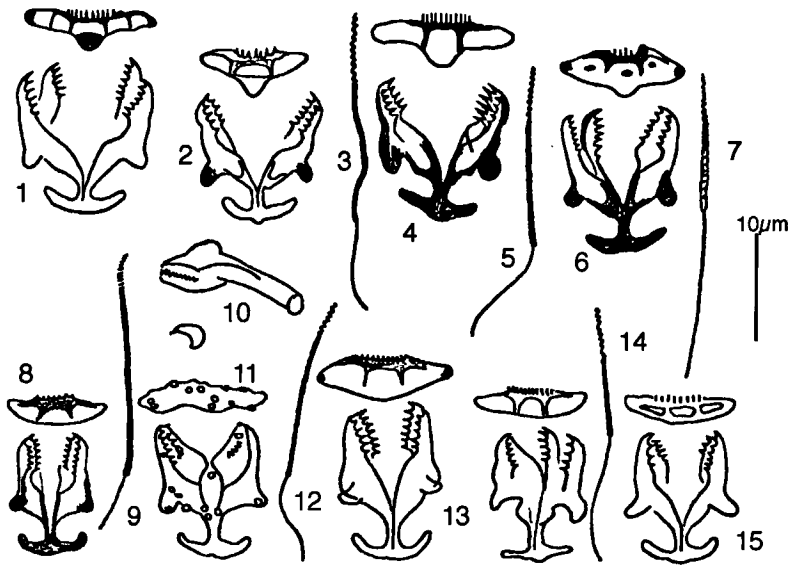
(Figs. 23.2-23.4, 24.1-24.15; Table 13)

Material:
- North Carolina: 6 specimens (3 adults) from sample 61.
- Bermuda: 13 specimens (4 adults) from samples 25, 70, 111, 120, 127, D4A, D5B, 94.01 and 94.05.
- Florida: One juvenile from sample F6.
- Belize: 7 specimens (1 adult) from sample 94.15.
- Panama: Two juveniles from sample 94.P3.

Distribution: Fiji (STERRER 1991a), Hawaii (STERRER 1991b).

FIGURES 23.2-23.4. *Pterognathia ctenifera.* Basal plate and jaws. 23.2: NC specimen; 23.3-23.4: BDA specimens. – Phase contrast micrographs of live specimens.





FIGURES 24.1-24.15. *Pterognathia ctenifera.* Basal plates, jaws and sperm. 24.1-24.7: BDA specimens; 24.8-24.12: NC specimens (24.10. left lateral view); 24.13: FLO specimen; 24.14: BZE specimen; 24.15: PAN specimen.

Organization and behaviour: Colourless, of wrinkled appearance; adults are dull-opaque except for the rostrum which is transparent. Juveniles are usually glassy-translucent throughout. This species is typically active in a nervous manner, continually probing its surroundings by means of a very contractile rostrum. Adults (from BDA) are 1,150 to 1,900 μm long and 40-50 μm wide at U 42.71 (index 30.25); the rostrum is 165-250 μm long and 25-30 μm wide at 10.65 (index 7.00).

Digestive tract: Basal plate transverse rod-shaped, with 7-11 tiny, lamella-like teeth in one row on the median edge. Basal plate lengths range from 2 to 5 μm, widths from 9 to 13 μm (index 0.27-0.34). Jaws small (11-15 μm long), compact, with stubby rostral apophyses and a broadly lunuliform symphysis. Each jaw with 5-7 uniform teeth on dorsal part, and 6-8 uniform teeth on ventral part. The pharynx length behind the symphysis is 8-17 (12.14) μm.

Male system: A single vas deferens was seen in two specimens. An unpaired testis seems to be the rule, but one BDA specimen appeared to have two testes. The filiform sperm has a delicate head spiral, but lacks a clear, consistent distinction into head, middle piece and tail. Sperm of BDA (Figs. 24.1, 24.3, 24.7) and BZE (Figs. 24.14) specimens was measured as 13-19 µm for head plus middle piece, and 8-15 µm for the tail, of NC specimens (Figs. 24.9, 24.12) as 25 µm for head plus middle piece, and 5 µm for the tail.

Female system: In the largest BDA specimen the mature egg was 280 µm long, extending from U 63.2 to U 77.9. One NC juvenile contained two partner's sperm near the tail.

TABLE 13
MORPHOMETRIC DATA FOR *PTEROGNATHIA CTENIFERA*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	843.33	35.12	880	810	3
Body width of adults	40.00	0.00	40	40	3
Body index of adults	21.08	0.88	22.00	20.25	3
Rostrum index of adults	4.41	1.05	5.56	3.50	3
Jaw length	12.67	0.82	13	11	6
Basal plate length	3.17	0.75	4	2	6
Basal plate width	10.33	1.03	12	9	6
Basal plate index	0.31	0.08	0.40	0.22	6
Sperm length	27.00	2.00	30	26	4
Sperm width	0.50	0.00	0.5	0.5	4
Sperm index	54.00	4.00	60.00	52.00	4

Bermuda	Mean	SD	Max	Min	n
Body length of adults	1416.67	419.32	1900	1150	3
Body width of adults	46.67	5.77	50	40	3
Body index of adults	30.25	7.12	38.00	24.00	3
Rostrum index of adults	7.00	1.89	8.33	5.67	2
Jaw length	13.31	0.48	14	13	13
Basal plate length	3.64	0.67	5	3	11
Basal plate width	11.10	0.88	12	10	10
Basal plate index	0.34	0.06	0.42	0.25	10
Sperm length	27.14	2.04	29	23	7
Sperm width	0.50	0.00	0.5	0.50	7
Sperm index	54.29	4.07	58.00	46.00	7

Florida	Mean	SD	Max	Min	n
Jaw length	15.00				1
Basal plate length	4.00				1
Basal plate width	13.00				1
Basal plate index	0.31				1

TABLE 13 (Continued)

Belize	Mean	SD	Max	Min	n
Jaw length	12.67	0.82	14	12	6
Basal plate length	3.00	0.00	3	3	3
Basal plate width	11.00	0.00	11	11	3
Basal plate index	0.27	0.00	0.27	0.27	3
Sperm length	24.00	0.00	24	24	3
Sperm width	0.50	0.00	0.5	0.5	3
Sperm index	48.00	0.00	24.00	24.00	3

Panama	Mean	SD	Max	Min	n
Jaw length	12.00	0.00	12	12	2
Basal plate length	3.00	0.00	3	3	2
Basal plate width	10.50	0.71	11	10	2
Basal plate index	0.29	0.02	0.30	0.27	2

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	1130.00	411.63	1900	810	6
Body width of adults	43.33	5.16	50	40	6
Body index of adults	25.67	6.77	38.00	20.25	6
Rostrum index of adults	5.44	1.86	8.33	3.50	5
Jaw length	13.00	0.80	15	11	29
Basal plate length	3.39	0.66	5	2	23
Basal plate width	10.91	0.97	13	9	22
Basal plate index	0.31	0.06	0.42	0.22	22
Sperm length	26.43	2.14	30	23	14
Sperm width	0.50	0.00	0.50	0.5	14
Sperm index	52.86	4.28	60.00	46.00	14

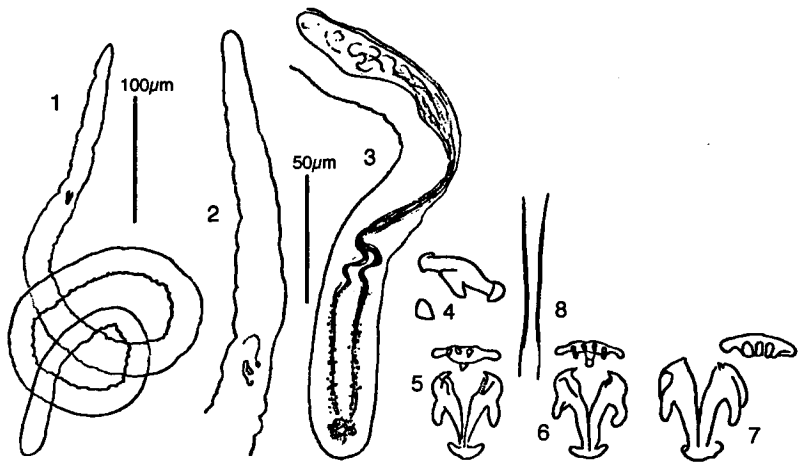
Discussion: Originally described from North Carolina (STERRER 1970a) and subsequently encountered in Fiji (STERRER 1991a) and Hawaii (STERRER 1991b), this species is as widely distributed as *H. ruberrima* and *H. rosea.* Unlike these two species, however, *P. ctenifera* is astoundingly invariable over its global range.

Pterognathia pygmaea n. sp.

(Figs. 21.1-21.8, 25; Table 14)

Holotype: One adult specimen from N. Carolina (sample 61) in squeeze preparation; USNMNH 178346.
Etymology: This is the filospermoid with the smallest body and mouth part dimensions ever recorded.

Diagnosis: Very small, colourless, slender *Pterognathia* (body index 36.80) with a slender rostrum (index 6.50). Jaws 10 µm long, with a termi-



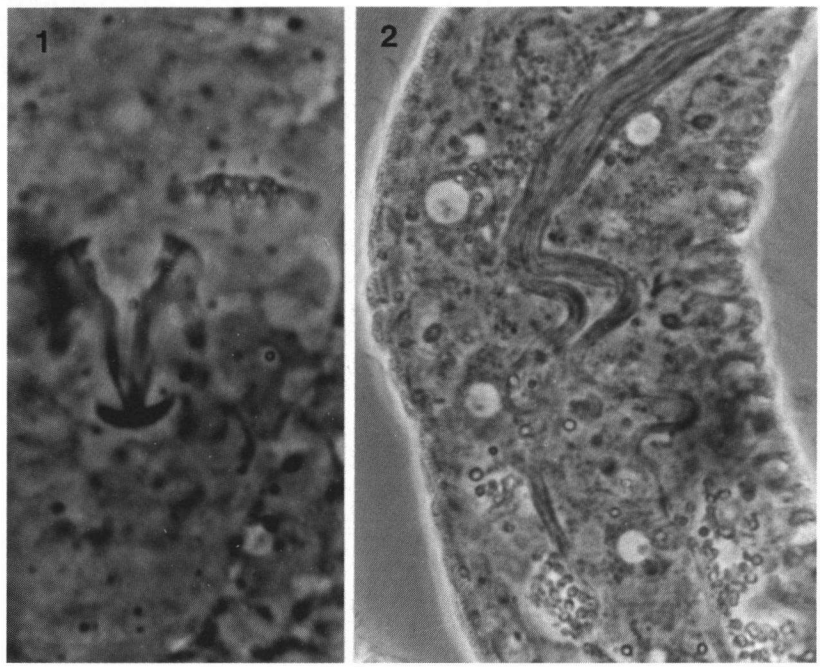
FIGURES 21.1-21.8. *Pterognathia pygmaea*, holotype specimen from NC. 21.1: Habitus of adult; 21.2: Rostrum; 21.3: Posterior body portion with testis, vasa deferentia and male pore; 21.4: Basal plate and jaws, left lateral view; 21.5: Basal plate and jaws; 21.6: The same, more strongly squeezed; 21.7: The same, drawn from preserved wholemount; 21.8: Sperm.

nal tooth; basal plate transverse rod-shaped, 3 µm long and 8 µm wide, set dorsally with 4 coarse teeth. Sperm about 20 µm long (10:7:3).

Organization and behaviour: Colourless-translucent. The single specimen, an adult (Fig. 21.1), was 920 µm long and 25 µm wide at 30.4 (index 36.80). The rostrum (Fig. 21.2) is slender, 130 µm long and 20 µm wide at 11.4 (index 6.50).

Digestive tract: The basal plate (Fig. 21.4-21.7, 25.1) is transverse rod-shaped, 3 µm long and 8 µm wide, with tapering lateral wings ending in small knobs, and a small caudo-medial process. There may be 4 coarse, irregular teeth on the dorsal surface. The jaws are 10 µm long, simple, with short rostral apophyses and a lunuliform symphysis. Only one terminal tooth is sure, but there may be very small teeth on one or two tooth ridges. The pharynx bulb is 10 µm long.

Male system: The unpaired testis (Fig. 21.3, 25.2) is 50 µm long, extending from U 78.3 to U 83.7; it empties into a pair of vasa deferentia



FIGURES 25.1-25.2. *Pterognathia pygmaea*, holotype specimen from NC. 25.1: Basal plate and jaws; 25.2: Testis and vasa deferentia. – Phase contrast micrographs of live specimens.

which end at the male pore located 15 µm anterior to the tail end. Sperm (fig. 21.8) is delicate, with a barely discernible head spiral. Head 10 µm long, middle piece 7 µm, and tail 3-4 µm.

TABLE 14

MORPHOMETRIC DATA FOR *PTEROGNATHIA PYGMAEA*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	920				1
Body width of adults	25				1
Body index of adults	36.8				1
Rostrum index of adults	6.5				1
Jaw length	10				1
Basal plate length	3				1
Basal plate width	8				1
Basal plate index	0.38				1
Sperm length	20.33	0.58	21	20	3
Sperm width	0.5	0	0.5	0.5	3
Sperm index	40.67	1.15	42	40	3

Discussion: *P. pygmaea* is one of the smallest filospermoid species recorded, and has the smallest mouth parts of all (*P. ctenifera*, at a minimal jaw length of 11 µm and basal plate dimensions of 2 µm by 9 µm, is a close second, and *P. alcicornis* comes third).

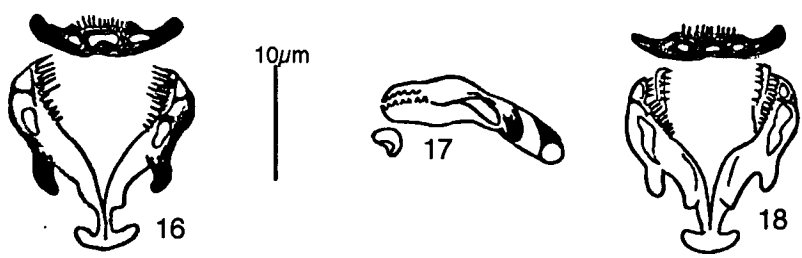
Pterognathia sorex Sterrer, 1969

(Figs. 24.16-24.18; Table 15)

Material: North Carolina: Three juveniles from sample 61.
Distribution: North Sea (STERRER 1969, MÜLLER & AX 1971).

Organization and behaviour: Colourless. The largest juvenile measured 610 µm by 25 µm at U 73.8 (index 24.40), with a rostrum 150 µm by 23 µm at U 19.7 (index 6.52).

Digestive tract: The basal plate (Figs. 24.16-24.18) is transverse rod-shaped, 3-4 µm long by 13-14 µm wide (index 0.25). Its caudo-medial edge is gently concave, and its lateral wings bend rostro-laterally. The rostro-medial edge, over a width of 5-6 µm, is set with 10-12 fine, lamellar teeth. In phase contrast, the basal plate appears dark, with one central and a pair of lateral light 'windows'. The jaws are 16-18 µm long, with short, caudo-medially pointing rostral apophyses and a crescent-shaped symphysis. Each dorsal jaw part carries 5-7, each ventral part 10-14 delicate but long teeth. The pharynx bulb is 12-13 µm long, and there is a pair of globular glands just behind the symphysis.



FIGURES 24.16-24.18. *Pterognathia sorex*. Basal plates and jaws of NC specimens (4.17: left lateral view). – All to the same scale.

TABLE 15
MORPHOMETRIC DATA FOR *PTEROGNATHIA SOREX*

North Carolina	Mean	SD	Max	Min	n
Jaw length	17.33	1.15	18	16	3
Basal plate length	3.33	0.58	4	3	3
Basal plate width	13.67	0.58	14	13	3
Basal plate index	0.25	0.05	0.31	0.21	3

Discussion: The NC finds agree well with the original description (STERRER 1969) from the Swedish west coast (jaw length 17.8 µm, basal plate 3.4 µm by 11.6 µm), except that the latter had more teeth on the basal plate (13-20), and possibly also on the jaws (6-8 dorsally, 16-18 ventrally). MÜLLER & AX (1971) reported 20 teeth for the basal plate, and 10-12 teeth each for the ventral and dorsal parts of the jaws in specimens from Sylt.

Pterognathia swedmarki Sterrer, 1966

(Figs. 26.1, 27.4)

Material: Belize: One juvenile from sample 91.6.
Distribution: North Sea (STERRER 1969, MÜLLER & AX 1971).

Organization and behaviour: Colourless-opaque. The single specimen, a juvenile, was 1,450 µm long and 60 µm wide at U 48.3 (index

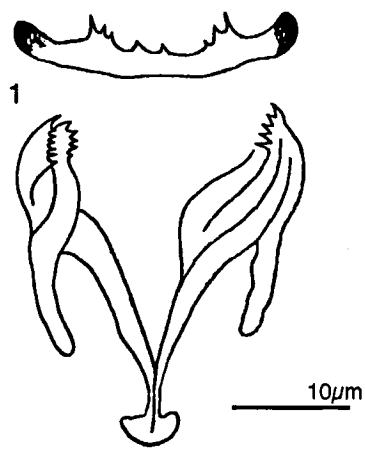


FIGURE 26.1. *Pterognathia swedmarki.* Basal plate and jaws of BZE specimen.

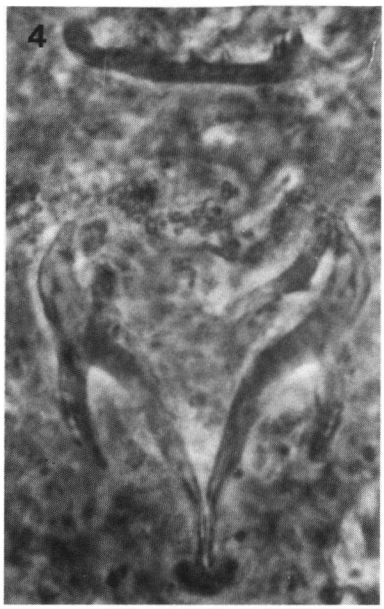


FIGURE 27.4. *Pterognathia swedmarki.* Basal plate and jaws of BZE specimen. – Phase contrast micrograph of live specimen.

24.17). The rostrum is pointed, 280 µm long by 50 µm wide at U 14.5 (index 5.60).

Digestive tract: Basal plate (Figs. 26.1, 27.4) transverse rod-shaped, 5 µm long and 26 µm wide (index 0.19); lateral edges rounded, reinforced, pointing rostro-laterally. Caudal outline slightly convex; mediofrontal edge, over a width of 13 µm, set with about 8 uneven teeth. Jaws 31 µm long, with long, slender rostral apophyses and a compact crescent-shaped symphysis. Dorsal and ventral part of each jaw set with 5 teeth each. Pharynx bulb 17 µm long.

Discussion: This is the first record of the species outside the North Sea (STERRER 1966a, 1969; MÜLLER & AX 1971). Biometric data agree well with the original description (jaw length 26.7 µm, basal plate 6.3 µm by 21.6 µm), except that the basal plate of the BZE specimen is wider and less robust.

Pterognathia ugera Sterrer, 1991

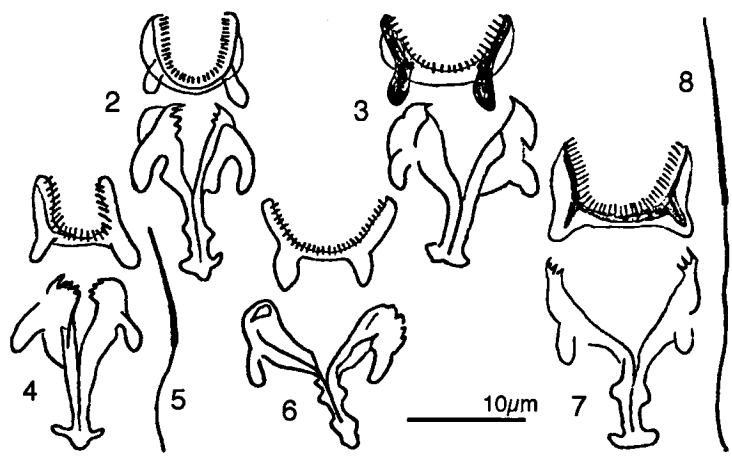
(Figs. 26.2-26.8, 28; Table 16)

Material:
- Bermuda: One adult from sample 94.06.
- Belize: 15 specimens (2 adults) from samples 91.3, 91.10, 91.11, 91.12, 91.21 and 94.9.
- Puerto Rico: One anterior fragment from sample 95.01.
- Panama: One anterior fragment from sample 94.P3.

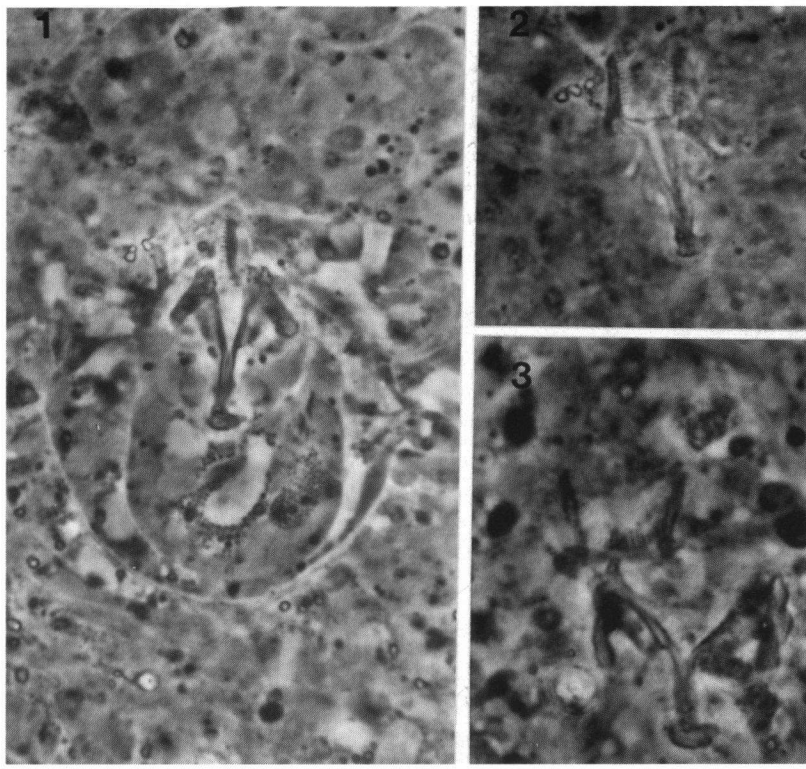
Distribution: Tahiti (STERRER 1991c).

Organization and behaviour: Colourless-opaque to brownish; very young individuals are transparent. The largest mature specimen (from BDA) was 2,700 µm long and 100 µm wide at U 24.1 (index 27.00); another one from BZE measured 2,500 µm by 70 µm at U 40.0 (index 35.71). The rostrum can be as long as 480 µm and 110 µm wide (index 4.36), but more typically measures only 240-280 µm by 45-60 µm (index 4.67).

Digestive tract: The horseshoe-shaped basal plate (Figs. 26.2-26.3, 26.6-26.7, 28.2-28.3) is 7-11 µm long and 8-16 µm wide. Its U-shaped median edge is entirely set with about 25 extremely delicate teeth.There is a pair of caudo-lateral wings. The rostral wings can be pulled apart by mus-



FIGURES 26.2-26.8. *Pterognathia ugera*. Basal plates, jaws and sperm. 26.2: PR specimen; 26.3: PAN specimen; 26.4-26.6: BZE specimens; 26.7-26.8: BDA specimens. – All to the same scale.



FIGURES 28.1-28.3. *Pterognathia ugera.* Basal plates and jaws of BZE specimens. In 28.2 the focus is on the basal plate teeth. – Phase contrast micrographs of live specimens.

cular contraction which changes their angle to each other, making the 'U' look more like a blunt 'V'. The jaws are 13-17 µm long, rather poorly defined, and disintegrate easily in squeeze preparation. While there are typically 2-3 teeth in each dorsal and 3-4 teeth in each ventral jaw part, some individuals only seem to have one tooth per jaw. The symphysis is flanked by a pair of globular glands; the pharynx bulb is 7-17 µm long.

Male system: No head spiral can be discerned in the sperm. In BZE specimens (Fig. 26.5) the head/middle piece was 12 µm long, the tail 9 µm; in BDA specimens (Fig. 26.8) these values were 17 µm and 20 µm, respectively.

Female system: In the BZE specimen a mature egg was 200 µm long, extending from U 44.0 to U 52.0.

TABLE 16

MORPHOMETRIC DATA FOR *PTEROGNATHIA UGERA*

Bermuda	Mean	SD	Max	Min	n
Body length of adults	2700.00				1
Body width of adults	100.00				1
Body index of adults	27.00				1
Rostrum index of adults	4.36				1
Jaw length	17.00				1
Basal plate length	9.00				1
Basal plate width	12.00				1
Basal plate index	0.75				1
Sperm length	29.00	6.93	37	25	3
Sperm width	0.50	0.00	0.5	0.5	3
Sperm index	58.00	13.86	74.00	50.00	3

Belize	Mean	SD	Max	Min	n
Body length of adults	2500.00				1
Body width of adults	70.00				1
Body index of adults	35.71				1
Rostrum index of adults	4.67				1
Jaw length	14.93	1.39	17	13	15
Basal plate length	9.07	1.03	11	8	15
Basal plate width	11.73	1.53	16	10	15
Basal plate index	0.78	0.13	1.00	0.62	15
Sperm length	21.00	0.00	21	21	2
Sperm width	0.50	0.00	0.5	0.5	2
Sperm index	42.00	0.00	42.00	42.00	2

Puerto Rico	Mean	SD	Max	Min	n
Jaw length	15.00				1
Basal plate length	8.00				1
Basal plate width	8.00				1
Basal plate index	1.00				1

Panama	Mean	SD	Max	Min	n
Jaw length	15.00				1
Basal plate length	7.00				1
Basal plate width	11.00				1
Basal plate index	0.64				1

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	2600.00	141.42	2700	2500	2
Body width of adults	85.00	21.21	100	70	2
Body index of adults	31.36	6.16	35.71	27.00	2
Rostrum index of adults	4.52	0.21	4.67	4.36	2
Jaw length	15.06	1.35	17	13	18
Basal plate length	8.89	1.08	11	7	18
Basal plate width	11.50	1.65	16	8	18
Basal plate index	0.79	0.14	1.00	0.62	18
Sperm length	25.80	6.57	37	21	5
Sperm width	0.50	0.00	0.5	0.5	5
Sperm index	51.60	13.15	74.00	42.00	5

Discussion: First recorded from Tahiti (STERRER 1991c), *P. ugera* is yet another circumtropical species. Its mouth part architecture is so distinctive that it may eventually warrant a separate genus.

Order *BURSOVAGINOIDEA Sterrer, 1972*

Suborder **SCLEROPERALIA Sterrer, 1972**

Family **AGNATHIELLIDAE Sterrer, 1972**

Agnathiella beckeri Sterrer, 1971

(Figs. 29.1, 30.1; Table 17)

Material: Florida: Three adults from sample F15.

No new material has become known since the description of this species. The table below summarizes my original data.

FIGURE 29.1. *Agnathiella beckeri.* Habitus of FLO adult.

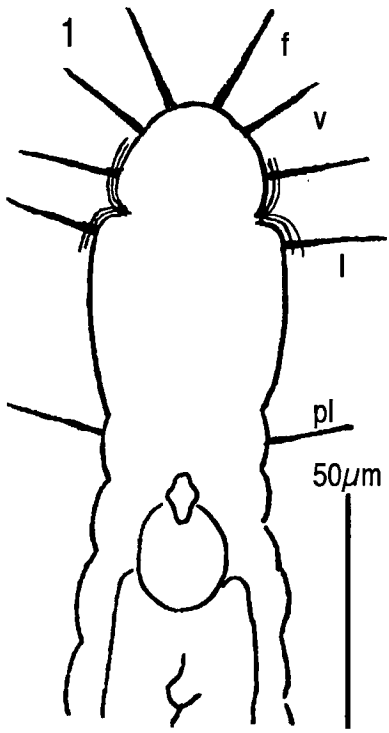


FIGURE 30.1. *Agnathiella beckeri*. Rostrum of FLO adult.

TABLE 17

MORPHOMETRIC DATA FOR *AGNATHIELLA BECKERI*

Florida	Mean	SD	Max	Min	n
Body length of adults	1033.33	45.09	1080	990	3
Body width of adults	78.33	7.64	85	70	3
Body index of adults	13.25	1.03	14	12	3
Rostrum index of adults	2.15	0.14	2.26	2.00	3
Penis stylet length	44.00	5.29	50	40	3
Sperm length	3	0	3	3	3
Sperm width	2.33	0.58	3	2	3
Sperm index	1.33	0.29	2	1	3

Discussion: This species, from which *Agnathiella* sp. has been separated (STERRER 1991a), was the first gnathostomulid described that consistently lacks both a basal plate and jaws. It shares its clover-shaped rostrum and the presence of a pair of postlateralia with *Paragnathiella trifoliceps* (STERRER 1997).

Agnathiella sp. (Sterrer, 1971)

(Figs. 29.2-29.3, 30.2)

Material: North Carolina: One juvenile from sample 79.
Distribution: Fiji (STERRER 1991a).

Description: The only juvenile was 750 µm long and 40 µm wide at U 46.7 (body index 18.75). The rostrum was 90 µm long and 25 µm wide (index 3.60).

Discussion: This species had erroneously been included in *Agnathiella beckeri* (STERRER 1971c). Three more juvenile specimens found in Fiji have been provisionally assigned to it (STERRER 1991a).

FIGURES 29.2-29.3. *Agnathiella* sp. NC juvenile. 29.2: Habitus; 29.3: Rostrum with sensorium. – Phase contrast micrographs of live specimens.

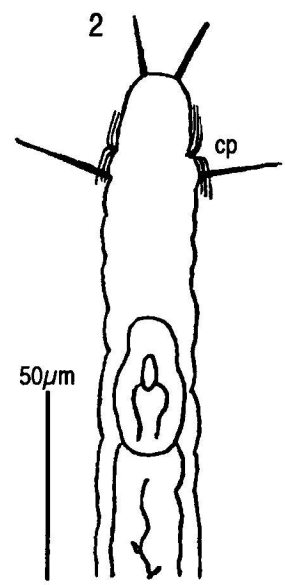


FIGURE 30.2. *Agnathiella* sp. Rostrum of NC juvenile.

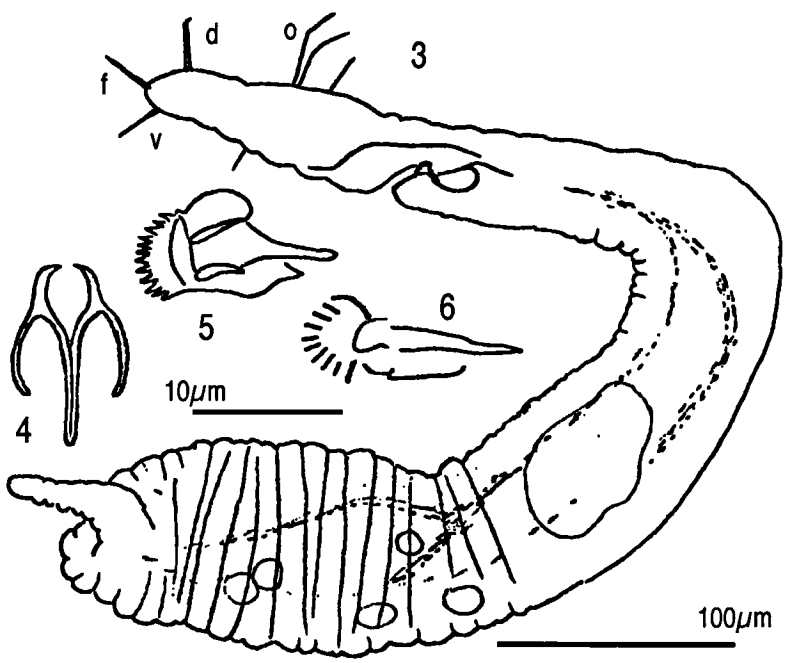
Family CLAUSOGNATHIIDAE Sterrer, 1992

Emended diagnosis: Scleroperalia with an elongated, pointed rostrum (index greater than 3). Epidermal cells not in stripes. Male stylet of the rod type. Sperm small, round or polygonal. Basal plate may be absent. Jaws lamellar but not closed, without a cauda; teeth uniform, arranged in a ventro-rostral arc. Without a jugum. With the ability to swim backwards.

Clausognathia suicauda Sterrer, 1992

(Figs. 30.3-30.6; Table 18)

Material:
- Belize: 11 specimens (3 adults) from samples 91.21, 91.23, 92.4 and 94.9.
- Panama: One juvenile from sample 94.P3.



FIGURES 30.3-30.6. *Clausognathia suicauda*. 30.3: Habitus of PAN adult; 30.4-30.5: Jaws of BZE specimens; 30.6: Jaws of PAN specimen (30.5 and 30.6 in left lateral view). – One scale applies to 30.1-30.2, another to 30.3, and a third to the remaining figures.

Organization and behaviour: Colourless-translucent to yellowish. Very fragile; animals disintegrate easily after extraction when other gnathostomulids (e.g., *Pterognathia ugera*) in the same dish are still in fine fettle. The sensorium of the PAN specimen (Fig. 30.3) consisted of the (previously recorded) occipitalia, but in addition sported 20 µm short yet distinct paired frontalia, ventralia and dorsalia.

Digestive tract: The jaw length of two additional specimens from Belize (both 14 µm) and one from Panama (13 µm; Fig. 30.6) fall within the range of the original description. The jaws are capable of very rapid snapping motions. A basal plate is absent.

TABLE 18

MORPHOMETRIC DATA FOR *CLAUSOGNATHIA SUICAUDA*

Belize	Mean	SD	Max	Min	n
Body length of adults	1150.00	70.71	1200	1100	2
Body width of adults	85.00	7.07	90	80	2
Body index of adults	13.54	0.29	13.75	13.33	2
Rostrum index of adults	4.67				1
Jaw length	13.82	1.08	15	12	11
Penis stylet length	28.33	4.51	33	24	3
Sperm length	4.83	0.41	5	4	6
Sperm width	4.67	0.52	5	4	6
Sperm index	1.04	0.10	1.25	1	6
Panama	Mean	SD	Max	Min	n
Jaw length	13.00				1
ALL DATA	Mean	SD	Max	Min	n
Body length of adults	1500.00	70.71	1200	1100	2
Body width of adults	85.00	7.07	90	80	2
Body index of adults	13.54	0.29	13.75	13.33	2
Rostrum index of adults	4.67				1
Jaw length	13.75	1.06	15	12	12
Penis stylet length	28.33	4.51	33	24	3
Sperm length	4.83	0.41	5	4	6
Sperm width	4.67	0.52	5	4	6
Sperm index	1.04	0.10	1.25	1.00	6

Discussion: The possession of an almost complete sensorium (except apicalia and lateralia, which could not be ascertained) confirms this species as a member of Bursovaginoidea-Scleroperalia, and makes it necessary to emend the diagnosis of the family Clausognathiidae.

Family GNATHOSTOMARIIDAE Sterrer, 1972

Gnathostomaria lutheri Ax, 1956

(Figs. 31-34; Table 19)

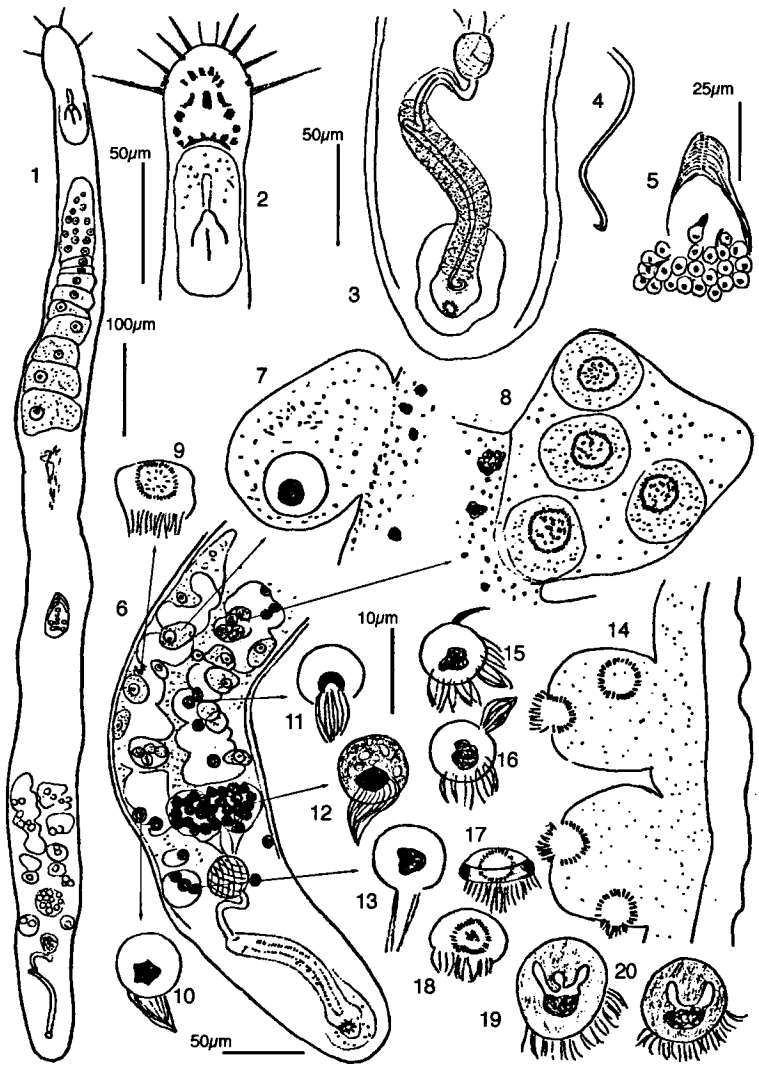
Synonymy: *Gnathostomaria* sp. n. (Sterrer 1972).
Material: North Carolina: 8 specimens (4 adults, one juvenile, and 3 anterior fragments) from sample 59.
Distribution: Western Mediterranean (Ax 1956, 1964b), North Sea ?(Kristensen 1978).

Organization and behaviour: Colourless-transparent, and an agile swimmer. Adults (Fig. 31.1) slender, from 1,000 µm to 1,160 µm in length, and 50 µm to 70 µm in width at U 36.23 (index 18.37). Rostrum (Fig. 31.2, 33.1) equally slender and rounded, 68-95 µm long and 38-52 µm wide at U 3.43 (index 1.96), and with a sulcus (constriction) at U 6.5. Posterior end of body rounded, without a tail section. The epidermal cells are pentagonal, 3-5 µm in diameter, and well visible in phase contrast.

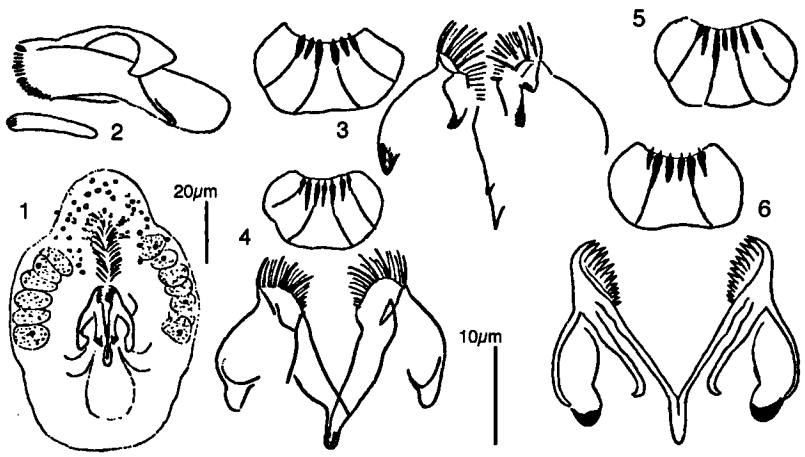
The sensorium (Fig. 31.2) consists of one pair of single apicalia (12-13 µm long), and one pair each of compound frontalia (28-30 µm), ventralia (20 µm), dorsalia (18 µm), and lateralia (33-35 µm). The ventralia in this species are not as tightly bunched as the other compound cirri. There is also a row of single occipitalia, 17 µm long, medio-dorsally on the rostrum. A pair of ciliary pits was seen in one specimen at U 2.0, just in front of the lateralia, but not confirmed in the other specimens.

Digestive tract: The oval mouth opening is 20 µm long, extending from U 6.6 to U 8.3. The buccal cavity (Fig. 32.1) is lined by 5 µm long microvilli that point medio-caudally. The large prepharyngeal gland extends caudally on either side of the buccal cavity, reaching as far as the jaw symphysis. The basal plate (Figs. 32.2-32.6, 33.2) is 8-11 µm long and 13-16 µm wide (index 0.63). Its well-defined rostral outline is concave whereas its delicate caudal outline is straight or concave caudally; the lateral contours are convex. Two pairs of longitudinal ridges divide the basal plate into 5 sections. The median edge is dorsally set with 6-8 rather strong teeth which, in some specimens, seem to have offset needle-sharp points.

The jaws (Figs. 32.2-32.6, 33.2) are forceps-shaped, 20-26 µm long, with a strong and sharply curved dorso-terminal tooth from which 15-17 long



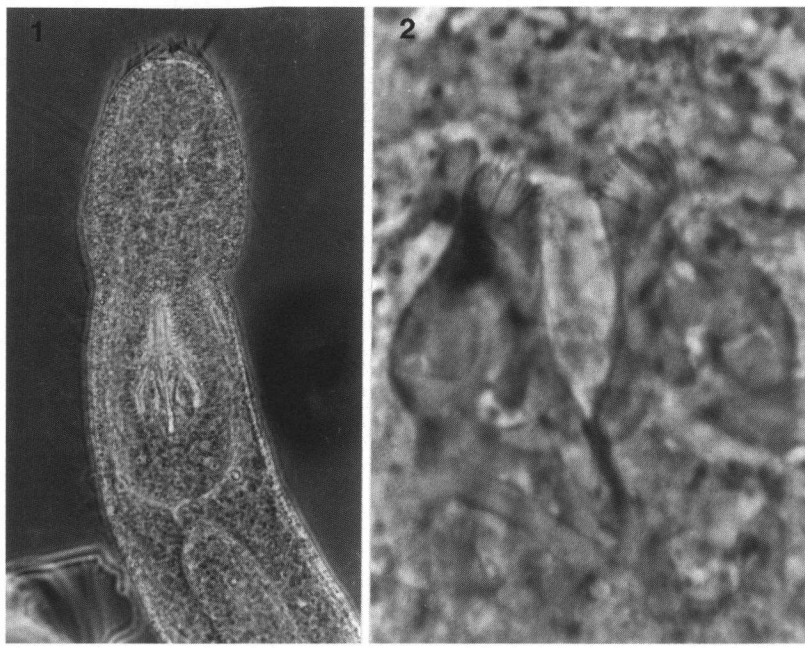
FIGURES 31.1-31.20. *Gnathostomaria lutheri*. 31.1: Habitus of adult; 31.2: Rostrum with sensorium; 31.3: Posterior body region with male copulatory organ; 31.4: Male copulatory stylet of another specimen; 31.5: Bursa; 31.6: Posterior body region with male organs, squeezed; 31.7-31.13: Spermiogenesis stages, magnified from 31.6 (see arrows); 31.7: Spermatocyte?; 31.8: Tetrad of spermatids; 31.9: Spermatid; 31.10-31.13: Sperm; 31.14-31.20: Spermiogenesis stages of another specimen. – One scale applies to 31.1, a second to 31.2, a third to 31.3-31.4, a fourth to 31.5, a fifth to 31.6, and a sixth to the remaining figures.



FIGURES 32.1-32.5. *Gnathostomaria lutheri*. 32.1: Pharynx; 32.2-32.6: Basal plates and jaws of different specimens (32.2 left lateral view). – One scale applies to 32.1, a second to the remaining figures.

but thinner teeth descend in a rostro-ventral arc. Teeth get shorter as the descend ventrally, and in most specimens, every third or fourth tooth is thicker than the rest. The pharynx bulb, which is only inconspicuously tripartite, measures 15-27 µm behind the symphysis.

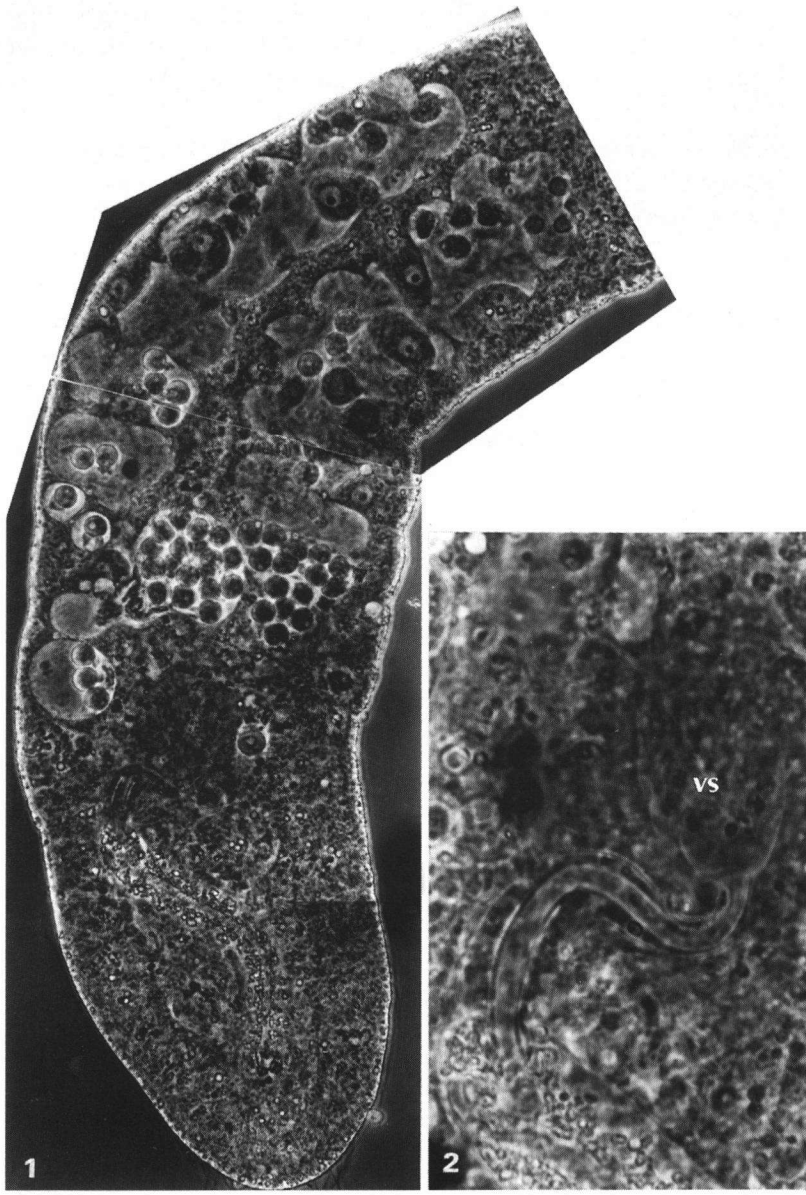
Male system: The paired testes (Figs. 31.6, 34.1) are 185 µm long, extending from U 72.0 to U 87.9. They are loosely tubular, consisting of a series of vacuoles in whose walls spermiogenesis takes place. Two short, funnel-shaped vasa deferentia connect the testes with a round, muscular seminal vesicle (Fig. 34.2) which, via a sphincter, empties into the penis. The seminal vesicle may be seen to contract periodically. The penis (Fig. 31.3, 34.1) consists of a straight or convoluted, weakly sclerotized stylet and a surrounding, tubular gland sheath. The stylet (Figs. 31.3-31.4) is 95-110 µm long and 4 µm in diameter proximally. It was almost straight in one specimen (Fig. 31.6), and slightly S-shaped in another (Fig. 31.4). In a third it was S-shaped but with a sharp, fishhook-like bend distally. In a fourth specimen (Fig. 31.3) the stylet ascended dorsally to a loop of an almost full circle 15 µm behind the proximal end, and ended in a similar loop distally. The stylet is made up of about 10 concentrically arranged rods. The surrounding sheath is 12-18 µm in diameter; its granular content



FIGURES 33.1-33.2. *Gnathostomaria lutheri*. 33.1: Rostrum; 33.2: Basal plate and jaws, strongly squeezed.

is organized as cells. The sheath widens caudally, and opens to a male pore situated subterminally, 15-25 µm in front of the posterior end of the body.

Spermiogenesis (Figs. 31.6-31.20, 34.1) proceeds caudally. The anterior regions of the testes contain 20 µm large cells (spermatogonia?) with a large nucleus and nucleolus (Fig. 31.7). In the same region one may find groups of four round, 10 µm large cells with granular nuclei that are contained in a common matrix (Fig. 31.8). A little more caudally these cells, still attached to the testis wall or separating from it, show a dense growth of 3 µm long filaments (Figs. 31.9, 31.14). Possibly the next stage is represented by round cells, 8 µm in diameter, which contain a fuzzy central body (nucleus?), and sport two tufts of filaments, one pointed, the other loose (Figs. 31.15-31.16). One stage looked like a jellyfish: with a semicircular umbrella and a fringe of filaments (Fig. 31.17). The caudal part of the testes, finally, is filled with what I interpret as sperm: almost perfectly round cells of 8 µm diameter which contain an optically dense body (the



FIGURES 34.1-34.2. *Gnathostomaria lutheri.* 34.1: Posterior body region with male organs, squeezed (*cf.* Fig. 31.6); 34.2: Seminal vesicle *(vs)* and proximal part of copulatory organ. – Phase contrast micrographs of live specimens.

nucleus?) from which a bundle of 6-10 µm long filaments emerges (Figs. 31.10-31.13). These filaments are immobile, both inside the testis and when squeezed out; it is unlikely, therefore, that they are cilia.

Female system: The single ovary (Fig. 31.1) is 180-250 µm long; it extends from U 24.1 to U 44.3. Maturing eggs are arranged in single file; the largest egg may reach 120 µm in length. Behind the ovary, from U 55.4 to U 59.1, there is a delicate, 38-50 µm long and 17-25 µm wide bursa of which only the 6-13 µm long mouthpiece is well-defined. The mouthpiece appears as if alternate halves of its component rings were cuticularized. The bursa (Fig. 31.5) is usually packed with sperm similar to but slightly smaller than those in the testes.

TABLE 19

MORPHOMETRIC DATA FOR *GNATHOSTOMARIA LUTHERI*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	1060	87.18	1160	1000	3
Body width of adults	58.33	10.41	70	50	3
Body index of adults	18.37	1.72	20	16.57	3
Rostrum index of adults	1.96	0.21	2.24	1.79	4
Jaw length	24	2	26	20	7
Basal plate length	9.17	1.17	11	8	6
Basal plate width	14.50	1.38	16	13	6
Basal plate index	0.63	0.06	0.73	0.56	6
Penis stylet length	103.75	7.50	110	95	4
Sperm length	13.67	1.86	16	11	6
Sperm width	8	0	8	8	6
Sperm index	1.71	0.23	2	1	6

Discussion: *Gnathostomaria lutheri* was first described by AX (1956) from a coastal brackish pond in south-western France. The scarce material allowed only a cursory account particularly of the reproductive system. The same author added further details about the epidermis (AX 1964a) and the pharynx (AX 1964b). My own visit to the type locality in 1966 failed to shed further light on the anatomy of the reproductive system because all of the 259 specimens collected were anterior fragments (STERRER 1971a). The adults from NC are, therefore, of considerable interest.

In most respects the NC specimens agree well with AX' descriptions and my own observations of *G. lutheri* from the type locality. Body dimensions are identical. Basal plate measurements, however, are larger for French

specimens (11-13 µm long and 15-18 µm wide), and so are jaw lengths (29-32 µm). My observations of the male reproductive system agree with AX' (1956) description and fig. 48 regarding the seminal vesicle with a sphincter, and the adjoining penis. The latter, however, is termed a 'cirrus' by AX who makes no mention of a stylet, possibly on account of the extremely weak sclerotization of the stylet rods. In the absence of any differences other than mouth part dimensions, however, I see no reason for establishing a new species for the NC population.

The possession of a stylet composed of rods establishes *Gnathostomaria* more firmly within Scleroperalia; if indeed there are 10 rods this would move the genus closer to Gnathostomulidae (which have 10 rods) rather than Mesognathariidae (which have 8 rods (MAINITZ 1979). Sperm is much larger than but structurally similar to that of *Gnathostomula jenneri* (RIEDL 1971b, fig. 49); of Mesognathariidae such as *Labidognathia longicollis* (RIEDL 1970a, fig. 38) and *Mesognatharia eastwardiae* (this paper, Fig. 36.7); and of *Agnathiella beckeri* (STERRER 1971d, fig. 13). The high similarity not only in body proportions and jaw architecture, but especially in the male reproductive system between *Gnathostomaria* and *Rastrognathia macrostoma* (KRISTENSEN & NØRREVANG 1977), makes a more detailed study of both desirable.

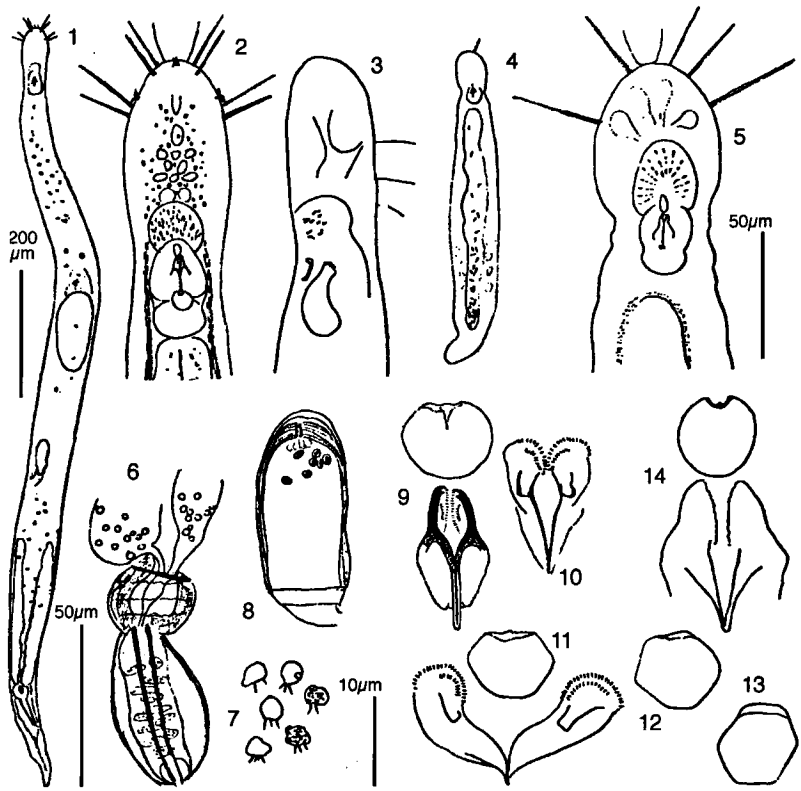
Family **MESOGNATHARIIDAE Sterrer, 1972**

Mesognatharia eastwardiae nov. spec.

(Figs. 35, 36; Table 20)

Holotype: North Carolina: One adult (from sample E3) in squeeze preparation, USNMNH 178347.
Further material:
– North Carolina: One adult and 2 juveniles from the same sample.
– Georgia: One juvenile from sample 50m.
Etymology: In appreciation of R/V EASTWARD which, operated by Duke University, provided many meiofauna samples, specimens and species.

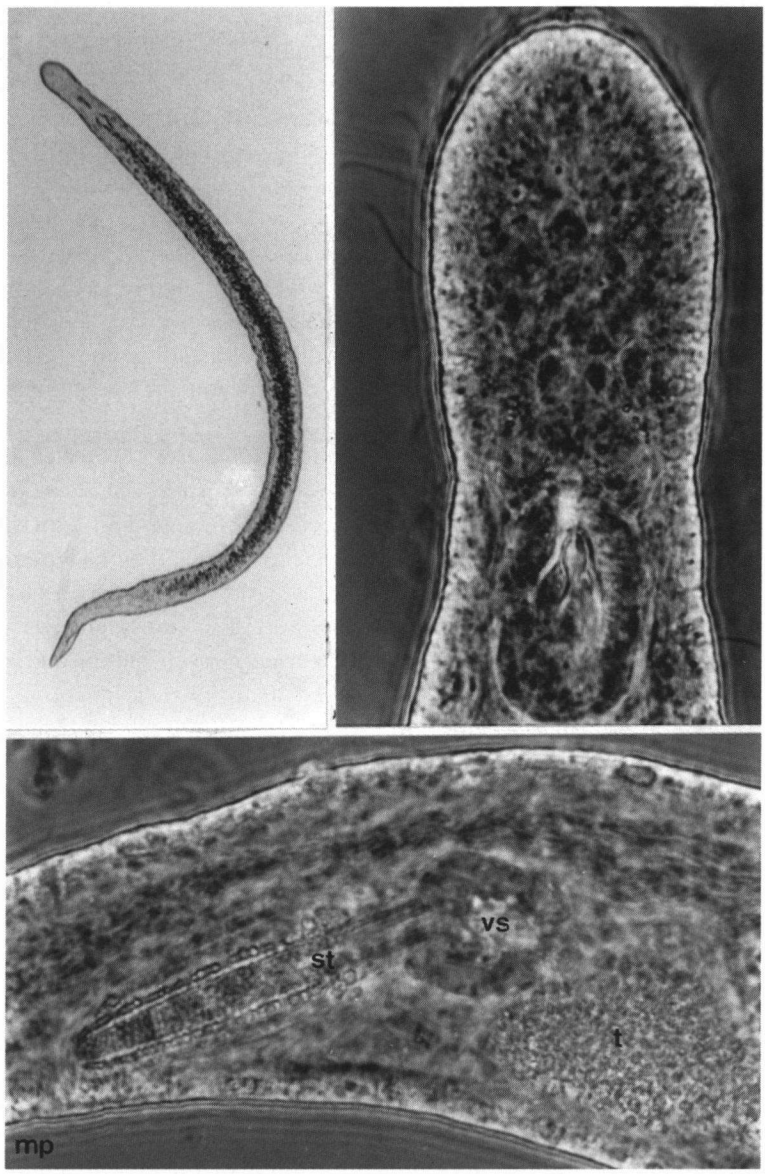
Diagnosis: Slender Mesognatharia (1,300 µm long and 75 µm wide; body index 17.75) with slender rostrum (index 1.85). Basal plate 7.80 µm long and 8.80 µm wide (index 0.89). Jaws 16.20 µm long, with short rostral



FIGURES 35.1-35.14. *Mesognatharia eastwardiae.* 35.1: Habitus of NC adult; 35.2: Rostrum of NC specimen; 35.3: Same in left lateral view; 35.4: Habitus of GEO juvenile; 35.5: Rostrum of same; 35.6: Male copulatory organ; 35.7: Sperm; 35.8: Bursa; 35.9: Basal plate and jaws of NC specimen; 35.10: Jaws of same, more strongly squeezed; 35.11: Basal plate and jaws of another NC specimen; 35.12-35.13: Basal plates of two more NC specimens; 35.14: Basal plates and jaws of the GEO specimen.

apophyses and two rostro-ventral arcs of very delicate, equal teeth. Penis stylet 62.00 µm long.

Organization and behaviour: Colourless. Adults (Fig. 35.1) were measured at 1,190-1,410 µm in length, and 60-90 µm in width at U 43.23 (index 17.75). The largest juvenile (Fig. 36.1) was only slightly shorter (1,160 µm) but thinner (50 µm; index 23.20). Specimens are always slender, with the posterior body portion tapering to a pointed tail. The ros-



FIGURES 36.1-36.3. *Mesognatharia eastwardiae.* 36.1: Habitus of NC juvenile; 36.2: Rostrum of same; 36.3: Male reproductive organs, in right lateral view; *mp* male pore, *st* male stylet, *vs* vesicula seminalis, *t* testis. – Phase contrast micrographs of live specimens.

trum (Figs. 35.2, 36.2) is rounded and slender, 72-80 µm long and 40-42 µm wide at U 2.76 (index 1.85). The 520 µm long juvenile from Georgia (Fig. 35.4) was considerably stouter (index 6.93), with a plumper rostrum (Fig. 35.5; index 1.12). The sensorium (Fig. 35.2-35.3) consists of paired apicalia (length 18 µm), frontalia (to 27 µm), ventralia (to 22 µm), dorsalia (to 30 µm), lateralia (to 30 µm), and a row of unpaired occipitalia (16 µm). In addition there is a pair of ciliary pits at U 0.3 (15 µm behind the anterior end), just in front of the lateralia; and an unpaired ciliary pit at the very front tip of the rostrum. The gut, which is often filled with round inclusions, is accompanied by a pair of tissue strands ('lateral system') which join behind the male pore and extend into the tail region. The animal is able to reverse its ciliary beat and swim backwards.

Digestive tract: The oval mouth opening extends from U 6.1 to U 6.9. It is enveloped rostrally by a massive unpaired prepharyngeal gland. The pharynx is faintly tripartite. The basal plate, 7-9 µm long and 8-10 µm wide (index 0.89), is rounded and shield-shaped (Figs. 35.9-35.14). Its outline is faint except for a reinforced, median concavity which may carry a single, sometimes deeply rooted tooth. The jaws are 15-17 µm long, delicate-lamellar, forceps-like, without a prominent symphysis. In the unsqueezed condition (Fig. 27.1) they seem to carry 1-2 teeth; further squeezing reveals that these are but the most dorso-rostral teeth of an arc of some 20-28 very delicate teeth, all connected at the base by a lamella that extends to the symphysis (Fig. 37.2). A second, more proximal arc contains 10-15 teeth. The rostral apophyses do not extend past half of the jaw length.

Male system: The paired, tubular testes are 240 µm long and 20 µm in diameter, extending from U 66.4 to U 86.6. Testes empty into short vasa deferentia which join inside a muscular seminal vesicle 30 µm long and 25 µm wide (Figs. 35.6, 36.3). The vesicle connects directly with the penis stylet, which extends from U 88.4 to U 91.9. Made up of 8 concentrically arranged rods, the stylet is 60-64 µm long, and proximally 4-5 µm wide. It is surrounded by a sheath which contains pockets of secretory granules. Sperm (Fig. 35.7) squeezed from the testes or the seminal vesicle is irregularly globular, of granular appearance, 2-3 µm in diameter, with a bundle of 2-4 short filaments ('membrane protrusions', (ALVESTAD-GRAEBNER 1983)).

Female system: The single dorsal ovary extends from 17.0 to U 50.4; of its total length of 470 µm the single mature egg may take up 270 µm. A bursa (Fig. 35.8) is usually found from U 56.6 to U 62.5. It is 60-65 µm long and 23-25 µm wide, semi-globular anteriorly, with parallel walls. Posteriorly the bursa continues into a prebursa which, in one specimen, reached so close to the dorsal body surface as to suggest a vagina. However, no vaginal pore was observed.The bursa mouthpiece is 4 µm long. Sperm stored in the bursa appears round and smooth, 3 µm in diameter, with a dark core.

TABLE 20

MORPHOMETRIC DATA FOR *MESOGNATHARIA EASTWARDIAE*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	1300.00	155.56	1410	1190	2
Body width of adults	75.00	21.12	90	60	2
Body index of adults	17.75	2.95	19.83	15.67	2
Rostrum index of adults	1.85	0.07	1.90	1.80	2
Jaw length	16.25	0.96	17	15	4
Basal plate length	7.75	0.96	9	7	4
Basal plate width	9.00	0.82	10	8	4
Basal plate index	0.86	0.10	1.00	0.78	4
Penis stylet length	62.00	2.83	64	60	2
Sperm length	3.00	0.00	3	3	3
Sperm width	2.33	0.58	3	2	3
Sperm index	1.33	0.29	1.50	1.00	3

Georgia	Mean	SD	Max	Min	n
Jaw length	16.00				1
Basal plate length	8.00				1
Basal plate width	8.00				1
Basal plate index	1.00				1

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	1300.00	155.56	1410	1190	2
Body width of adults	75.00	21.21	90	60	2
Body index of adults	17.75	2.95	19.83	15.67	2
Rostrum index of adults	1.85	0.07	1.90	1.80	2
Jaw length	16.20	0.84	17	15	5
Basal plate length	7.80	0.84	9	7	5
Basal plate width	8.80	0.84	10	8	5
Basal plate index	0.89	0.11	1.00	0.78	5
Penis stylet length	62.00	2.83	64	60	2
Sperm length	3.00	0.00	3	3	3
Sperm width	2.33	0.58	3	2	3
Sperm index	1.33	0.29	1.50	1.00	3

Discussion: The genus *Mesognatharia* was introduced by STERRER (1966b) with the (rather skimpily described) species *M. remanei*. KIRSTEUER (1969a) added (the equally scantily documented) *M. bahamensis*. The new species agrees with both in the general shape and dimensions of the basal plate (9 µm by 10 µm in *M. remanei*), but differs in the length of the jaws (30 µm in *M. remanei*). Male stylet length of *M. eastwardiae* is closer to that of *M. bahamensis* (50 µm) than *M. remanei* (35-40 µm). It is possible that the new species will turn out to be conspecific with *M. bahamensis*.

Labidognathia longicollis Riedl, 1970

(Figs. 38, 39; Table 21)

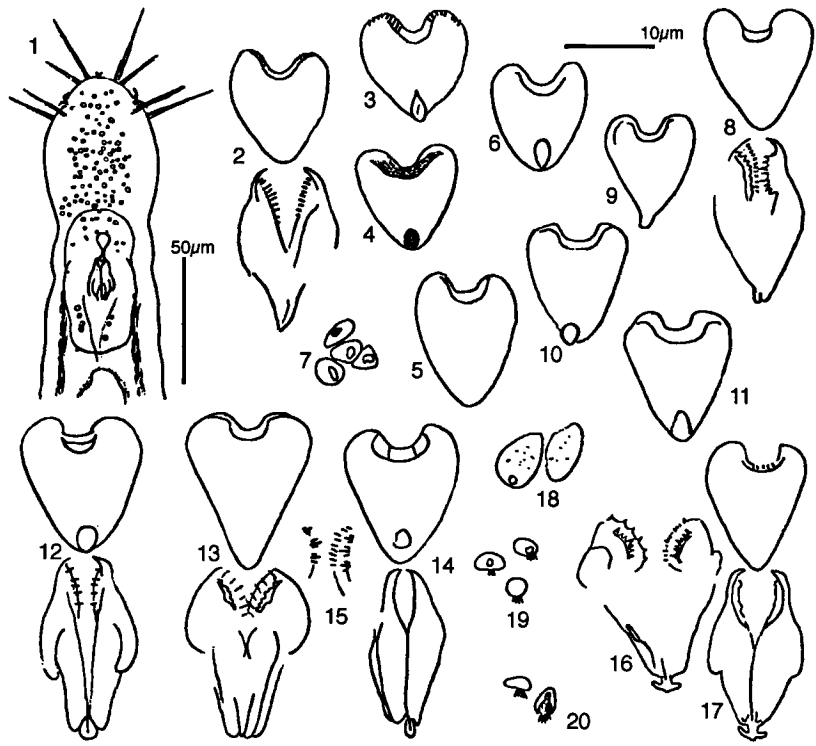
Material:
- North Carolina: 15 specimens (4 adults) from samples 61, 70.3, 79 and 111.
- Florida: One adult from sample F8.
- Belize: 8 specimens (1 adult) from samples 91.9, 91.11, 91.12, 91.20, 91.21, 94.12 and 94.15.
- Puerto Rico: 5 specimens (2 adults) from samples 95.01 and 95.04.
- Panama: 5 specimens (2 adults) from samples 118 and 94.P3.

Distribution: Canary Islands (STERRER 1997).

Only observations that augment or contradict the detailed original description are listed here.

Organization and behaviour: Transparent to grayish. Adults range from 560 µm to 1070 µm in length, and 35 µm to 75 µm in width. The sensorium (Fig. 38.1) consists of paired frontalia, ventralia, dorsalia and lateralia; apicalia are probably absent. In addition, there is one pair of ciliary pits about 15 µm behind the tip of the rostrum. Each pit consists of two bundles of cilia that originate 8 µm below the surface of the epidermis; after emerging, they bend rostro-ventrally. There is, finally, an unpaired ciliary pit at the very tip of the rostrum, whose cilia originate 4 µm below the surface of the epithelium and diverge ventro-laterally after emerging.

Digestive tract: The shield-shaped, always well-defined basal plate is 11-17 µm long and 9-14 µm wide. In the PR specimens (Figs. 38.2-38.6) the rostral contours were set with 9 teeth on either side. The jaws are 16-22 µm



FIGURES 38.1-38.20. *Labidognathia longicollis*. 38.1: Rostrum and sensorium of PAN specimen; 38.2-38.6: Basal plates of PR specimens; 38.7: Sperm of PR specimen; 38.8-38.11: Basal plates and jaws of BZE specimens; 38.12-38.14: Basal plates and jaws of PAN specimens; 38.15: Detail of dentition of a strongly squeezed PAN specimen; 38.16-38.17: Basal plates and jaws of FLO specimens; 38.18: Spermatid (?) of a PAN specimen; 38.19-38.20: Sperm of two PAN specimens. – One scale applies to 38.1, and a second to the remaining figures.

long, lamellate, with a distal arc of teeth embedded in a lamella that contains a second, proximal arc of teeth (which may actually be the roots of the first). In both arcs, teeth often appear of unequal size, so that one longer tooth is flanked by a pair of shorter ones (Fig. 38. 15, 39).

Male system: The male stylet is 23-35 µm long and consists of 8 rods. Sperm is 1-3 µm in diameter; its appearance seems to vary depending on whether it has been squeezed out of a testis, the vasa deferentia, or the bur-

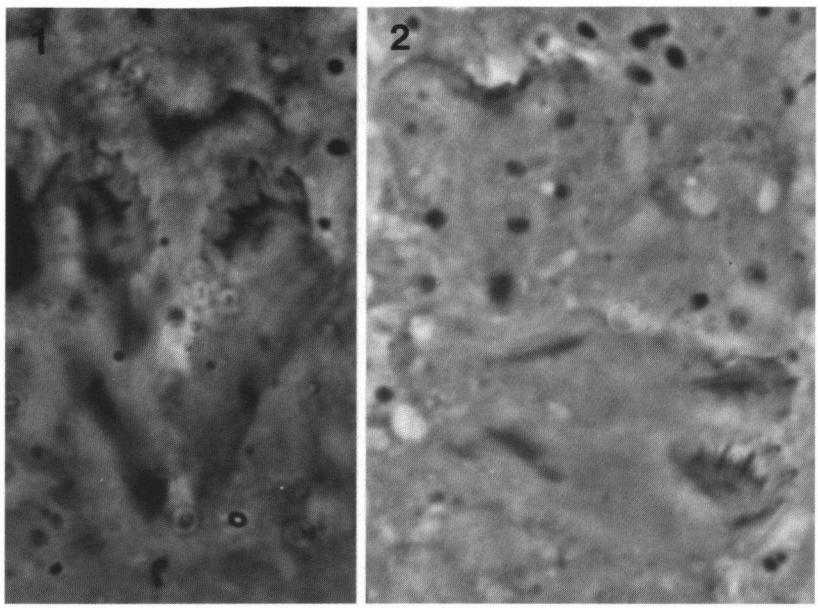


FIG. 39.1-39.2. *Labidognathia longicollis*. Basal plates and jaws, strongly squeezed. 39.1: FLO specimen; 39.2: NC specimen (jaws pointing to the right). – Phase contrast micrographs of live specimens.

sa. Sperm from the bursa is usually round and smooth whereas sperm from the testes is irregularly spherical, with a bundle of short filaments.

Female system: The bursa system consists of an ovoid bursa, 25-40 µm long and 15-20 µm wide, with a conspicuous mouthpiece. The bursa is usually stuffed solid with sperm. Posteriorly it is joined by an irregularly globular prebursa that may attain 50 µm in diameter and often contains rod- and lamellar structures.

TABLE 21

MORPHOMETRIC DATA FOR *LABIDOGNATHIA LONGICOLLIS*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	1070.00				1
Body width of adults	35.00				1
Body index of adults	30.57				1
Rostrum index of adults	1.80				1
Jaw length	17.43	0.79	18	16	7
Basal plate length	13.56	1.13	16	12	9
Basal plate width	10.67	1.12	12	9	9
Basal plate index	1.28	0.11	1.45	1.17	9
Penis stylet length	30.00				1
Sperm length	2.00	0.00	2	2	9
Sperm width	1.67	0.50	2	1	9
Sperm index	1.33	0.50	2.00	1.00	9

Florida	Mean	SD	Max	Min	n
Body length of adults	560.00				1
Body width of adults	54.00				1
Body index of adults	10.37				1
Rostrum index of adults	1.02				1
Jaw length	19.00				1
Basal plate length	14.00				1
Basal plate width	11.00				1
Basal plate index	1.27				1
Sperm length	2.00	0.00	2	2	2
Sperm width	2.00	0.00	2	2	2
Sperm index	1.00	0.00	1.00	1.00	2

Belize	Mean	SD	Max	Min	n
Body length of adults	760.00	226.27	920	600	2
Body width of adults	65.00	7.07	70	60	2
Body index of adults	11.57	2.22	13.14	10.00	2
Rostrum index of adults	1.94	0.12	2.03	1.86	2
Jaw length	19.13	0.64	20	18	8
Basal plate length	14.14	1.07	16	13	7
Basal plate width	11.29	0.95	12	10	7
Basal plate index	1.26	0.09	1.40	1.17	7
Penis stylet length	24.50	2.12	26	23	2
Sperm length	2.00	0.00	2	2	2
Sperm width	2.00	0.00	2	2	2
Sperm index	1.00	0.00	1.00	1.00	2

Puerto Rico	Mean	SD	Max	Min	n
Jaw length	17.60	0.89	19	17	5
Basal plate length	12.20	1.10	14	11	5
Basal plate width	10.60	0.55	11	10	5
Basal plate index	1.15	0.11	1.27	1.00	5
Penis stylet length	27.00	1.41	28	26	2

TABLE 21 (Continued)

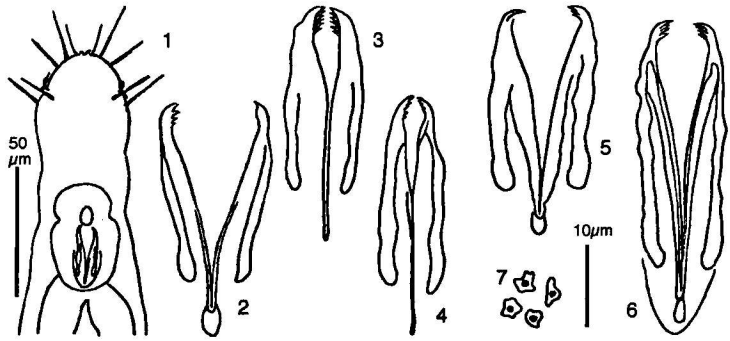
Panama	Mean	SD	Max	Min	n
Body length of adults	860.00	42.43	890	830	2
Body width of adults	72.50	3.54	75	70	2
Body index of adults	11.86	0.01	11.87	11.86	2
Rostrum index of adults	1.67				1
Jaw length	20.20	1.10	22	19	5
Basal plate length	15.20	1.48	17	13	5
Basal plate width	12.80	0.84	14	12	5
Basal plate index	1.19	0.07	1.25	1.08	5
Penis stylet length	32.50	3.54	35	30	2
Sperm length	2.67	0.58	3	2	3
Sperm width	2.33	0.58	3	2	3
Sperm index	1.22	0.48	1.50	0.67	3
ALL DATA	**Mean**	**SD**	**Max**	**Min**	**n**
Body length of adults	811.67	196.51	1070	560	6
Body width of adults	60.67	14.72	75	35	6
Body index of adults	14.63	7.89	30.57	10.00	6
Rostrum index of adults	1.68	0.39	2.03	1.02	5
Jaw length	18.58	1.33	22	16	26
Basal plate length	13.78	1.45	17	11	27
Basal plate width	11.22	1.19	14	9	27
Basal plate index	1.23	0.11	1.45	1.00	27
Penis stylet length	28.29	3.86	35	23	7
Sperm length	2.13	0.34	3	2	16
Sperm width	1.88	0.50	3	1	16
Sperm index	1.23	0.43	2.00	0.67	16

Discussion: The possession of an unpaired ciliary pit has not been reported in this species before, and is shared with *Mesognatharia eastwardiae* and *Tenuignathia rikerae.* Jaw length, although fairly consistent within a locality, seems to increase from north to south. PR specimens are similar to those from the Canary Islands (STERRER 1997) in having pronounced teeth on the rostral contour of the basal plate.

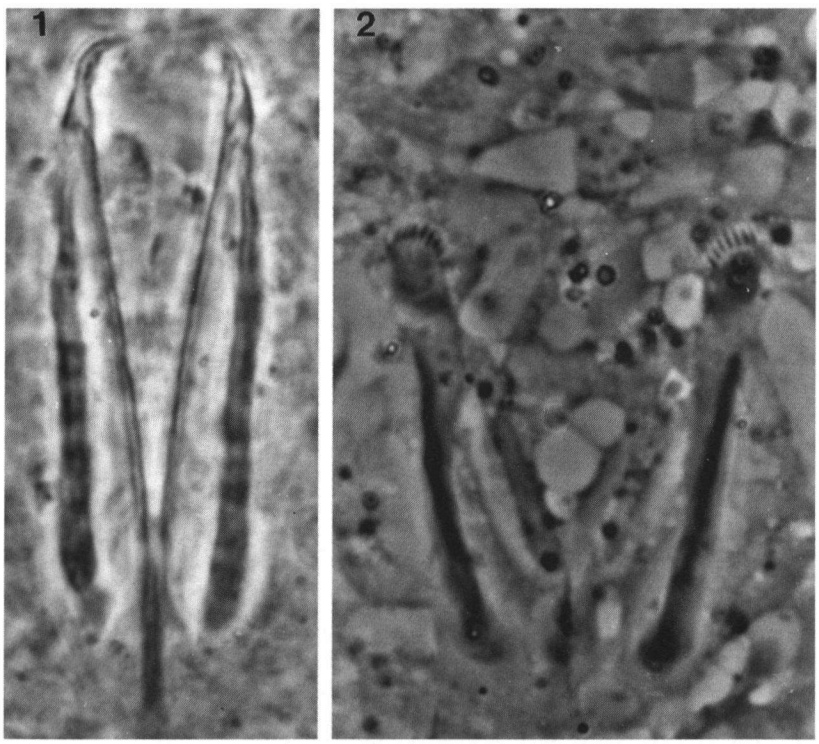
Tenuignathia rikerae Sterrer, 1976

(Figs. 40, 41; Table 22)

Material:
- North Carolina: 15 specimens (7 adults) from samples Pine KS and B1.
- Bermuda: 385 specimens (131 adults) from samples 18, 25, 29, 54.3, 75, 76, 79, 82, 94, 106, 107, 110, 111, 112, 117, 119, 120, EoN, TTX, 126 and 127.
- Florida: 2 juveniles from samples F15.
- Belize: 17 specimens (6 adults) from samples 91.1, 91.12 and 94.4.
- Panama: 3 specimens (1 adult) from sample 94.P3.



FIGURES 40.1-40.7. *Tenuignathia rikerae.* 40.1: Rostrum of BDA adult; 40.2: Jaws of NC specimen; 40.3: Jaws of FLO specimen; 40.4: Jaws of BZE specimen; 40.5: Jaws of PAN specimen; 40.6: Jaws of BDA specimen; 40.7: Sperm of NC specimen. – One scale applies to 40.1, a second to the remaining figures.



FIGURES 41.1-40.2. *Tenuignathia rikerae.* Jaws. 41.1: BDA specimen; 41.2: NC specimen, strongly squeezed. – Phase contrast micrographs of live specimens.

Organization and behaviour: Sensorium (Fig. 40.1) consisting of of one pair each of apicalia, frontalia, ventralia, dorsalia, and lateralia, as well as a row of occipitalia and three ciliary pits. Usually lemon-yellow.

Digestive tract: A basal plate is consistently absent; the "possible outline of a basal plate" shown in fig. 18 (STERRER 1976) must go down as a figment of my imagination. At jaw lengths of 26-31 µm, the new data from BZE (Fig. 40.4) and PAN (Fig. 40.5) are well within the NC-FLO range of 24-31 µm (Figs. 40.2-40.3, 41.2), and do not approach the extremes recorded in Bermuda (26-40 µm; Figs. 40.6, 41.1) (STERRER 1977).

TABLE 22

MORPHOMETRIC DATA FOR *TENUIGNATHIA RIKERAE*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	775.00	113.62	900	590	6
Body width of adults	45.83	7.36	60	40	6
Body index of adults	17.09	2.84	22.50	14.75	6
Rostrum index of adults	1.86				1
Jaw length	25.80	1.26	28	24	15
Penis stylet length	28.20	3.19	32	24	5
Bermuda	Mean	SD	Max	Min	n
Body length of adults	652.90	174.88	1080	340	131
Body width of adults	52.65	11.21	90	30	131
Body index of adults	12.52	2.84	24.50	6.67	131
Rostrum index of adults	1.71	0.07	1.80	1.57	8
Jaw length	31.71	2.65	40	26	385
Penis stylet length	31.38	4.63	42	21	72
Sperm length	3.75	0.50	4	3	4
Sperm width	3.00	0.00	3	3	4
Sperm index	1.25	0.17	1.33	1.00	4
Florida	Mean	SD	Max	Min	n
Jaw length	28.00	0.00	28	28	2
Belize	Mean	SD	Max	Min	n
Body length of adults	820.00				1
Body width of adults	70.00				1
Body index of adults	11.71				1
Rostrum index of adults	1.43				1
Jaw length	29.06	1.95	31	26	17
Penis stylet length	29.30	4.19	37	23	10

TABLE 22 (Continued)

Panama	Mean	SD	Max	Min	n
Body length of adults	720.00				1
Body width of adults	100.00				1
Body index of adults	7.20				1
Rostrum index of adults	1.83				1
Jaw length	25.67	0.58	26	25	3
Penis stylet length	25.00	2.00	27	23	3
ALL DATA	**Mean**	**SD**	**Max**	**Min**	**n**
Body length of adults	654.90	173.35	1080	340	145
Body width of adults	52.41	12.04	100	22	145
Body index of adults	12.69	2.97	24.50	6.67	145
Rostrum index of adults	1.70	0.14	1.86	1.43	13
Jaw length	31.33	2.89	40	24	422
Penis stylet length	30.76	4.64	42	21	90
Sperm length	3.75	0.50	4	3	4
Sperm width	3.00	0.00	3	3	4
Sperm index	1.25	0.17	1.33	1.00	4

Discussion: The genus comprises two species of which one, *T. vitiensis* Sterrer, 1991 is so far known only from Fiji. An analysis of 385 specimens of *T. rikerae* from Bermuda for jaw length variability (STERRER 1977) suggested that – at least in this species – jaw length is independent of age, is only slightly variable within a sample, remains stable within the same population over years, but can be significantly different in populations that are only a short distance apart.

Family **PAUCIDENTULIDAE nov. fam.**

Diagnosis of family: Scleroperalia with one pair of apicalia and 3 or 4 pairs of compound bristles. Ciliary pits absent. Epidermal cells in stripes. Jaws without a cauda, lamellar but open, with few teeth in a rostro-ventral arc. Without a jugum. Without ability to swim backwards.
One genus: *Paucidentula* n. g.

Diagnosis of *Paucidentula* n.g.: Paucidentulidae with rostrum narrower than the body. Sperm droplet-shaped.
Type species: *P. anonyma* n. sp.

Paucidentula anonyma n.g., n. sp.

(Figs. 42.1-42.8, 43-45; Table 23)

Holotype: One adult from Belize (sample 91.3) in squeeze preparation, USNMNH 178351.
Further material: Belize: 6 specimens (5 adults) from samples 91.3, 91.7, 91.13, 91.18 and 94.15.
Etymology: The genus name refers to the paucity of jaw teeth; the species name to the relative lack of identifying features.

Diagnosis: Small, plump *Paucidentula* (length 329.00 µm, width 65.00 µm; index 4.93) with a short rostrum (index 0.84). Without a basal plate; jaws 22.67 µm long, with about 3 teeth. Penis stylet 39.80 µm long.

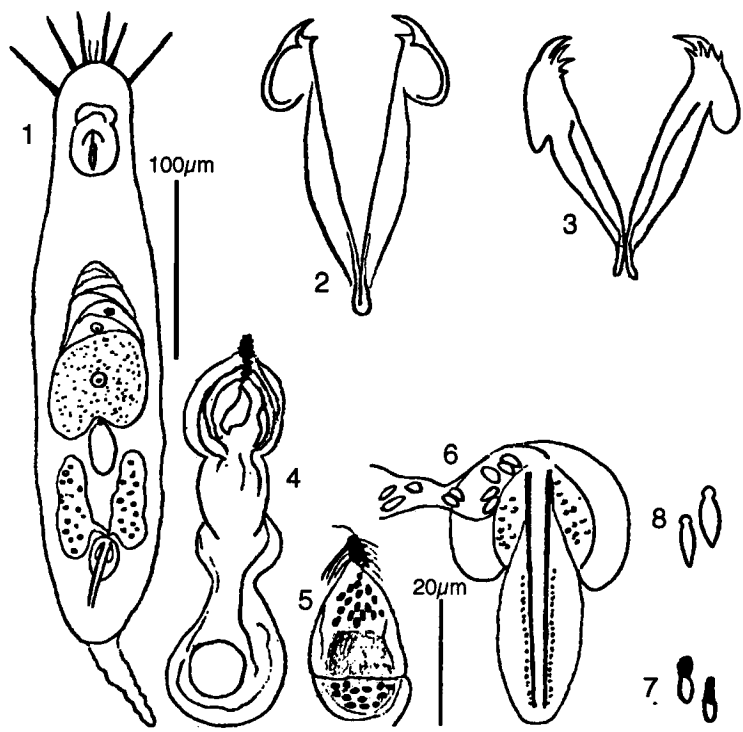
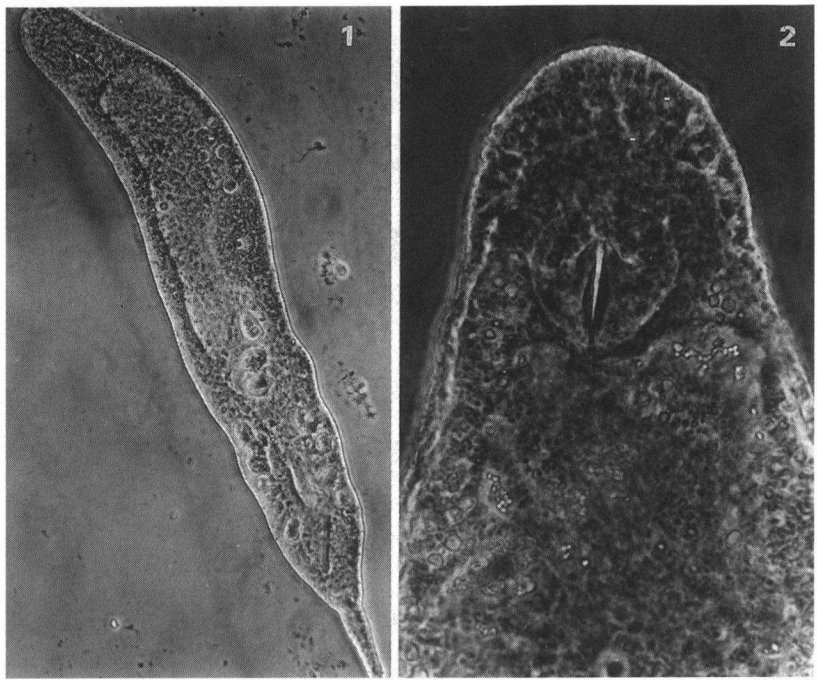


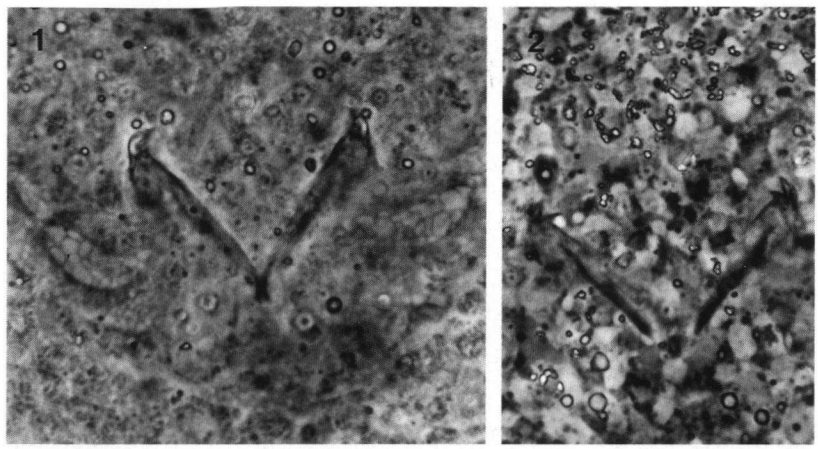
FIGURE 42.1-42.8. *Paucidentula anonyma*. 42.1: Habitus; 42.2-42.3: Jaws of two specimens; 42.4: Bursa and prebursa; 42.5: Bursa of another specimen; 42.6: Male copulatory organ; 42.7-42.8: Sperm of two specimens.



FIGURES 43.1-43.2. *Paucidentula anonyma.* 43.1: Habitus of adult, somewhat squeezed; 43.2: Rostrum, somewhat squeezed. – Phase contrast micrographs of live specimens.

Organization and behaviour: Body colourless, rather translucent. Animals are fast, agile swimmers. The body length of adults (Figs. 42.1, 43.1) ranges from a mere 260 µm to 400 µm, body width is 60-70 µm at U 41.41 (index 4.93). The rostrum is much narrower than the body; it measures 40 µm in length and 45-50 µm in width at U 12.27 (index 0.84). There is a 25-50 µm short but well-delimited tail region. The epidermis is organized in stripes. The sensorium consists of one pair each of apicalia (15 µm long), frontalia (35 µm), ventralia (25 µm) and lateralia (38 µm). A short row of occipitalia originates on a dorsal hump on the rostrum, above the mouth. Neither dorsalia nor ciliary pits were seen in the few specimens studied.

Digestive tract: The round to oval mouth is located at U 6.7. A large but diffuse prepharyngeal gland was observed. A basal plate is lacking. The

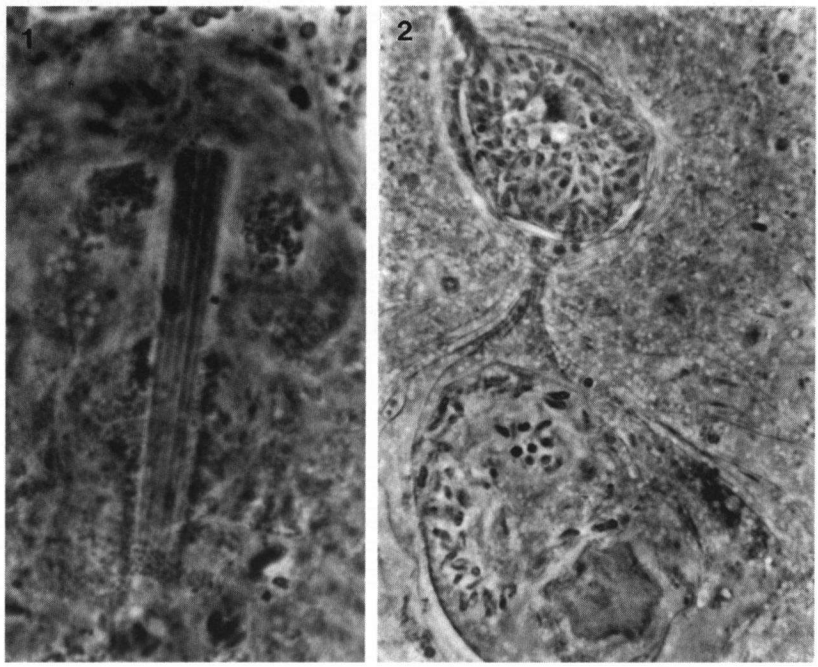


FIGURES 44.1-44.2. *Paucidentula anonyma*. 44.1: Jaws; 44.2: Same, more strongly squeezed. – Phase contrast micrographs of live specimens.

jaws (Figs. 42.2-42.3, 43.2, 44) are 21-26 µm long and quite delicate, hence difficult to analyze. They are slender, with short, rounded shoulders; the symphysis is not enlarged, and a cauda is lacking. In the unsqueezed condition (Figs. 42.2, 44.1) a strong terminal tooth is accompanied by one smaller tooth; further squeezing (Figs. 42.3, 44.2) suggests there may be as many as 4 smaller teeth of unequal size ventral to the terminal tooth. The pharynx bulb does not appear tripartite, and is only 1-4 µm long behind the symphysis.

Male system: The paired, diffuse-follicular testes extend from U 58.7 to U 72.0. A pair of short vasa deferentia (Fig. 42.6) lead into a large seminal vesicle that caps the proximal end of the penis stylet. The conical stylet extends from U 73.03 to U 84.84. It is 38-41 µm long and 4-7 µm wide, and surrounded proximally by a belt of medium-coarse granula; distally it is accompanied by very fine granula. Sperm (Figs. 42.7-42.8) is droplet-shaped, 4-6 µm long and 1-2 µm wide, often with a neck and head region that appear darker in phase contrast than the remainder.

Female system: The ovary extends from U 30.7 to U 53.3; a mature egg was 50 µm long. The bursa (Figs. 42.4-42.5), which often bulges into the largest egg, is bell-shaped, 26-33 µm long and 15 µm wide, with a strongly



FIGURES 45.1-45.2. *Paucidentula anonyma*. 45.1: Male copulatory organ; 45.2: Bursa (upper) and prebursa (lower part of figure). – Phase contrast micrographs of live specimens.

cuticularized, 8 µm long mouth piece but without cristae. The caudally adjoining prebursa is usually irregularly shaped and contains convoluted vacuoles. In two specimens the prebursa seemed to continue into a dorsal vagina situated at about U 61.

TABLE 23

MORPHOMETRIC DATA FOR *PAUCIDENTULA ANONYMA*

Belize	Mean	SD	Max	Min	n
Body length of adults	329.00	62.29	400	260	5
Body width of adults	65.00	7.07	70	60	2
Body index of adults	4.93	0.61	5.36	4.5	2
Rostrum index of adults	0.84	0.06	0.89	0.8	2
Jaw length	22.67	1.97	26	21	6
Penis stylet length	39.80	1.64	41	38	5
Sperm length	5.00	1.00	6	4	5
Sperm width	1.50	0.58	2	1	4
Sperm index	3.50	1.29	5	2	4

Discussion: The possession of a cuticular stylet and bursa places the new genus in the Suborder Bursovaginoidea-Scleroperalia. The absence of a jugum and a basal plate rules out a close affinity with the family Gnathostomulidae. A basal plate is lacking in the family Agnathiellidae, but also in other lower Scleroperalia such as the genera *Tenuignathia* Sterrer, 1976 (Fam. Mesognathariidae), *Clausognathia* Sterrer, 1992 (Fam. Clausognathiidae), and *Rastrognathia* Kristensen & Nørrevang, 1977 (Fam. Rastrognathiidae). In body and rostrum proportions as well as the reproductive system, the new genus is most similar to members of Onychognathiidae, especially *Onychognathia* Riedl, 1971, and *Nanognathia* Sterrer, 1973. However, the diagnosis of Onychognathiidae specifies jaws "with a cauda and long teeth arranged in a ventro-dorso-rostral basket" (STERRER 1972) – features which this genus clearly does not share. Rather than water down the rather homogeneous family Onychognathiidae, therefore, I see no way around erecting a new family, to be placed – together with the equally monotypic family Problognathiidae – between Mesognathariidae and Onychognathiidae.

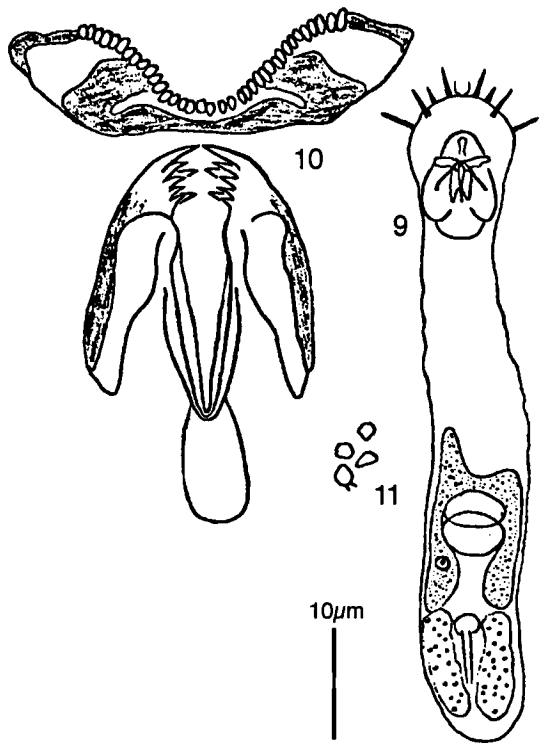
Family **PROBLOGNATHIIDAE Sterrer & Farris, 1975**

Problognathia minima Sterrer & Farris, 1975

(Figs. 42.9-42.11, 46; Table 24)

Material: Bermuda: 39 specimens (16 adults) from samples 29, 54.3, 111, 126, 129 and 137.

No additional material has been examined since the original description, with the exception of measurements of jaws, basal plate and penis stylet which were used for comparative population analyses (STERRER 1977). These data have been incorporated in the table below, which is otherwise an amended version of Table 1 in STERRER & FARRIS (1975).



FIGURES 42.9-42.11. *Problognathia minima.* 42.9: Habitus; 42.10: Basal plate and jaws; 42.11: Sperm. – One scale applies to 42.1 and 42.9, a second to 42.4-42.6, and a third to the remaining figures.

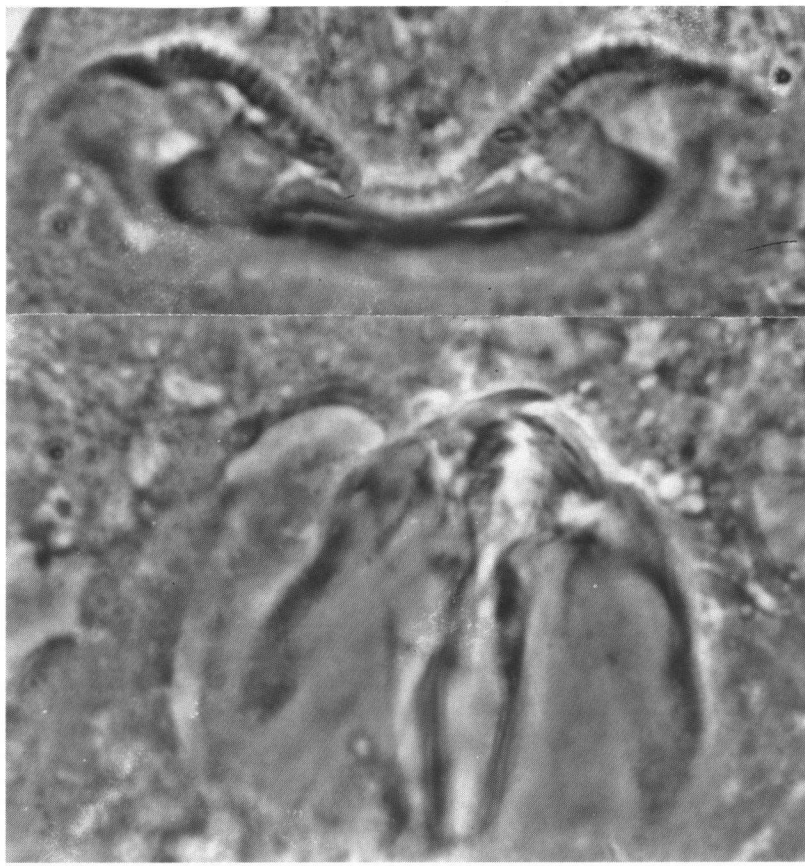


FIG. 46. *Problognathia minima.* Basal plate and jaws, squeezed. – Phase contrast micrograph of live specimen.

TABLE 24

MORPHOMETRIC DATA FOR *PROBLOGNATHIA MINIMA*

Bermuda	Mean	SD	Max	Min	n
Body length of adults	329.30	44.50	370	230	9
Body width of adults	53.20	7.50	70	45	9
Body index of adults	6.03	0.95	7.26	5.63	8
Rostrum index of adults	0.62	0.19	0.94	0.39	8
Jaw length	23.23	0.96	25	22	39
Basal plate length	10.62	0.89	12	9	34
Basal plate width	35.65	2.13	40	32	34
Basal plate index	0.30	0.02	0.35	0.27	34
Penis stylet length	25.75	2.93	31	20	16
Sperm length	2.00	0.00	2	2	6
Sperm width	2.00	0.00	2	2	6
Sperm index	1.00	0.00	1.00	1.00	6

Discussion: To date found only in Bermuda, this monotypic genus is quite unique among Scleroperalia owing to its round, interlocking bursa and prebursa, small and stout body and rostrum, and expansive basal plate.

Family ONYCHOGNATHIIDAE Sterrer, 1972

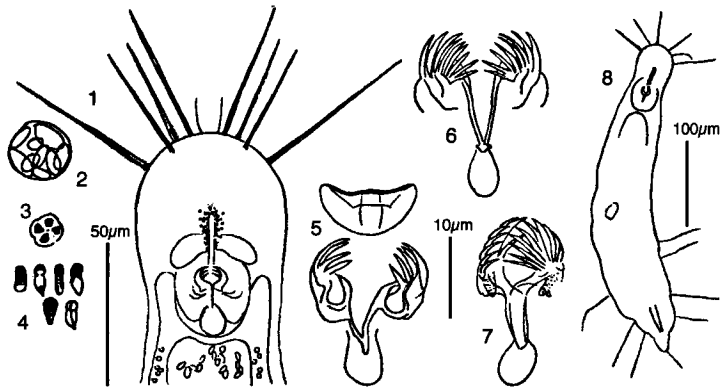
Onychognathia filifera Riedl, 1971

(Figs. 47, 48; Table 25)

Material:
- North Carolina: 1 adult from sample E.
- Florida: 6 specimens (3 adults) from samples F14 and F15.

Since many of my FLO observations contributed to the original description of this species (RIEDL 1971a), and no new material has been added, I restrict myself here to a re-analysis of salient features. The single specimen from NC (Figs. 47.8, 48.1-48.2) may not belong to the same species.

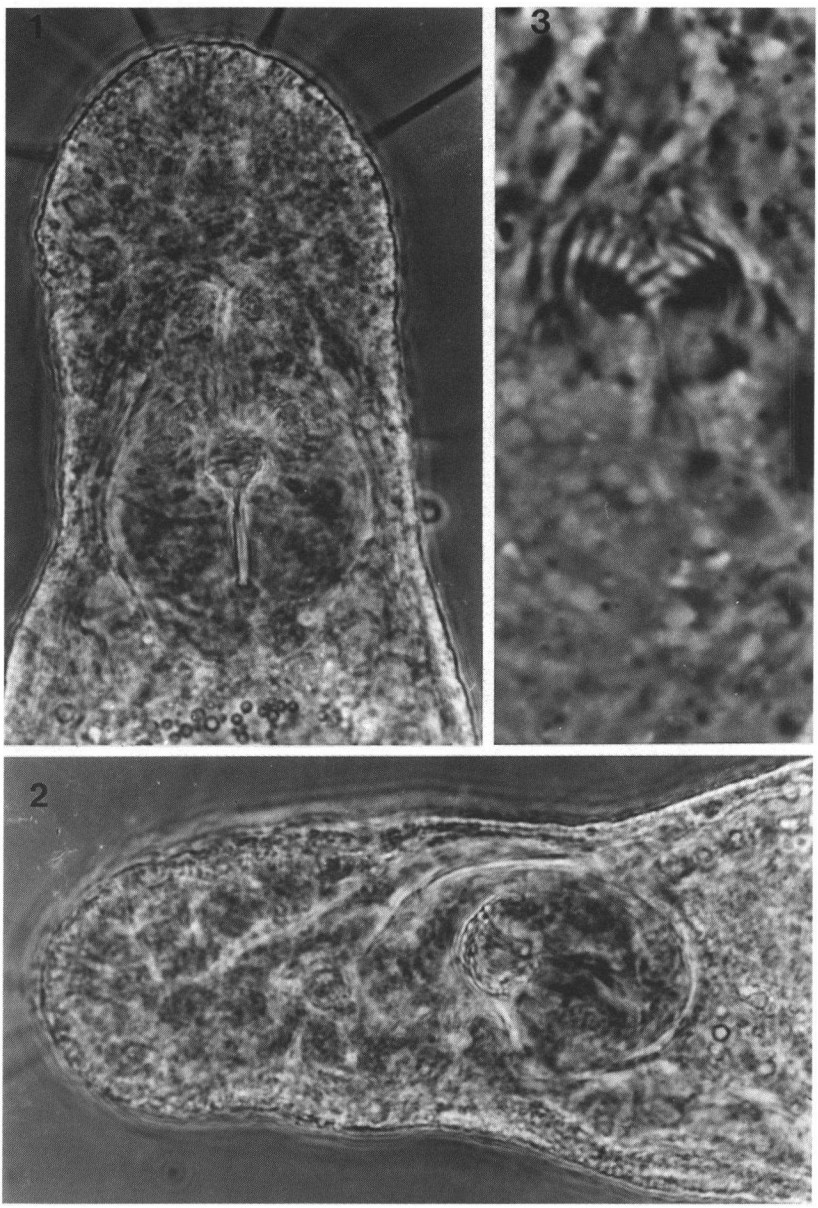
Organization and behaviour: Adults are 460-540 µm long and 70-75 µ wide at U 55 (index 5.43-7.20). Rostrum (Fig. 47.1) evenly rounded, 42-50 µm long and 43-50 µm wide at U 4.8-6.3 (index 0.84-1.16). Sensorium consisting of apicalia 1 (to 18 µm), frontalia (48 µm), ventralia (38 µm), dorsalia (42 µm), lateralia (62 µm), and occipitalia. Ciliary pits are lacking.



FIGURES 47.1-47.8. *Onychognathia filifera*. 47.1: Habitus of FLO specimen; 47.2: Rhabdoid bundles of ventral epidermis, FLO specimen; 47.3: Spermatid tetrad of FLO specimen; 47.4: Sperm of FLO specimen; 47.5: Basal plate and jaws of FLO specimen; 47.6: Same of another FLO specimen; 47.7: Jaws of FLO specimen, left ventral view (after (RIEDL, 1971a 112), fig. 16); 47.8: Habitus of NC specimen. – One scale applies to 47.1, a second to 47.8, and a third to the remaining figures.

Tail region short (20 µm, or 5% of body length) and blunt. The posterior body region, from about U 65 on, is set with single trailing cilia up to 60 µm long. The ventral epidermis of FLO specimens contained spherical rhabdoid bundles arranged in two parallel strips (Fig. 47.2). These bundles are 6-8 µm in diameter in the epidermis of the rostrum, and larger (to 20 µm) post-rostrally. Individual rhabdoids are ricegrain-shaped, 3 µm long by 1 µm in the rostral bundles and 5 µm by 2 µm in the posterior bundles. Such bundles were lacking in the single NC specimen (Fig. 47.8).

Digestive tract: The mouth is up to 22 µm long and 3 µm wide. A pair of large prepharyngeal glands flank the mouth opening anterior to the pharynx bulb. Judging from the faint contours which I recorded from two specimens (RIEDL 1971a: figs. 18, 19), the basal plate (Fig. 47.5) is either only faintly sclerotized or not expressed at all. The jaws (Figs. 47.5-47.7, 48.3) are 13-20 µm long, with a slender, forceps-like symphysis lamella and a bulbous cauda. Each jaw carries 8-10 saber-shaped teeth in a basket-like arrangement; teeth are longest dorsally (7 µm) and get shorter ventrally (to 3 µm). The rostral apophyses bend ventro-caudally and slightly medially so that the jaw ridges (RIEDL 1971a: fig. 12, ri) represent the lateral-most contour of the jaws.



FIGURES 48.1-48.3. *Onychognathia filifera*. 48.1: Rostrum of NC specimen; 48.2: Same in left lateral view; 48.3: Jaws of FLO specimen, strongly squeezed. – Phase contrast micrographs of live specimens.

Male system: The paired testes extend from U 68.5 to U 81.5 (length 70 µm). Sperm (Fig. 47.4) is conical, flattened at one end, 3-4 µm long and 1-2 µm wide. Extending from U 81.5 to U 88 the male stylet is 33-41 µm long and 4-7 µm wide proximally.

Female system: The dorsal ovary extends from U 24.1 to U 51.9; the largest egg from U 36.1 to U 51.9 (length 85 µm). Bursa system from U 53.7 to U 59.3 (length 85 µm, width 30 µm).

TABLE 25

MORPHOMETRIC DATA FOR *ONYCHOGNATHIA FILIFERA*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	380.00				1
Body width of adults	70.00				1
Body index of adults	5.43				1
Rostrum index of adults	1.16				1
Jaw length	20.00				1
Penis stylet length	33.00				1
Florida	Mean	SD	Max	Min	n
Body length of adults	500.00	56.57	540	460	2
Body width of adults	72.50	3.54	75	70	2
Body index of adults	6.89	0.44	7.20	6.57	2
Rostrum index of adults	0.86	0.03	0.88	0.84	2
Jaw length	14.50	1.22	16	13	6
Basal plate length	5.50	0.71	6	5	2
Basal plate width	10.00	2.83	12	8	2
Basal plate index	0.56	0.09	0.63	0.50	2
Penis stylet length	38.75	1.71	41	37	4
Sperm length	3.33	0.52	4	3	6
Sperm width	1.17	0.41	2	1	6
Sperm index	3.08	0.92	4.00	1.50	6
ALL DATA	Mean	SD	Max	Min	n
Body length of adults	460.00	80.00	540	380	3
Body width of adults	71.67	2.89	75	70	3
Body index of adults	6.40	0.90	7.20	5.43	3
Rostrum index of adults	0.96	0.17	1.16	0.84	3
Jaw length	15.29	2.36	20	13	7
Basal plate length	5.50	0.71	6	5	2
Basal plate width	10.00	2.83	12	8	2
Basal plate index	0.56	0.09	0.63	0.50	2
Penis stylet length	37.60	2.97	41	33	5
Sperm length	3.33	0.52	4	3	6
Sperm width	1.17	0.41	2	1	6
Sperm index	3.08	0.92	4.00	1.50	6

Discussion: In its general appearance the animal can be likened to a plump *Gnathostomula* with a tiny, well-rounded head. The NC specimen, which came from deeper water, had much larger jaws than the FLO specimens.

Onychognathia rhombocephala nov. spec.

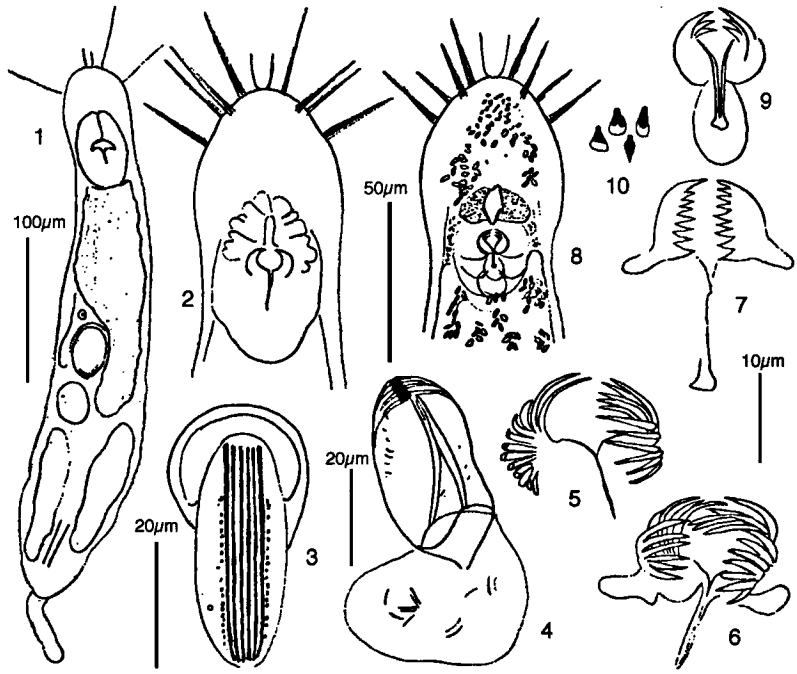
(Figs. 49-51; Table 26)

Holotype: One adult from Belize (sample 91.9) in squeeze preparation, USNMNH 178348.
Further material:
- Belize: 15 specimens (12 adults) from samples 91.9, 91.11, 91.12, 91.13, 94.4.
- North Carolina : 1 adult from sample E3.
- Panama: 1 adult from sample P3.

Etymology: From the diamond shape of the rostrum.

Diagnosis: Short *Onychognathia* (length 390 µm, width 67.14 µm; index 5.86) with rhomboid rostrum (index 1.00) and well-delimited tail but no trailing cilia. With massive, lobate prepharyngeal glands. Jaws 19.83 µm long, with caudo-laterally flaring rostral apophyses. Penis stylet 32.44 µm long.

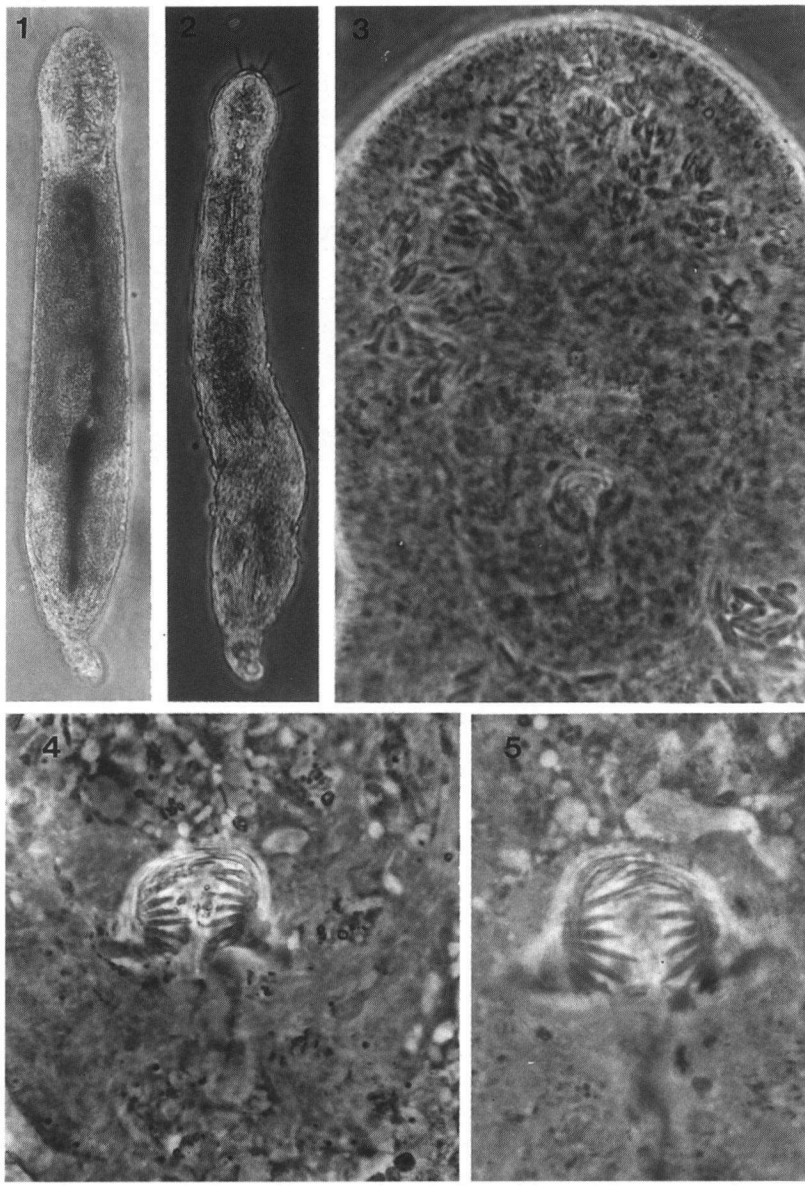
Organization and behaviour: Adults (Figs. 49.1, 50.1-50.2) are 355-420 µm long and 55-70 µm wide at U 45-76 (index 5.07-7.09). Rostrum (Figs. 49.2, 49.8) somewhat diamond-shaped, 45-50 µm long, 45-52 µm wide at U 7.3-9.1 (index 0.92-1.11). All specimens had a well-delimited tail about 30-40 µm long and 15 µm in diameter. In the single NC specimen (Figs. 49.8, 50.2-50.3) the ventral epidermis contained groups of rhabdoids; these were evenly distributed in the rostrum, but arranged in 3 longitudinal rows behind the pharynx. The median row ended at about U 26 whereas the 2 lateral rows continued to U 82. Rhabdoids were rice grain shaped, 4-6 µm long and 1-2 µm wide. The sensorium (Figs. 49.2, 49.8) consists of apicalia (to 18 µm), frontalia (57 µm), ventralia (25 µm), dorsalia (35 µm), and lateralia (50 µm). Occipitalia are present, ciliary pits absent. There are no trailing cilia. The animal is an agile, fast swimmer, but reacts to anaesthetic (magnesium sulfate) instantly by ceasing all locomotion. In transmitted light the species is easily distinguished from *Gnathos-*



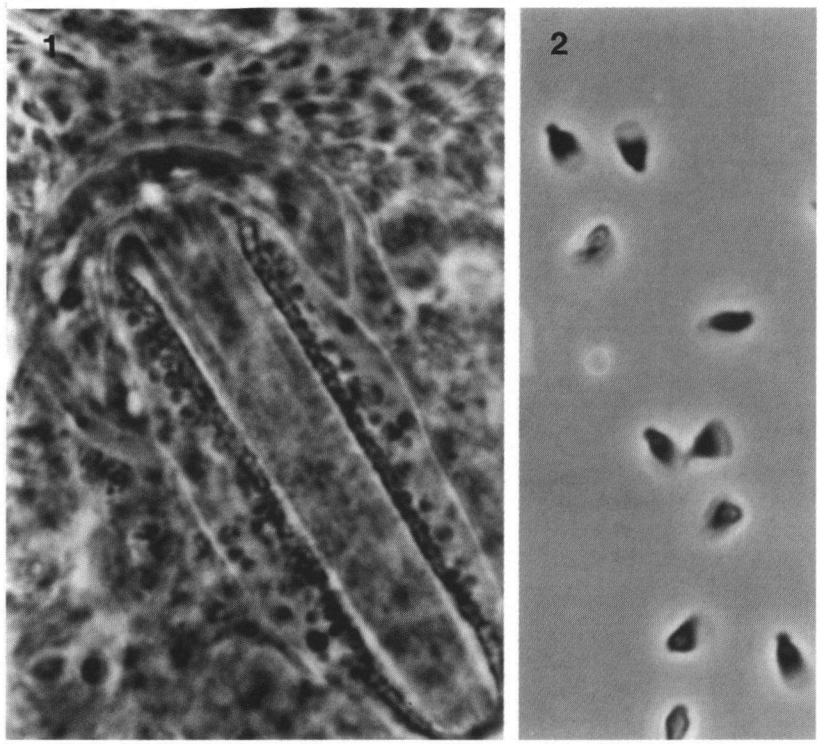
FIGURES 49.1-49.10. *Onychognathia rhombocephala.* 49.1: Habitus of BZE specimen; 49.2: Rostrum of BZE specimen; 49.3: Male copulatory organ of NC specimen; 49.4: Bursa of PAN specimen; 49.5: Jaws of BZE specimen; 49.6: Jaws of holotype BZE specimen; 49.7: Jaws of BZE specimen, unsqueezed; 49.8: Rostrum of NC specimen; 49.9: Jaws of same; 49.10: Sperm of same. – One scale applies to 49.1, a second to 49.2 and 49.8, a third to 49.3, a fourth to 49.4, and a fifth to the remaining figures.

tomula axi by the abrupt contrast between the translucent pharynx and the dark, opaque gut.

Digestive tract: The slit-like mouth is 14-22 µm long and 2-3 µm wide. The buccal cavity is capped anteriorly by a bulky, many-lobed prepharyngeal gland (Fig. 49.2). A basal plate is lacking. The basket-shaped jaws are 18-23 µm long in BZE specimens (Figs. 49.5-49.7, 50.4-50.5), only 13 µm long in the single NC specimen (Fig. 49.9), and 25 µm in the single PAN specimen. This wide range may be partly due to the fact that the symphysis is not swollen, and is furthermore often partially embedded in a bulbous cauda – all of which make it difficult to determine the posterior end of the



FIGURES 50.1-50.5. *Onychognathia rhombocephala.* 50.1: Habitus of BZE specimen; 50.2: Habitus of NC specimen; 50.3: Rostrum of same; 50.4-50.5: Jaws of two BZE specimens. – Phase contrast micrographs of live specimens.



FIGURES 51.1-51.2. *Onychognathia rhombocephala.* 51.1: Male copulatory organ of NC specimen; 51.2: Sperm of NC specimen. – Phase contrast micrographs of live specimens.

jaws with certainty. There are 11-13 teeth per jaw, arranged in two groups: a ventral group of 6-7 shorter, broader teeth that point medially, and a dorso-rostral group of 5-6 longer, saber-shaped teeth that point medianly. A pair of conspicuous rounded apophyses project latero-caudally.

Male system: The paired testes extend from U 62 to U 83 (length 70-100 µm). They are not follicular but appear to consist of a pair of tubes tightly packed with sperm. The sperm of a BZE specimen was 2.5 µm long and 1.5 µm wide, leaf-shaped, with a tiny head; the sperm of the single NC specimen (Fig. 49.10, 51.2) was slightly larger (3 µm by 2 µm). Located between U 83 and U 92, the penis stylet (Figs. 49.3, 51.1)is 25-38 µm long and 5-7 µm wide proximally; it hardly tapers at all distally.

Female system: The largest egg in the dorsal ovary extends from U 42 to U 62 (length 70 µm); it may laterally overlap the bursa system (Fig. 49.4) which is located between U 53.5 and U 62. Bursa 40-63 µm long, 20-35 µm wide, with two cristae; mouthpiece 8 µm long.

TABLE 26

MORPHOMETRIC DATA FOR *ONYCHOGNATHIA RHOMBOCEPHALA*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	390.00				1
Body width of adults	55.00				1
Body index of adults	7.09				1
Rostrum index of adults	1.02				1
Jaw length	13.00				1
Penis stylet length	35.00				1
Sperm length	3.33	0.58	4	3	3
Sperm width	1.67	0.58	2	1	3
Sperm index	2.17	0.76	3.00	1.50	3

Belize	Mean	SD	Max	Min	n
Body length of adults	395.83	20.10	420	370	6
Body width of adults	69.00	2.24	70	65	5
Body index of adults	5.77	0.28	6.00	5.29	5
Rostrum index of adults	1.01	0.02	1.04	1.00	3
Jaw length	19.94	1.29	23	18	16
Penis stylet length	32.25	3.34	38	25	16
Sperm length	2.50	0.00	2.5	2.5	2
Sperm width	1.50	0.00	1.5	1.5	2
Sperm index	1.67	0.00	1.67	1.67	2

Panama	Mean	SD	Max	Min	n
Body length of adults	355.00				1
Body width of adults	70.00				1
Body index of adults	5.07				1
Rostrum index of adults	0.92				1
Jaw length	25.00				1
Penis stylet length	33.00				1

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	390.00	22.20	420	355	8
Body width of adults	67.14	5.67	70	55	7
Body index of adults	5.86	0.64	7.09	5.07	7
Rostrum index of adults	1.00	0.04	1.04	0.92	5
Jaw length	19.83	2.41	25	13	18
Penis stylet length	32.44	3.20	38	25	18
Sperm length	3.00	0.61	4	3	5
Sperm width	1.60	0.42	2	1	5
Sperm index	1.97	0.61	3.00	1.50	5

Discussion: The BZE and PAN specimens provide sufficient criteria for distinguishing a new species from the closely related *O. filifera*: a rhomboid (vs. evenly rounded) rostrum, well-delimited (*vs.* tapering) tail, lack of trailing cilia, caudo-laterally flaring (*vs.* caudo-medially pointing) jaw apophyses, and much more massively lobate prepharyngeal glands. *O. bracteorotunda*, described by EHLERS & EHLERS (1973) from Galapagos, differs in the shape of the basal plate as well as in the much larger jaws (length 27 µm), which actually have similarities with *Vampyrognathia* (see below). The single NC specimen, on the other hand, which was included by RIEDL (1971a: 212) in his description of *Onychognathia filifera*, with the caveat that "more information would be required to separate this type as a special species", remains intermediate between the two. Although it resembles *O. rhombocephala* in the shape of the head, it shares with *O. filifera* the presence of ventral rhabdoid strands and the small jaws – enough of a difference to assign it, again, only provisionally, this time to *O. rhombocephala*.

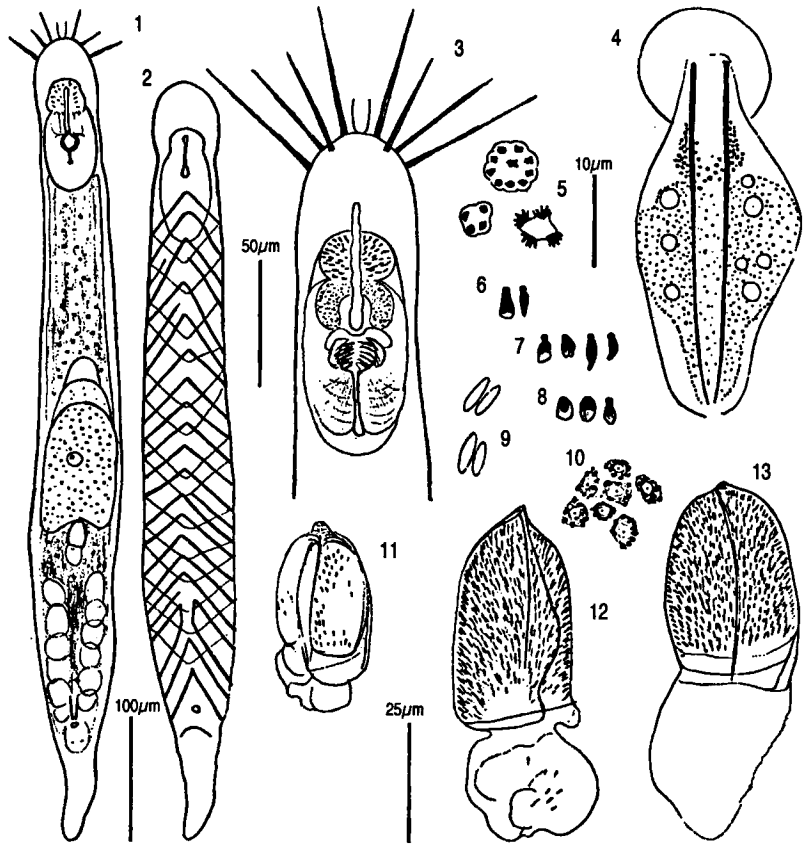
Diagnosis of *Vampyrognathia* n.g.: Slender Onychognathiidae (index 9-13) with a long rostrum (index 1.5-2) and long mouth opening. Basal plate very delicate, buckle-shaped. Jaws with very long teeth in a ventral and a rostral group; no terminal tooth developed.
Type species: *V. horribilis* n. sp.

Vampyrognathia horribilis n.g., n. sp.

(Figs. 52-55; Table 27)

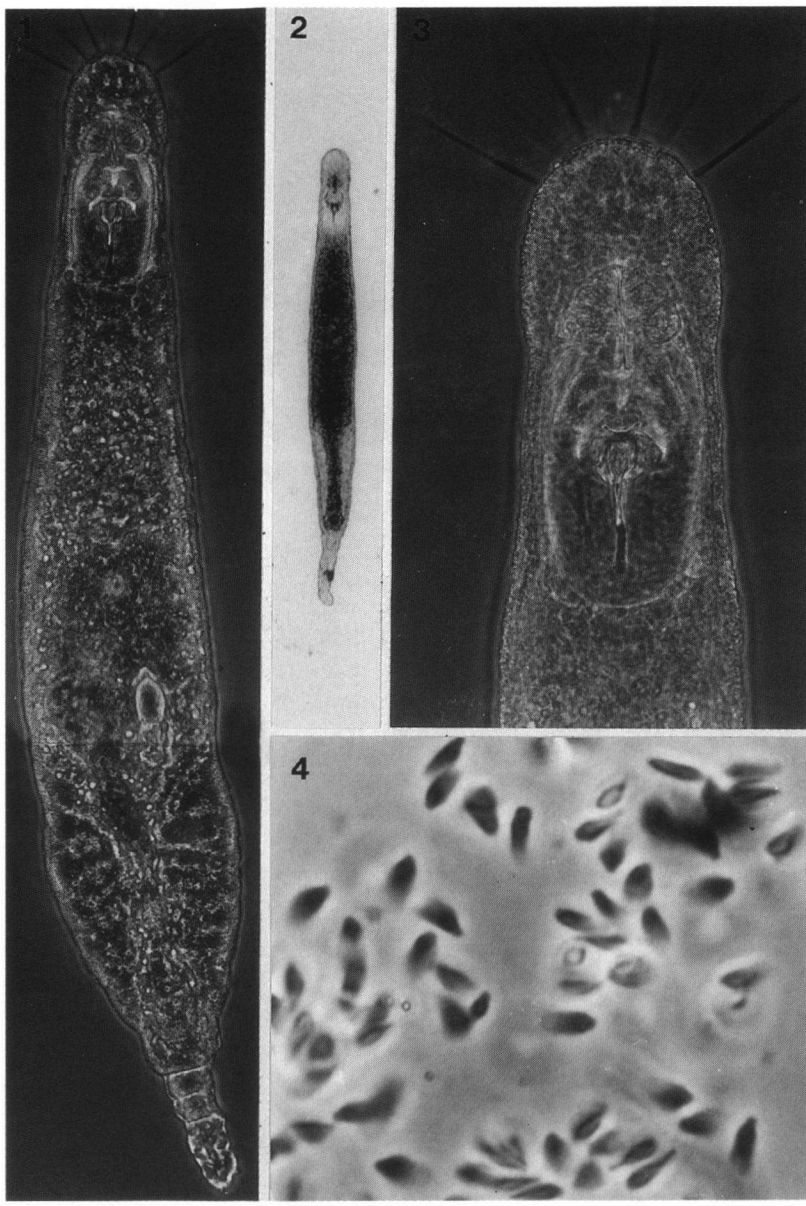
Synonymy: "Genus XI" in STERRER (1972).
Holotype: One adult from Florida (sample F15) in squeeze preparation, USNMNH 178349.
Further material: Florida: 14 specimens (5 adults) from sample F15.
Etymology: Both genus and species name refer to the horrifying, vampire-like complement of teeth.

Diagnosis of *V. horribilis* n. sp.: Large *Vampyrognathia* (length 595.00 µm, width 65 µm; body index 9.26), rostrum index 1.55. Basal plate 7.00 µm long, 22.09 µm wide (index 0.32). Jaws 26.09 µm long, with 12-17 teeth in ventral and 4-7 teeth in dorsal group. Penis stylet 38.00 µm long.

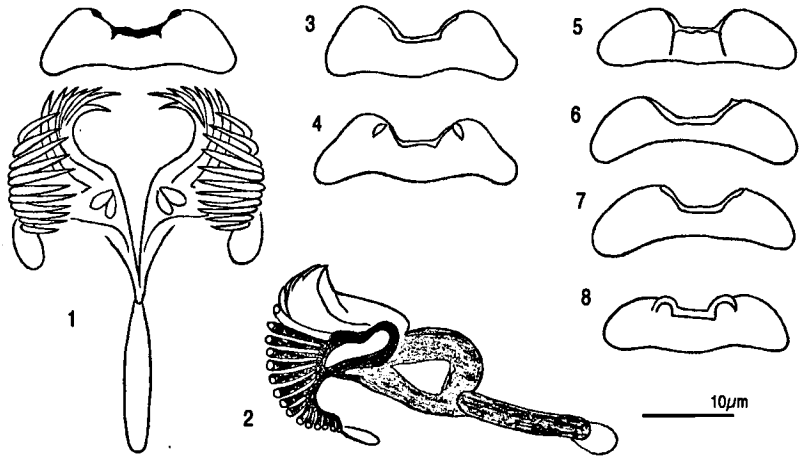


FIGURES 52.1-52.13. *Vampyrognathia horribilis*. 52.1: Habitus; 52.2: Pattern of epidermal cells; 52.3: Rostrum and sensorium; 52.4: Male copulatory organ; 52.5: Spermiogenesis stages; 52.6-52.8: Sperm of three specimens; 52.9: Rhabdoids; 52.10: Epidermal cells of the rostrum; 52.11-52.13: Bursa systems of three specimens. – One scale applies to 52.1-52.2, a second to 52.3, a third to 52.4-52.10, and a fourth to the remaining figures.

Organization and behaviour: Colourless but quite opaque except for the pharynx regions which appears glassy-transparent. In a small dish, animals swim actively and indefatigably. Adults (Figs. 52.1, 53.1-53.2) to 550-640 µm long and 60-70 µm wide at U 65.3 (body index 9.26). Rostrum (Figs. 52.3, 53.3) slender, 79.5 µm long by 51.5 µm wide at U 6.76 (index 1.55), with a slight constriction (sulcus) at U 7.8. Posteriorly the body tapers continuously into a blunt tail. The sensorium (Figs. 52.3, 53.3) con-



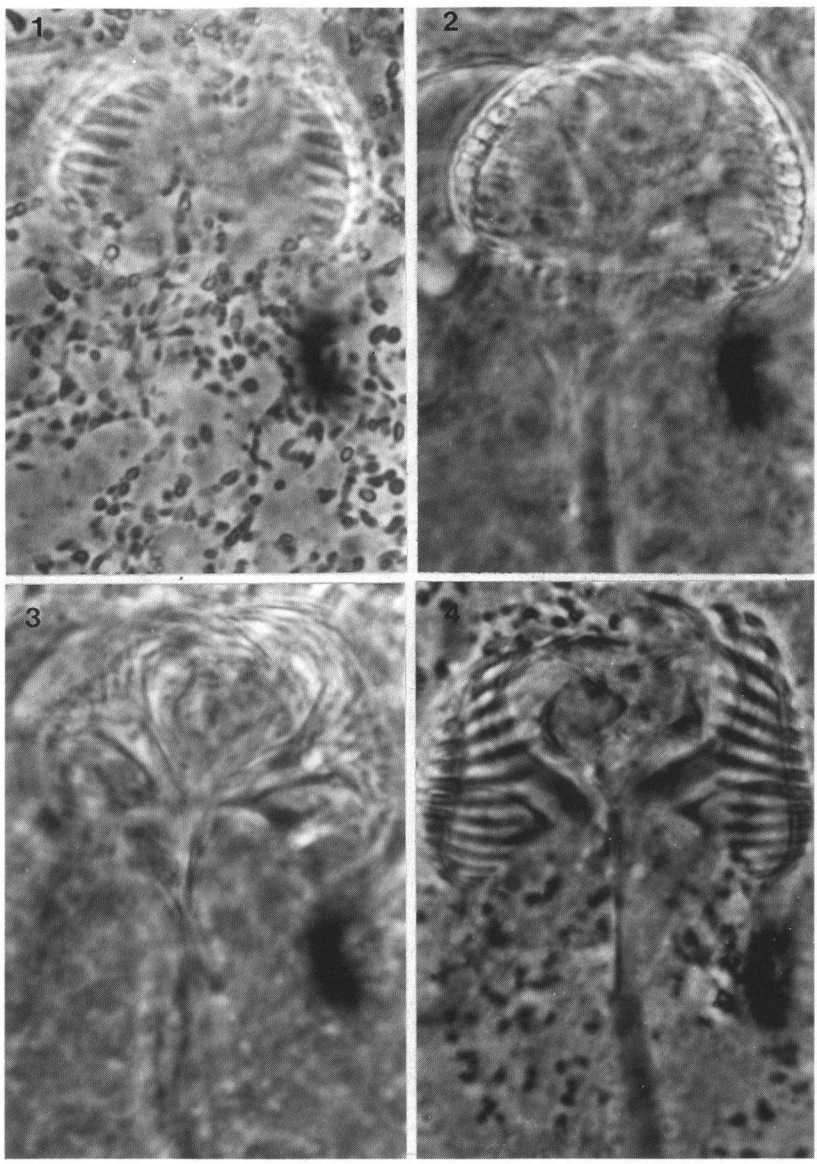
FIGURES 53.1-53.4. *Vampyrognathia horribilis*. 53.1: Habitus; 53.2: Free-swimming specimen 53.3: Rostrum; 53.4: Sperm. – Phase contrast micrographs of live specimens.



FIGURES 54.1-54.8. *Vampyrognathia horribilis*. 54.1: Basal plate and jaws, ventral view; 54.2: Basal plate and jaws, left lateral view; 54.3-54.8: Basal plates of different specimens. – All to the same scale.

sists of one pair each of apicalia (to 13 µm), frontalia (50 µm), ventralia (40 µm), dorsalia (40 µm), and lateralia (47 µm); there is a row of occipitalia (30 µm), but ciliary pits seem to be lacking. The epidermis cells (Fig. 52.10) are polygonal, 3 µm in diameter, and arranged in stripes 2-3 cells wide that are separated by furrows containing ricegrain-shaped rhabdoids (Fig. 52.9). These epidermal stripes (Fig. 52.2) circle the body in such a way that they form an anteriorly pointing arrow medio-ventrally, and a posteriorly pointing arrow medio-dorsally, conveying a fishbone pattern that is often conspicuous already at low magnification.

Digestive tract: The narrow, slit-shaped mouth opening (Fig. 52.3) extends from U 7.0 to U 12.7, and may reach the remarkable length of 52 µm. It opens into a buccal cavity beset with up to 10 µm long, mostly caudally projecting microvilli. The buccal cavity is rostrally capped by a large prepharyngeal gland with coarsely granular secretion, and laterally by a buccal gland with finer secretion. The pharynx, which measures 25 µm behind the symphysis, is not conspicuously tripartite. The basal plate (Figs. 54.1, 54.3-54.8) is 6-8 µm long and 21-23 µm wide (index 0.32), broadly buckle-shaped, with a shallow, reinforced mediorostral concavity.



FIGURES 55.1-55.4. *Vampyrognathia horribilis.* Jaws of the same specimen. 55.1: Focus on ventral plane showing tooth tips; 55.2: Focus in median plane showing symphysis and cauda; 55.3: Focus on dorsal plane; 55.4: Strongly squeezed. – Phase contrast micrographs of live specimens.

Jaws (Figs. 54.1-54.2, 55) are 25-28 µm long, with a narrow symphysis and a slender cauda 12-16 µm long and 3 µm wide. Shaped like a pair of pitch forks they appear to consist of nothing but 17-21 long, sharp, saber-shaped teeth organized as 2 groups: a dorsal group of 4-7 dorsomedially pointing teeth, and a ventral group of 12-17 ventromedially pointing teeth. All the teeth of a group arise from a common basis; the bases of the 2 groups then converge in a pattern reminiscent of elk antlers. In lateral view (Fig. 54.2) the jaws are 20 µm high, the teeth enclosing a nearly semispherical space. The jaws are highly flexible, and the impression arises that the process of opening is actively initiated and sudden whereas closing is slower and as though achieved by a spring snapping back into its resting position.

Male system: A pair of follicular to loosely tubular testes extends from U 61.8 to U 81.8 (length 110 µm). Sperm (Fig. 52.6-52.8, 53.4) is leaf- or droplet-shaped, 3-4 µm long and 1-2 µm wide (index 2.41), with a tiny spherical 'head'. The male stylet (Fig. 52.4) measures 36-39 µm in length, and 4 µm in width. It is proximally accompanied by coarse, globular granula, and distally by fine-grained secretion interspersed with vacuoles. Located ventrally at U 83 the male genital pore is quite conspicuous even at low magnification.

Female system: The ovary extends mediodorsally from U 34.4 to U 60.9; the largest egg may be 105 µm long. A bursa system (Fig. 52.11-52.13) is located behind the ovary, from U 57.4 to U 62.2. The bursa is bell-shaped, 30-45 µm long and 20-25 µm wide, usually packed with sperm, and provided with a short mouth piece and two longitudinal ridges. A sac-like prebursa was attached to it in several specimens. One specimen was observed during oviposition; the egg broke through the epidermis dorsorostrally of the bursa, then assumed a spherical shape.

TABLE 27

MORPHOMETRIC DATA FOR *VAMPYROGNATHIA HORRIBILIS*

Florida	Mean	SD	Max	Min	n
Body length of adults	595.00	63.64	640	550	2
Body width of adults	65.00	7.07	70	60	2
Body index of adults	9.26	1.99	10.67	7.86	2
Rostrum index of adults	1.55	0.19	1.68	1.42	2
Jaw length	26.09	0.94	28	25	11
Basal plate length	7.00	0.77	8	6	11
Basal plate width	22.09	0.70	23	21	11
Basal plate index	0.32	0.03	0.36	0.26	11
Penis stylet length	38.00	1.73	39	36	3
Sperm length	3.33	0.50	4	3	9
Sperm width	1.56	0.46	2	1	9
Sperm index	2.41	1.06	4.00	1.50	9

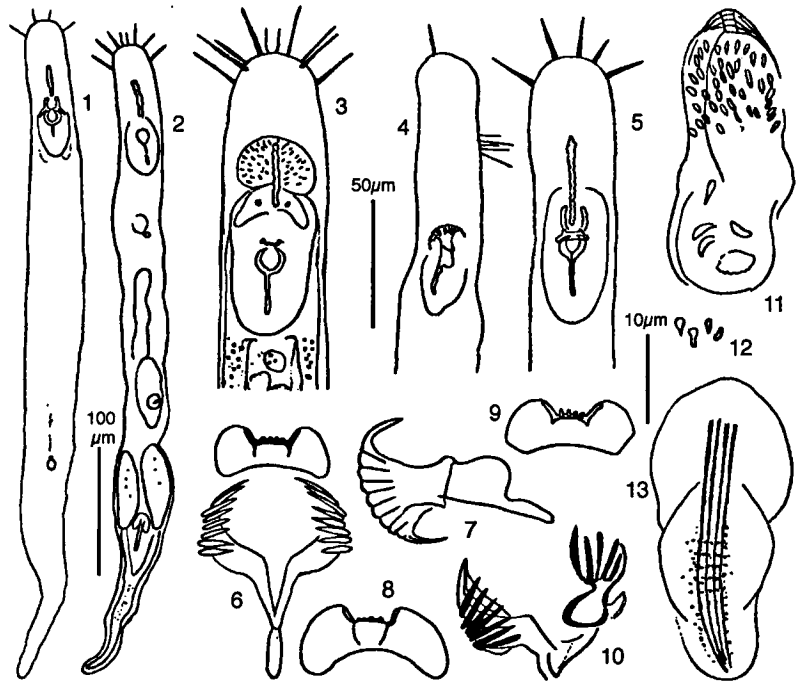
Discussion: Within the scleroperalian family Onychognathiidae, to which it clearly belongs on the basis of its jaw structure, the genus *Vampyrognathia* is most closely allied with *Onychognathia* Riedl, 1971; less so with *Nanognathia* Sterrer, 1973 and *Valvognathia* (KRISTENSEN & NØRREVANG 1978), both of which have one or several terminal teeth. The new genus differs from *Onychognathia* mainly in its possession of a basal plate, and the considerably more slender rostrum (index 1.55, vs. 0.96 in *O. filifera* and 1.00 in *O. rhombocephala*). As a species, *V. horribilis* differs from *V. minor* by its much larger dimensions of body and mouth parts. Not having observed identifiable food residues in the gut, and in the absence of any evidence for predation in Gnathostomulida I can only speculate that the twin 'pitch forks' that make up the jaws of *V. horribilis* are used to rake in filamentous food such as blue-green bacteria or fungal hyphae.

Vampyrognathia minor n. sp.

(Figs. 56-58; Table 28)

Holotype: One adult from North Carolina (sample Pine KS) in squeeze preparation, US-NMNH 178350.
Further material: North Carolina: 3 specimens (2 adults) from samples 61, 62 and 11.
Etymology: The smaller sibling of *V. horribilis*.

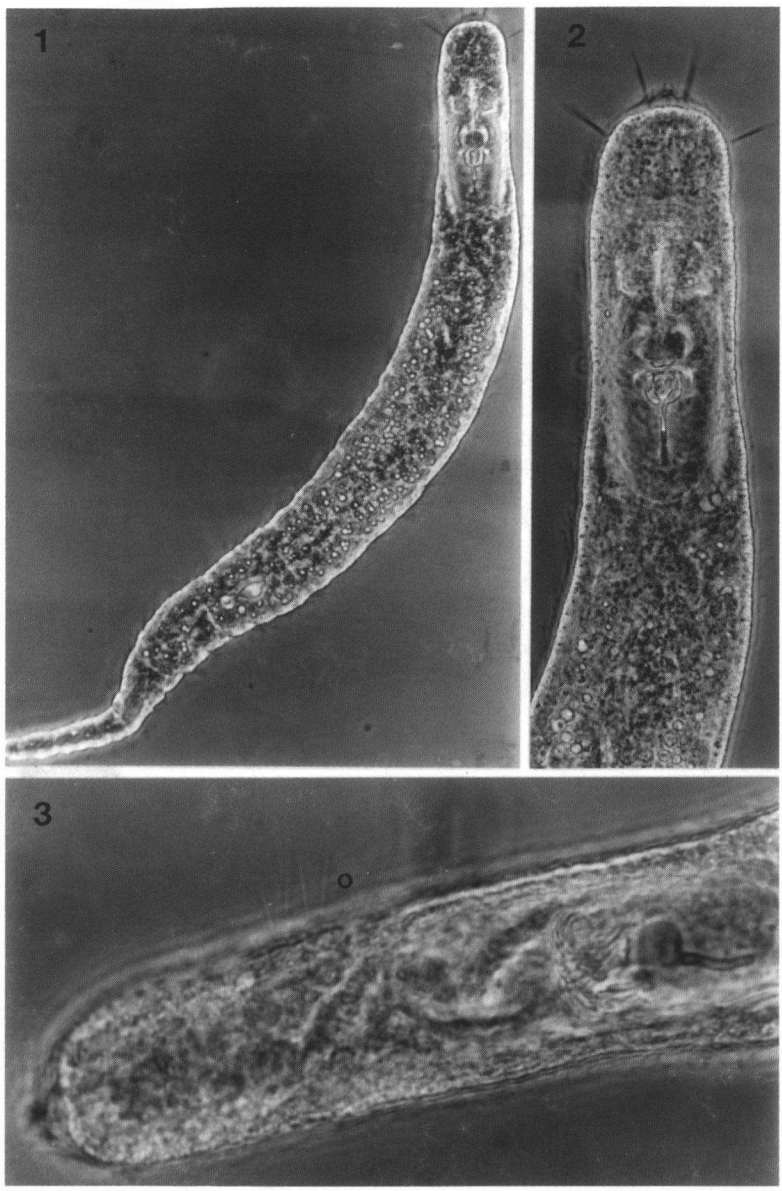
Diagnosis: *Vampyrognathia* with body index 12.38, rostrum index 1.98. Basal plate 6.25 µm long, 14.00 µm wide (index 0.47). Jaws 17.50 µm long,



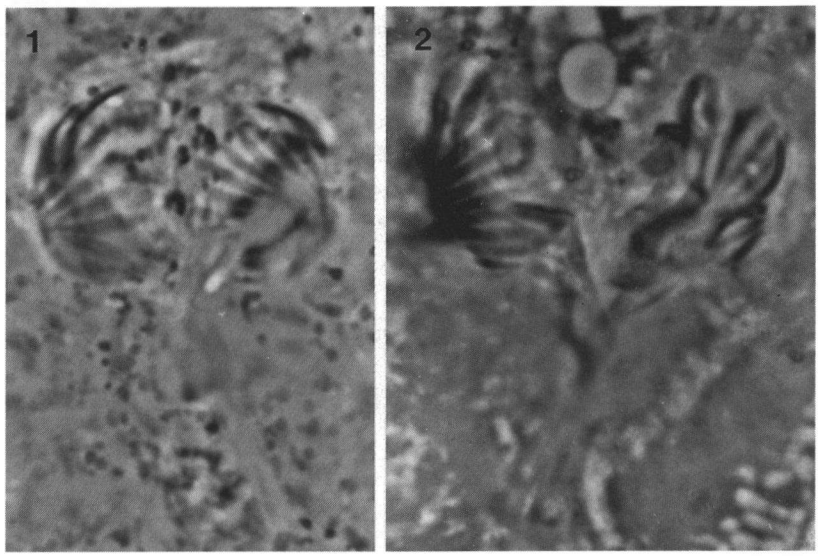
FIGURES 56.1-56.13. *Vampyrognathia minor.* 56.1-56.2: Habitus of two adults; 56.3: Rostrum of adult; 56.4: Rostrum of juvenile, left lateral view; 56.5: Same in ventral view; 56.6: Basal plate and jaws, ventral view; 56.7: Jaws, left lateral view; 56.8-56.9: Basal plates of two more specimens; 56.10: Jaws of another specimen, strongly squeezed; 56.11: Bursa and prebursa; 56.12: Sperm; 56.13: Male copulatory organ. – One scale applies to 56.1-56.2, a second to 56.3-56.5, and a third to the remaining figures.

with 8 teeth in ventral and 3 teeth in dorsal group. Penis stylet 29.33 μm long.

Organization and behaviour: Colourless-translucent. Adults (Fig. 56.1-56.2, 57.1) very thin, 500-570 μm long and 40-50 μm wide at U 51.5 (index 12.38). Rostrum (Figs. 56.3-56.5, 57.2) blunt, almost square, very slender, 67-72 μm long by 32-38 μm wide at U 7.7 (index 1.98). Posteriorly the body tapers into a tail. The sensorium (Fig. 56.3-56.4, 57.2) consists of one pair each of apicalia (to 10 μm), frontalia (18 μm), ventralia (17 μm), dorsalia (23 μm), and lateralia (20 μm) as well as a single row of occipitalia (13 μm). In dorsal view, ventralia and dorsalia almost coincide.



FIGURES 57.1-57.3. *Vampyrognathia minor.* 57.1: Habitus; 57.2: Rostrum and sensorium, ventral view; 57.3: Rostrum, left lateral view; *o* occipitalia. – Phase contrast micrographs of live specimens.



FIGURES 58.1-58.2. *Vampyrognathia minor.* Jaws of two specimens, strongly squeezed. – Phase contrast micrographs of live specimens.

Ciliary pits were not seen. Epidermal cells are arranged in stripes 2-3 cells wide which circle the body in a 'fishbone' pattern. Animals swim actively, even nervously, often contracting suddenly and changing direction.

Digestive tract: Mouth opening slit-shaped, to 35 µm long, extending from U 5.9 to U 11.9. Buccal cavity X-shaped in dorsal view, capped rostrally by a large prepharyngeal gland, and flanked by buccal glands. The pharynx is 18 µm long behind the symphysis. The delicate, buckle-shaped basal plate (Figs. 56.6, 56.8-56.9) is 5-8 µm long and 13-15 µm wide (index 0.47). The edge of its rostral indentation is reinforced and may appear to be set with 4 small teeth. Jaws (Figs. 56.6-56.7, 57.3, 58) are 17-19 µm long, with a 5-8 µm long, slender cauda. The jaws are extremely delicate, with little longitudinal rigidity, and are easily contorted in squeeze preparation. The 9-11 long, sharp teeth are arranged as 2 groups: a ventral, medially pointing, hand-shaped group of 8 teeth, and a dorsal, medianly pointing group of about 3 teeth.

Male system: A pair of tubular testes extends from U 59.3 to U 70.9

(length 60 µm). Sperm (Fig. 56.12) is droplet-shaped, 2 µm long and 1 µm wide (index 2.00). The male stylet (Fig. 56.13), located between U 68.0 and U 73.8, measures 28-32 µm in length and 3 µm in width.

Female system: Ovary from U 33.5 to U 60.5; largest egg 50-145 µm long. The bursa system extends from U 63.2 to U 66.0, with a bell-shaped bursa 25 µm by 10 µm followed by a globular prebursa of 10 µm diameter. In 2 specimens the prebursa seemed to open into a dorsal vagina. One specimen had a well-developed bursa system but lacked both ovary and male reproductive organs.

TABLE 28

MORPHOMETRIC DATA FOR *VAMPYROGNATHIA MINOR*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	533.33	35.12	570	500	3
Body width of adults	43.33	5.77	50	40	3
Body index of adults	12.38	0.93	13.25	11.40	3
Rostrum index of adults	1.98	0.18	2.19	1.86	3
Jaw length	17.50	1.00	19	17	4
Basal plate length	6.25	1.26	8	5	4
Basal plate width	14.00	1.00	15	13	3
Basal plate index	0.47	0.05	0.53	0.43	3
Penis stylet length	29.33	2.31	32	28	3
Sperm length	2.00	0.00	2	2	6
Sperm width	1.00	0.00	1	1	6
Sperm index	2.00	0.00	2.00	2.00	6

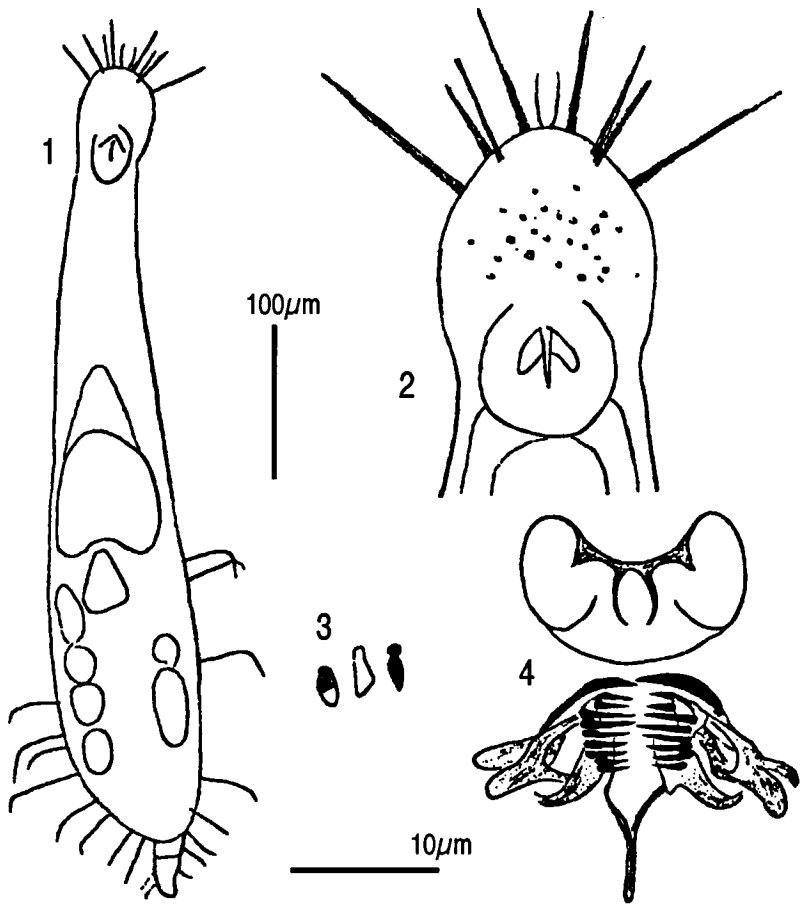
Discussion: Although this species is very similar to *V. horribilis* there are consistent differences that set it apart. *V. minor* has significantly smaller jaws (17.5 µm vs. 26.09 µm) and basal plate (width 14 µm vs. 22.09 µm). In addition, the jaws of *V. horribilis* are set with 17-21 teeth whereas those of *V. minor* only have 9-11 teeth.

Nanognathia exigua Sterrer, 1973

(Figs. 59.1-59.4; Table 29)

Material:

- North Carolina: 2 adults collected by R. RIEDL on an intertidal sand flat near Wrightsville Beach (STERRER 1973a).
- Florida: 21 specimens (9 adults) from samples F14 and F15.



FIGURES 59.1-59.4. *Nanognathia exigua.* 59.1: Habitus of adult; 59.2: Rostrum; 59.3: Sperm; 59.4: Basal plate and jaws, ventral view.

This species has not been encountered since its original description; the table below is therefore a re-analysis of the original material.

TABLE 29

MORPHOMETRIC DATA FOR *NANOGNATHIA EXIGUA*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	365.00	35.36	390	340	2
Body width of adults	62.00	11.31	70	54	2
Body index of adults	5.93	0.51	6.30	5.57	2
Rostrum index of adults	0.86	0.12	0.95	0.78	2
Jaw length	11.50	0.71	12	11	2
Penis stylet length	37.50	2.12	39	36	2

Florida	Mean	SD	Max	Min	n
Body length of adults	484.17	53.89	540	390	6
Body width of adults	79.17	12.01	90	65	6
Body index of adults	6.16	0.53	7.00	5.56	6
Rostrum index of adults	0.92	0.11	1.03	0.73	6
Jaw length	14.52	0.75	16	13	21
Basal plate length	8.00	1.15	10	7	7
Basal plate width	14.57	1.72	17	12	7
Basal plate index	0.55	0.08	0.67	0.44	7
Penis stylet length	32.78	8.15	43	18	9
Sperm length	3.00	0.00	3	3	2
Sperm width	1.00	0.00	1	1	2
Sperm index	3.00	0.00	3.00	3.00	2

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	454.38	72.77	540	340	8
Body width of adults	74.88	13.58	90	54	8
Body index of adults	6.10	0.50	7.00	5.56	8
Rostrum index of adults	0.91	0.10	1.03	0.73	8
Jaw length	14.26	1.14	16	11	23
Basal plate length	8.00	1.15	10	7	7
Basal plate width	14.57	1.72	17	12	7
Basal plate index	0.55	0.08	0.67	0.44	7
Penis stylet length	33.64	7.57	43	18	11
Sperm length	3.00	0.00	3	3	2
Sperm width	1.00	0.00	1	1	2
Sperm index	3.00	0.00	3.00	3.00	2

Discussion: This small, plump species (Figs. 59.1-59.2) with long, trailing cilia has jaws (Fig. 59.4) with a strong terminal tooth and a basket of long teeth, a feature which qualifies it as a member of the family Onychognathiidae. The basal plate is so delicate that I did not become aware of its existence until the fifth specimen, and could ascertain it in only 7 out of 21 Florida specimens studied.

Family GNATHOSTOMULIDAE Sterrer, 1972

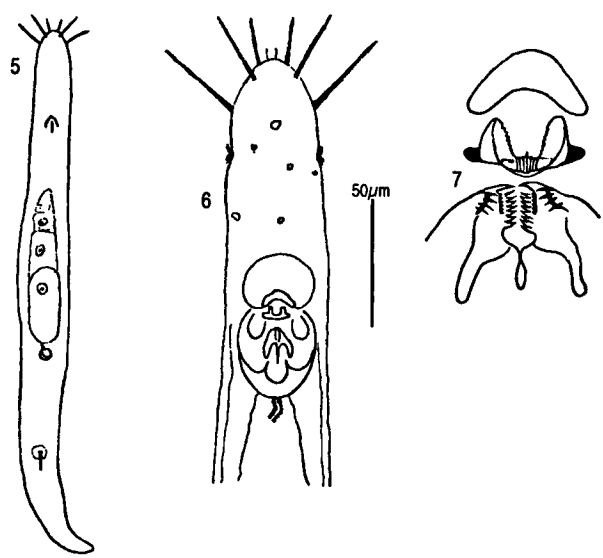
Semaeognathia sterreri Riedl, 1970

(Figs. 59.5-59.7, 60.1; Table 30)

Material:
- North Carolina: 11 specimens (5 adults) from samples 61, 70.1, 70.2 and 70.3.
- Florida: 2 juveniles from sample F1.

This is a re-examination of my material, much of which was used for the original description of this species (RIEDL 1970b).

Organization and behaviour: The rostrum of most of my specimens (Figs. 59.5-59.6, 60.1) was more pointed than is conveyed by Riedl's (1970b) figs. 1-5; it is more like Riedl's fig. 6. It is 80-105 µm long and 28-45 µm wide at 11.5 (index 2.70). The sensorium is difficult to analyze. On the basis of 3 specimens, one pair of apicalia is likely to be typical for this species whereas a careful search failed to produce dorsalia in any of the



FIGURES 59.5-59.7. *Semaeognathia sterreri*. 59.5: Habitus of NC adult; 59.6: Rostrum of NC adult; 59.7: Jugum, basal plate and jaws of NC specimen. – One scale applies to 59.1 and 59.5, a second to 59.2 and 59.6, and a third to the remaining figures.

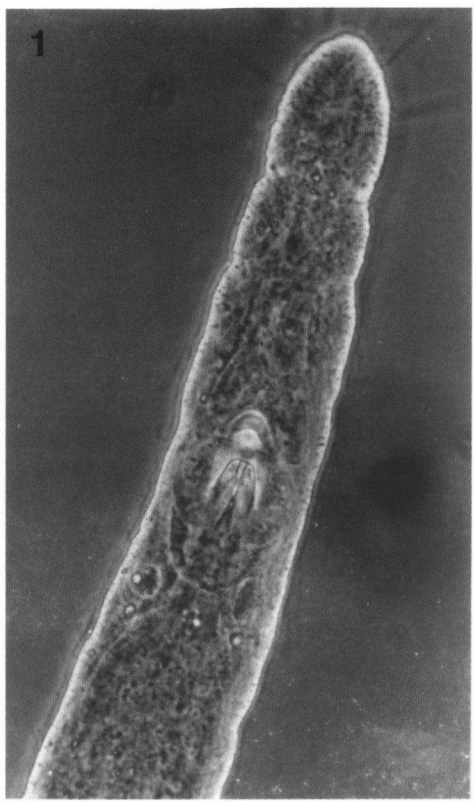


FIGURE 60.1. *Semaeognathia sterreri.* Rostrum of NC specimen.

specimens. The sensorium thus consists of paired apicalia (to 15 µm long), frontalia (23 µm), ventralia (37 µm), lateralia (40 µm), and a row of occipitalia (18 µm). A pair of conspicuous ciliary pits, whose trembling but not beating cilia are rooted deep in the epidermis, is located ventro-laterally at U 6.8, in a constriction 35-40 µm behind the tip of the rostrum.

Digestive tract: The mouth is situated at U 15.8-17.0. A crescent-shaped jugum, 5-8 µm long and 14-20 µm wide (mean 6.67 by 15.83), is present (Fig. 59.7). The basal plate is compact, 7-8 µm long and 14-16 µm wide (index 0.50). It consists of a pair of rostral wings that enclose a robust, toothed central part, and a pair of less defined lateral wings. The medial edges of the rostral wings may also carry delicate teeth. The jaws are 11-15 µm long and carry 3 rows of teeth behind a strong terminal tooth: a dorsal

row of 8 long teeth that point medio-caudally; a median row of 6 shorter teeth, and a ventral row of 8 very thin but long teeth that point medianly.

Male system: Testes are paired. The conical penis stylet is 22-24 µm long and 4 µm wide, consisting of 8-10 rods. Sperm from the testes appears irregularly rounded, about 2 µm in diameter. Sperm in the bursa may look cone-shaped, as described by RIEDL (1970).

Female system: The dorsal, unpaired ovary extends from U 36.4 to U 61.0; of the total length of 145 µm, 115 µm may be taken up by the mature egg. The bursa system is situated at U 58.2-61.1. The bursa is consistently small, 14-18 µm long and 9-11 µm wide; a 10 µm short prebursa may adjoin it caudally. The bursa mouth piece is strongly cuticular and, at a length of 3-5 µm, takes up a third of the total length of the bursa.

TABLE 30

MORPHOMETRIC DATA FOR *SEMAEOGNATHIA STERRERI*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	566.67	32.15	590	530	3
Body width of adults	55.00	5.00	60	50	3
Body index of adults	10.36	1.08	11.60	9.64	3
Rostrum index of adults	2.70	0.48	3.39	2.29	4
Jaw length	12.67	1.32	15	11	9
Basal plate length	7.57	0.53	8	7	7
Basal plate width	15.00	0.58	16	14	7
Basal plate index	0.50	0.03	0.53	0.47	7
Penis stylet length	23.00	1.41	24	22	2
Sperm length	1.50	0.00	1.5	1.5	4
Sperm width	1.13	0.25	1.5	1.0	4
Sperm index	1.38	0.25	1.50	1.00	4

Florida	Mean	SD	Max	Min	n
Jaw length	12.00				1

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	566.67	32.15	590	530	3
Body width of adults	55.00	5.00	60	50	3
Body index of adults	10.36	1.08	11.60	9.64	3
Rostrum index of adults	2.70	0.48	3.39	2.29	4
Jaw length	12.60	1.26	15	11	10
Basal plate length	7.57	0.53	8	7	7
Basal plate width	15.00	0.58	16	14	7
Basal plate index	0.50	0.03	0.53	0.47	7
Penis stylet length	23.00	1.41	24	22	2
Sperm length	1.50	0.00	1.5	1.5	4
Sperm width	1.13	0.25	1.5	1.0	4
Sperm index	1.38	0.25	1.50	1.00	4

Discussion: The possession of a jugum as well as details of basal plate and jaws agree well with those of *Gnathostomula*, and justify inclusion of the genus in the family Gnathostomulidae (which also contains *Corculognathia* Ehlers & Ehlers, 1973, and *Ratugnathia* Sterrer, 1991a). The elongated rostrum is a distinctive feature of the genus, whereas the absence of dorsalia needs to be reconfirmed in order to be a valid diagnostic character.

Gnathostomula axi Kirsteuer, 1964

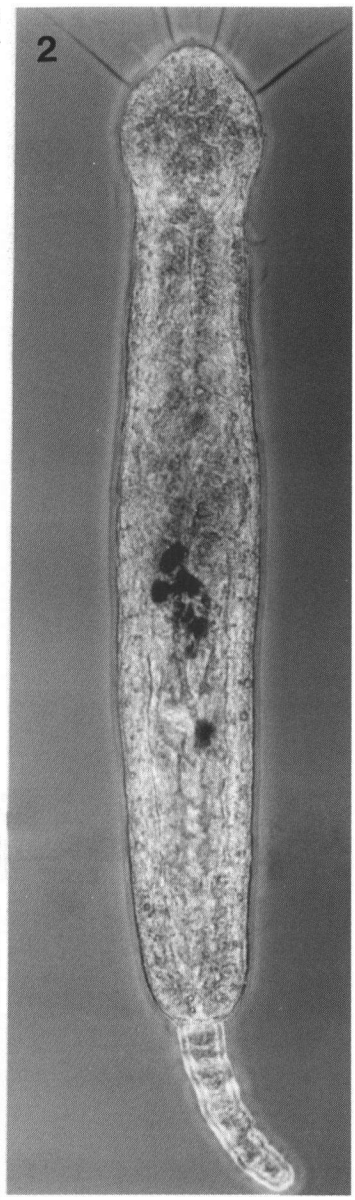
(Figs. 60.2-60.3, 61; Table 31)

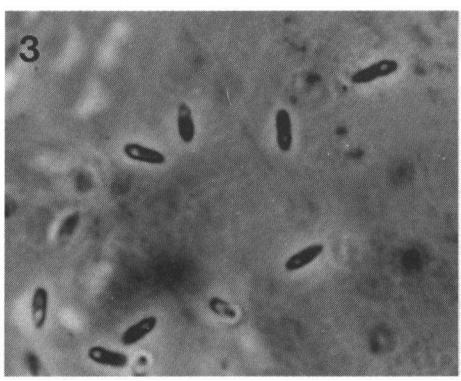
Material:
- Florida: 11 specimens (4 adults) from sample F14.
- Puerto Rico: 4 specimens (2 adults) from sample 95.01.
- Belize: 11 specimens (8 adults) from samples 91.3 and 91.11.
- Panama: 7 adults from samples 118 and 94.P3.

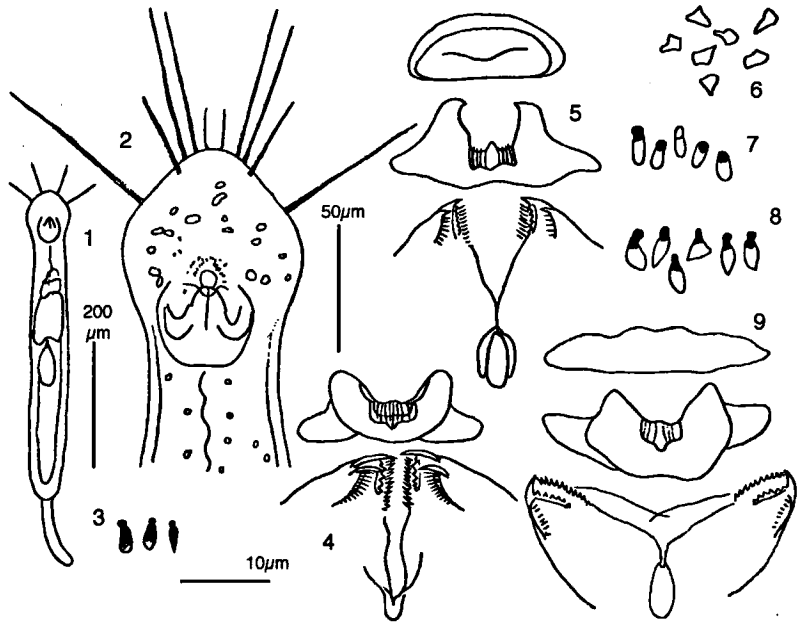
Distribution: Venezuela (KIRSTEUER 1964), Bahamas (KIRSTEUER 1969a), Barbados (KIRSTEUER 1970), and Red Sea (RIEDL 1966). The specimens from the Adriatic (STERRER 1965) have been assigned to the species *G. mediterranea* (STERRER 1970b).

Organization and behaviour: Adults (Figs. 60.2, 61.1) reach 650 µm in length and 75 µm in width (index 7.16-8.43). The rostrum (Figs. 60.2, 61.2) is broadly diamond-shaped (45-53 µm long and 66-70 µm wide at U 7.5), often being the widest part of the body (rostrum index 0.68-0.79). The body is of fairly even width to U 77 where it abruptly narrows to a uniformly thin, always clearly delimited tail. In relaxed specimens, the tail thus takes up almost a quarter of the total body length, and may perform undulating motions when the animal is immobilized under a cover slip. Sensorium prominent, made up of apicalia (to 16 µm), frontalia (73 µm), ventralia (47 µm), dorsalia (55 µm), lateralia (68 µm), and a row of about 15 single occipitalia (to 30 µm). The tail may carry single stiff cilia (to 15 µm), and there is a group of stiff cilia on the dorsal epidermis above the penis; trailing tail cilia were not observed. The epidermal cells are arranged in 5 µm wide stripes which circle the body obliquely, forming a rostrally pointing V on the ventral surface, and a caudally pointing V on the dorsal. In the FLO and PAN specimens, the epidermis over most of the body contained brown conglomerates, evenly distanced from each other at 15-20 µm.

FIGURES 60.2-60.3. *Gnathostomula axi*. 60.2: Habitus of FLO adult; 60.3: Sperm of BZE specimen. – Phase contrast micrographs of live specimens.







FIGURES 61.1-61.9. *Gnathostomula axi*. 61.1: Habitus of FLO adult; 61.2: Rostrum of FLO adult; 61.3: Sperm of FLO specimen; 61.4: Basal plate and jaws of FLO specimen; 61.5: Jugum, basal plate and jaws of PR specimen; 61.6: Sperm of PR specimen; 61.7: Sperm of another PR specimen; 61.8: Sperm of PAN specimen; 61.9: Jugum, basal plate and jaws of PAN specimen. – One scale applies to 61.1, a second to 61.2, and a third to the remaining figures.

Digestive tract: The basal plate (Figs. 61.4-61.5, 61.9) is 6-12 µm long and 18-29 µm wide (index 0.30-0.41). It consists of a conspicuous, shield-like central portion about 7 µm long and 13 µm wide, and a pair of lateral wings whose outline is difficult to resolve even in phase contrast; this may account for their omission in the original description as well as in subsequent records (KIRSTEUER 1964, 1969a, 1970). The lateral wings often point rostro-laterally. The central part is set with 11-13 teeth of which the median tooth is strongest. The jaws are 13-20 µm long, and provided with one terminal tooth plus 3 rows of teeth. The gently curved ventral row, 5 µm long, averages 11 long, thin teeth; the 4 µm long median row has 7 short, triangular teeth; and the 4 µm long dorsal row has 6 long teeth. The jugum is slender, 8-9 µm long and 23-24 µm wide. The gut lumen of one of the FLO specimens contained filamentous Cyanobacteria: a 50 µm long

strand of *Oscillatoria* sp., and two fragments of *Spirilla* sp., one 33 µm, the other 10 µm long.

Male system: The follicular, sperm-packed testes extend from U 57.5 to U 78.2 (length 85-120 µm). Sperm flow during squeeze preparation suggests that there is a pair of vasa deferentia which link the testis follicles medially; both vasa then join anteriorly to the penis to form a vesicula seminalis. Each follicle contains all stages of sperm maturation. Located between U 75.4 and U 81.8, the penis stylet is 36-48 µm long and 4-8 µm wide proximally, and consists of 10 rods. Sperm (Figs. 60.3, 61.3, 61.6-61.8) is somewhat keyhole-shaped in side view, 4-5 µm long and 1-2 µm wide. Seen broadside, a tiny round head is set off against the flat, leaf-like portion which is distally less dense in phase contrast than the head. Seen edge-on, the sperm is only 1 µm wide. The sperm of one PR specimen (Fig. 61.6) was consistently angular, shaped like sharks teeth. Spermatids are round to oval, 2-3 µm in diameter, with a dense core.

Female system: The ovary begins at U 20; the largest egg extends from U 29.1 to U 44.2 (length 80-100 µm). The bursa system extends between U 41.4 and U 49.9 (length 55-90 µm). The anterior, dome-shaped bursa has a 5 µm long mouthpiece, 2 cristae, and its posterior part is sometimes in the form of a collar. The posterior, rather shapeless prebursa is hollow and often partially envelops the bursa collar. A conspicuous dorsal vagina, located at U 50-55, above the posterior portion of the prebursa, was noted in 40% of the adults from BZE and 60% of the adults from PAN.

TABLE 31

MORPHOMETRIC DATA FOR GNATHOSTOMULA AXI

Florida	Mean	SD	Max	Min	n
Body length of adults	513.33	80.83	600	440	3
Body width of adults	61.00	1.41	62	60	2
Body index of adults	9.03	1.37	10.00	8.06	2
Rostrum index of adults	0.76	0.02	0.77	0.74	2
Jaw length	17.63	1.19	20	16	8
Basal plate length	7.17	1.17	9	6	6
Basal plate width	24.50	2.35	27	21	6
Basal plate index	0.30	0.06	0.36	0.22	6
Penis stylet length	44.00	5.66	48	40	2
Sperm length	4.00	0.00	4	4	3
Sperm width	1.67	0.58	2	1	3
Sperm index	2.67	1.15	4.00	2.00	3

TABLE 31 (Continued)

Puerto Rico	Mean	SD	Max	Min	n
Body length of adults	525.00	134.35	620	430	2
Body width of adults	85.00	21.21	100	70	2
Body index of adults	6.17	0.04	6.20	6.14	2
Rostrum index of adults	0.74				1
Jaw length	17.50	1.29	19	16	4
Basal plate length	9.33	0.58	10	9	3
Basal plate width	27.33	3.79	30	23	3
Basal plate index	0.35	0.05	0.39	0.30	3
Penis stylet length	42.50	3.54	45	40	2
Sperm length	3.20	0.45	4	3	5
Sperm width	1.40	0.55	2	1	5
Sperm index	2.60	1.08	4.00	1.50	5

Belize	Mean	SD	Max	Min	n
Body length of adults	491.67	96.88	610	355	6
Body width of adults	67.67	4.04	70	63	3
Body index of adults	7.16	1.54	8.71	5.63	3
Rostrum index of adults	0.68	0.07	0.78	0.63	4
Jaw length	16.64	1.80	18	13	11
Basal plate length	9.50	1.77	12	8	8
Basal plate width	24.75	3.11	28	18	8
Basal plate index	0.40	0.13	0.67	0.31	8
Penis stylet length	41.33	4.55	48	36	6
Sperm length	3.25	0.50	4	3	4
Sperm width	1.25	0.29	2	1	4
Sperm index	2.67	0.47	3.00	2.00	4

Panama	Mean	SD	Max	Min	n
Body length of adults	545.00	99.25	650	415	5
Body width of adults	65.00	7.91	75	55	5
Body index of adults	8.43	1.56	10.00	6.86	5
Rostrum index of adults	0.79	0.05	0.85	0.71	5
Jaw length	18.00	1.26	20	17	6
Basal plate length	10.20	0.84	11	9	5
Basal plate width	25.00	3.87	29	20	5
Basal plate index	0.41	0.06	0.50	0.34	5
Penis stylet length	38.17	3.87	42	31	6
Sperm length	5.00	0.00	5	5	6
Sperm width	1.58	0.20	2	2	6
Sperm index	3.19	0.34	3.33	2.50	6

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	516.56	91.43	650	355	16
Body width of adults	68.33	11.50	100	55	12
Body index of adults	7.84	1.59	10.00	5.63	12
Rostrum index of adults	0.74	0.07	0.85	0.63	12
Jaw length	17.31	1.51	20	13	29
Basal plate length	9.00	1.72	12	6	22
Basal plate width	25.09	3.10	30	18	22
Basal plate index	0.37	0.10	0.67	0.22	22
Penis stylet length	40.63	4.41	48	31	16
Sperm length	3.94	0.87	5	3	18
Sperm width	1.47	0.40	2	1	18
Sperm index	2.82	0.76	4.00	1.50	18

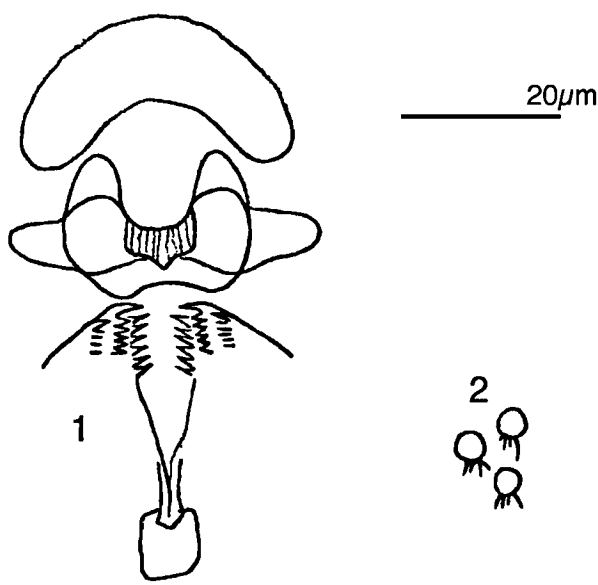
Discussion: The new finds confirm previous observations of this species. The presence of a vagina in many adults is new. This species is readily recognized by the broad rostrum and long, well-delimited tail. The presence of two species of Cyanobacteria in the gut is remarkable, since identifiable food items have only rarely been encountered in Gnathostomulida (STERRER 1971a).

Gnathostomula jenneri Riedl, 1971

(Figs. 62.1-62.2; Table 32)

Material: North Carolina: One adult from sample 57.

Description: The length of the single adult, including a 50 µm long tapered tail, was 490 µm, the width 70 µm at U 45 (index 7.00). Rostrum 50 µm long and 50 µm wide at U 7.1 (index 1.00). Basal plate (Fig. 62.1) 9 µm



FIGURES 62.1-62.2. *Gnathostomula jenneri*. 62.1: Jugum, basal plate and jaws; 62.2: Sperm.

long, 21 µm wide (index 0.43). Jugum crescent-shaped, 10 µm long and 18 µm wide. Jaws (16 µm long, with 6 teeth in the dorsal, 5 in the median, and 6 in the ventral row. Ovary from U 28.6, mature egg from U 40.8 to U 61.2 (length 100 µm). A bursa was lacking. Penis from U 75.5 to U 89.8; penis stylet of nearly even width throughout, 71 µm long and 6 µm wide. Testes from U 55.1 to U 83.7 (length 140 µm). Sperm (Fig. 62.2) spherical, 2 µm in diameter, with 4-5 podia of 1 µm length.

TABLE 32

MORPHOMETRIC DATA FOR *GNATHOSTOMULA JENNERI*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	490				1
Body width of adults	70				1
Body index of adults	7				1
Rostrum index of adults	1				1
Jaw length	16				1
Basal plate length	9				1
Basal plate width	21				1
Basal plate index	0.43				1
Penis stylet length	71				1
Sperm length	2	0	2	2	3
Sperm width	2	0	2	2	3
Sperm index	1	0	1	1	3

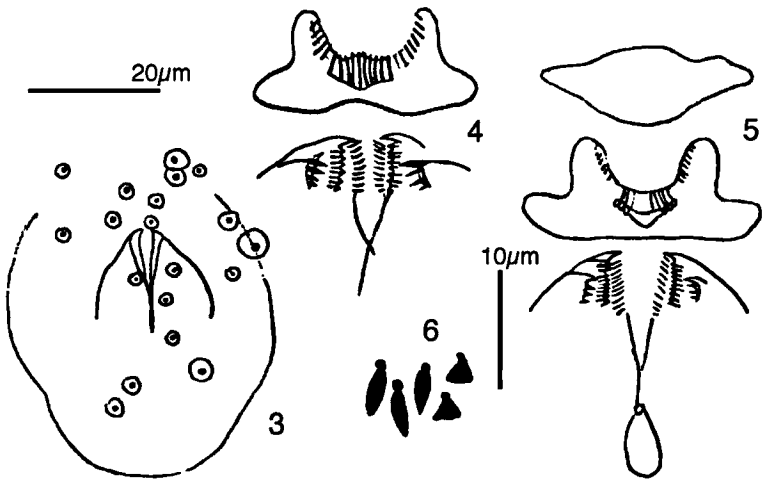
Discussion: The single adult specimen conforms well with the original description (RIEDL 1971b), with the possible exception of the lateral contour of the basal plate, which is notoriously delicate in this genus. The distinctive spherical sperm is shared, within the genus, only with *G. brunidens* Riedl, 1971, but also occurs in *Problognathia* and some Mesognathariidae.

Gnathostomula microstyla Riedl, 1971

(Figs. 62.3-62.6; Table 33)

Material: North Carolina: 10 specimens (6 adults) from samples 70.2, 70.3 and 70.4.

Organization and behaviour: Adults to 400 µm long and 50 µm wide at U 52.8 (index 8.0). Rostrum 28-42 µm long and 35 µm wide at U 6.6 (index 1.0). Posterior body region tapering, without a distinct tail region.



FIGURES 62.3-62.6. *Gnathostomula microstyla*. 62.3: Pharynx with vacuoles; 62.4: Basal plate and jaws; 62.5: Jugum, basal plate and jaws of another specimen; 62.6: Sperm. – One scale applies to 62.3, a second to the remaining figures.

Digestive tract: In two adult specimens the epithelium around and inside the mouth contained 11-19 vacuoles of 2-4 µm diameter, each with a central inclusion (Fig. 62.3). The basal plate (Figs. 62.4-62.5) is 7-9 µm long and 18-20 µm wide; its contour, including the usually faint lateral wings, is always well-defined, and the central, tooth-bearing part is particularly conspicuous. Jaws 13-16 µm long, with 4-6 teeth in the dorsal, 7-9 in the median, and 7-10 teeth in the ventral row. The median teeth are usually rather long. Jugum 6 µm long and 17 µm wide.

Male system: Testes from U 67.5 to U 92.5 (length 100 µm); penis from U 72.2 to U 77.8. The penis stylet is 30-32 µm long and 2.5-3 µm wide; in one specimen a 5 µm long distal part was bent at a 150° angle. Sperm (Fig. 62.6) is 4 µm long and 1.5 µm wide, leaf- or droplet-shaped, with a tiny head.

Female system: Ovary from U 35.5, mature egg from U 40.8 to U 57.3 (length to 65 µm). Located at U 50.0 to U 62.5, the conical bursa measures 34-50 µm in length and 20-22 µm in width.

TABLE 33

MORPHOMETRIC DATA FOR *GNATHOSTOMULA MICROSTYLA*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	380	28.28	400	360	2
Body width of adults	50	0	50	50	2
Body index of adults	7.6	0.57	8	7.2	2
Rostrum index of adults	1	0.28	1.2	0.8	2
Jaw length	14.67	1	16	13	9
Basal plate length	7.86	0.69	9	7	7
Basal plate width	19	1	20	18	7
Basal plate index	0.41	0.05	0.5	0.35	7
Penis stylet length	31	1.41	32	30	2
Sperm length	4	0	4	4	7
Sperm width	1.43	0.19	2	1	7
Sperm index	2.86	0.5	4	2.67	7

Discussion: Only known from the North Carolina coast so far, this species is defined by its small stylet, well-contoured basal plate, relatively long median jaw teeth, and the presence of vacuoles of as yet unknown function in the peri-oral tissue.

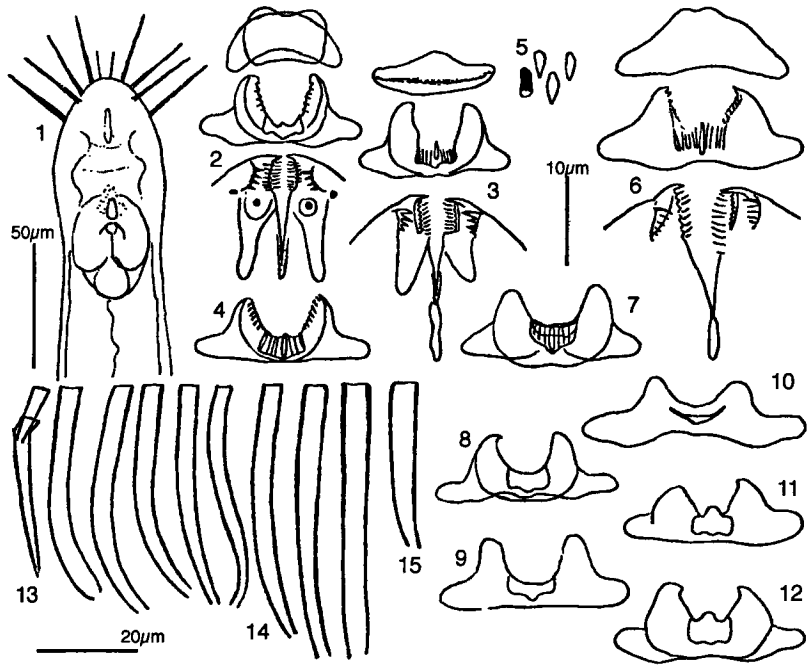
Gnathostomula peregrina Kirsteuer, 1969

(Figs. 63, 64; Table 34)

Synonyms: *Gnathostomula tuckeri* Farris, 1977, *Gnathostomula tuckeri* in Sterrer (1986).
Material:
– Bermuda: 141 specimens (many adults) from samples126, 127, 128, 129, 130, 131, 132, 134, 135, 136 and 137.
– Florida: 3 specimens (1 adult) from sample F8.
– Belize: 11 specimens (10 adults) from samples 91.12, 91.20, 91.23 and 94.9.
– Puerto Rico: One adult from sample PR95.04.

Organization and behaviour: Adults to 670 µm long and 75 µm wide at U 27.6 (index 6.20-9.33). Rostrum (Fig. 63.1) 40-57 µm long and 42-55 µm wide (index 0.87-0.94). The posterior end tapers more or less continuously into a slender tail. The sensorium consists of apicalia (to 20 µm), frontalia (60 µm), ventralia (30 µm), dorsalia (30 µm), and lateralia (60 µm); occipitalia were not looked for.

Digestive tract: The basal plate (Figs. 63.2-63.4, 63.6-63.12, 64) is 5-11 µm long and 16-26 µm wide (index 0.37-0.46). Its shield-shaped central



FIGURES 63.1-63.15. *Gnathostomula peregrina.* 63.1: Rostrum of FLO specimen; 63.2-62.3: Jugum, basal plate and jaws of two FLO specimens; 63.4: Basal plate of another FLO specimen; 63.5: Sperm of FLO specimen; 63.6: Jugum, basal plate and jaws of PR specimen; 63.7-63.9: Basal plates of three BDA specimens; 63.10-63.12: Basal plates of three BZE specimens; 63.13: Penis stylet of FLO specimen; 63.14: Penis stylets of eight BZE specimens; 63.15: Penis stylet of PR specimen. – One scale applies to 63.1, a second to 63.2-62.12, and a third to the remaining figures.

part is conspicuous whereas the lateral wings are delicately outlined, short, and directed laterally to caudo-laterally. The jaws are 12-18 μm long, with a terminal tooth and 3 tooth rows each of which is about 3 μm long. Ventral row of 8-9 long, thin teeth; median row of 6-7 short, triangular teeth; and dorsal row of 4-6 long, curved teeth. Jugum 4-10 μm long and 9-18 μm wide; its ventral outline may appear more rectangular, its dorsal outline more crescent-shaped.

Male system: Testes from U 60.8 to U 90.0 (length 80-110 μm), penis stylet (Figs. 63.13-63.15) from U 78.2 to U 90.2 (length 32-56 μm). Proximally 3-6 μm wide, the stylet tapers only little distally, and is always gently

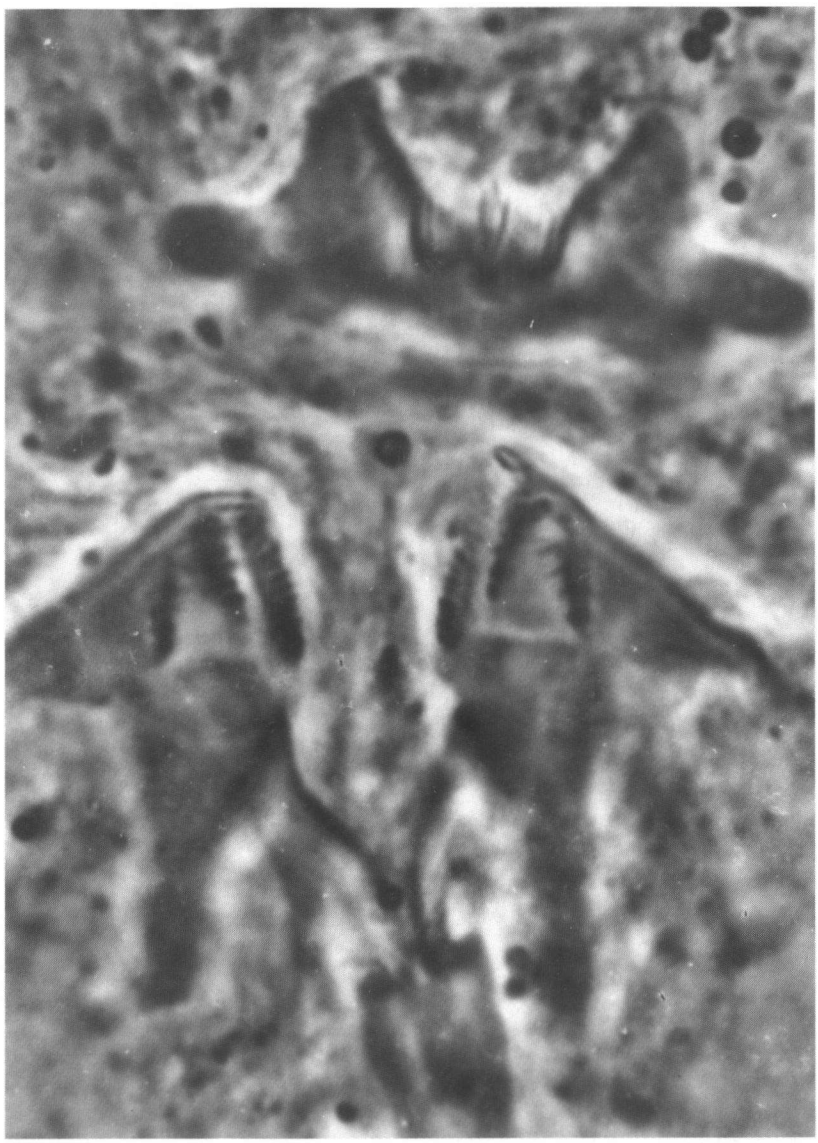


FIGURE 64. *Gnathostomula peregrina.* Basal plate and jaws of BDA specimen. – Phase contrast micrographs of live specimen.

curved, mostly in one direction, more rarely in an S-curve. It seems very soft, and is easily destroyed in squeezing. Sperm droplet-shaped, 3-4 µm long and 1 µm wide.

Female system: Ovary from U 20.9; the largest egg extends from U 39 to U 51 (length 70 µm). Bursa system from U 55 to U 66 (length 50-80 µm, width 16-35 µm). A vagina was not recorded.

TABLE 34

MORPHOMETRIC DATA FOR GNATHOSTOMULA PEREGRINA

Bermuda	Mean	SD	Max	Min	n
Body length of adults	670.00				1
Body width of adults	75.00				1
Body index of adults	8.93				1
Rostrum index of adults	0.90				1
Jaw length	16.03	1.06	18	13	141
Basal plate length	7.80	0.98	11	5	131
Basal plate width	21.10	1.78	26	17	131
Basal plate index	0.37	0.05	0.50	0.24	131
Penis stylet length	38.00				1
Florida	**Mean**	**SD**	**Max**	**Min**	**n**
Body length of adults	560.00				1
Body width of adults	60.00				1
Body index of adults	9.33				1
Jaw length	14.00	1.00	15	13	3
Basal plate length	8.00	0.00	8	8	3
Basal plate width	17.67	1.53	19	16	3
Basal plate index	0.46	0.04	0.50	0.42	3
Penis stylet length	42.00				1
Sperm length	3.00	0.00	3	3	3
Sperm width	1.33	0.58	2	1	3
Sperm index	2.50	0.87	3.00	1.50	3
Belize	**Mean**	**SD**	**Max**	**Min**	**n**
Body length of adults	403.13	71.16	520	310	8
Body width of adults	65.00	5.00	70	60	7
Body index of adults	6.20	1.04	7.83	5.17	7
Rostrum index of adults	0.89	0.05	0.94	0.80	5
Jaw length	15.56	1.51	17	12	9
Basal plate length	8.20	1.03	10	7	10
Basal plate width	21.90	2.51	26	18	10
Basal plate index	0.38	0.05	0.47	0.30	10
Penis stylet length	48.18	6.79	56	32	11
Sperm length	3.50	0.58	4	3	4
Sperm width	1.00	0.00	1	1	4
Sperm index	3.50	0.58	4.00	3.00	4

TABLE 34 (Continued)

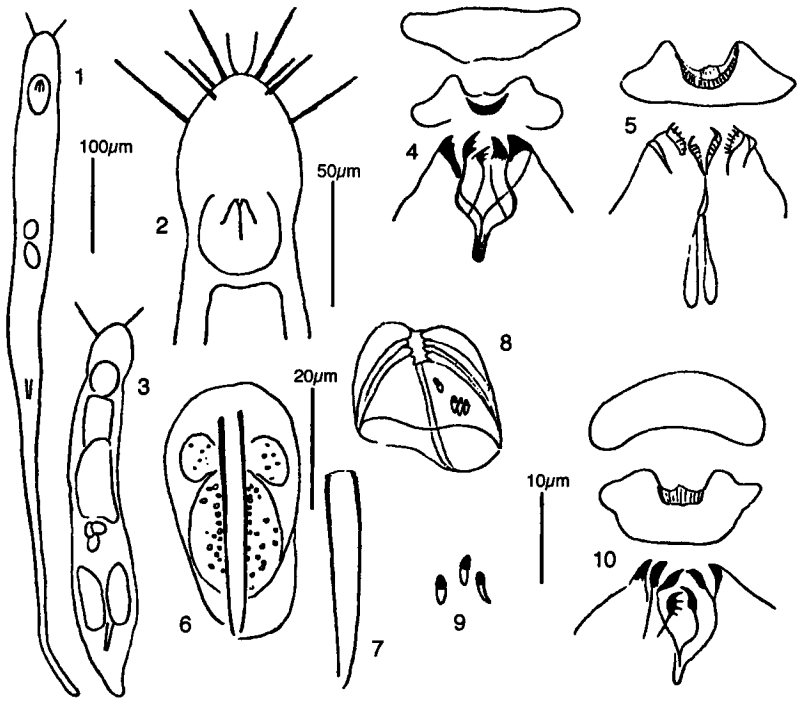
Puerto Rico	Mean	SD	Max	Min	n
Body length of adults	500.00				1
Body width of adults	80.00				1
Body index of adults	6.25				1
Rostrum index of adults	1.17				1
Jaw length	16.00				1
Basal plate length	9.00				1
Basal plate width	22.00				1
Basal plate index	0.41				1
Penis stylet length	35.00				1
ALL DATA	**Mean**	**SD**	**Max**	**Min**	**n**
Body length of adults	455.00	98.95	670	310	13
Body width of adults	65.45	8.50	80	50	11
Body index of adults	7.05	1.66	9.60	5.17	11
Rostrum index of adults	1.00	0.18	1.33	0.80	9
Jaw length	15.88	1.11	18	12	143
Basal plate length	7.82	1.00	11	5	136
Basal plate width	21.00	1.89	26	16	136
Basal plate index	0.37	0.05	0.50	0.24	136
Penis stylet length	46.07	7.42	56	32	14
Sperm length	3.29	0.49	4	3	7
Sperm width	1.14	0.38	2	1	7
Sperm index	3.07	0.84	4.00	1.50	7

Discussion: In addition to dimensions of body and mouth parts, my specimens share with *G. tuckeri*, described by FARRIS (1977) from Bermuda, the consistent curvature and soft nature of the penis stylet. Since this is also the major characteristic of *G. peregrina* described by KIRSTEUER (1969a) from the Bahamas, I suggest that they are identical, in which case *G. tuckeri* Farris becomes a junior synonym of *G. peregrina* Kirsteuer. In the compact nature of both the basal plate and the jugum, *G. peregrina* resembles *G. maldivarum* Gerlach, 1958 (see STERRER 1991c: fig. 5D-G). The low variability of jaw and basal plate measurements, as recorded in 141 BDA specimens, is remarkable.

Gnathostomula uncinata n. sp.

(Fig. 65; Table 35)

Holotype: One adult from 400 m depth off North Carolina (sample 24302) in squeeze preparation, USNMNH 178352.
Further material: One adult from the same sample.
Etymology: From Latin *uncinus*=hook, in reference to the hook-like appearance of the squeezed jaws.



FIGURES 65.1-65.10. *Gnathostomula uncinata*. 65.1: Habitus of first specimen; 65.2: Rostrum of first specimen; 65.3: Habitus of second specimen (holotype); 65.4: Jugum, basal plate and jaws of second specimen (holotype); 65.5: Same, drawn from preserved wholemount; 65.6: Male copulatory organ of holotype; 65.7: Penis stylet of first specimen; 65.8: Bursa of first specimen; 65.9: Sperm of holotype, drawn from preserved wholemount; 65.10: Jugum, basal plate and jaws of first specimen. – One scale applies to 65.1 and 65.3, a second to 65.2, a third to 65.6-65.8, and a fourth to the remaining figures.

Diagnosis: Slender *Gnathostomula* (length 555.00 µm, width 52.50 µm, index 11.22) with a long, tapering tail and a slender rostrum (index 1.24). Jaws delicate, 14.00 µm long, with hook-like terminal teeth.

Organization and behaviour: One of the two adults (Fig. 65.1) was 710 µm long and 45 µm wide at U 15.2 (index 15.78); almost half (330 µm) of the total length was taken up by the tail region (*i.e.*, posterior to the tip of the penis stylet). The other adult (Fig. 65.3) measured 400 µm in length and 60 µm in width at U 72.5 (index 6.72), having a (possibly not fully extended) tail region of only 50 µm length. This discrepancy means

that the system of Units distorts rather than informs in this case, and is replaced by actual micrometer readings. The rostrum (Fig. 65.2) is 50 µm long and 35-48 µm wide at 40-45 µm (index 1.24). The epidermis shows a fishbone pattern.

Digestive tract: The basal plate (Figs. 65.4-65.5, 65.10) is 76-8 µm long and 17-18 µm wide (index 0.40). Its teeth and serrations are equally faint. Jaws 14 µm long, and very delicate. In both specimens the jaws collapsed almost identically under squeezing so that the 3 tooth rows separated, and the terminal teeth assumed the appearance of strong hooks. Teeth are so delicate that, even under maximum squeezing, only those of the ventral row, about 4-5, were seen in the live specimen. Examined 21 years after it was prepared, the wholemount of the holotype (Fig. 65.5) revealed that there are 7 teeth in the median row, and it is likely that the dorsal row also has teeth. The crescent-shaped jugum measures 6 µm by 20 µm.

Male system: Testes from 255 µm to 325 µm (length 70 µm), penis stylet (Fig. 65.7) from 340 µm to 367.5 µm (length 35 µm, width 3.75 µm). Sperm (Fig. 65.9) 4 µm long, 1 µm wide, droplet-shaped, made up of a dense 'bullet' and a transparent, leaf-like portion.

Female system: Bursa system from 205 µm to 245 µm (length 26 µm, width 15-20 µm). An ovary was not seen.

TABLE 35

MORPHOMETRIC DATA FOR *GNATHOSTOMULA UNCINATA*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	555	219.2	710	400	2
Body width of adults	52.5	10.61	60	45	2
Body index of adults	11.22	6.44	15.78	6.67	2
Rostrum index of adults	1.24	0.27	1.43	1.04	2
Jaw length	14	0	14	14	2
Basal plate length	7	1.41	8	6	2
Basal plate width	17.5	0.71	18	17	2
Basal plate index	0.4	0.06	0.44	0.35	2
Penis stylet length	35	0	35	35	2
Sperm length	3.67	0.52	4	3	6
Sperm width	1	0	1	1	6
Sperm index	3.67	0.52	4	3	6

Discussion: While clearly belonging in *Gnathostomula*, this species differs from all known members of the genus. An elongated tail is known from *G. axi* where it is, however, well set off against the body and reaches at most 25-30% of the total body length. The jaw teeth of *G. uncinata* are unique in their extremely delicate nature. The fact that previously no gnathostomulid had been described from bottoms deeper than 30 m makes it also likely that this find from 400 m (COULL *et al.* 1977) is a distinct species.

Suborder **CONOPHORALIA Sterrer, 1972**

Family **AUSTROGNATHIIDAE Sterrer, 1971**

Triplignathia(?) bathycola n. sp.

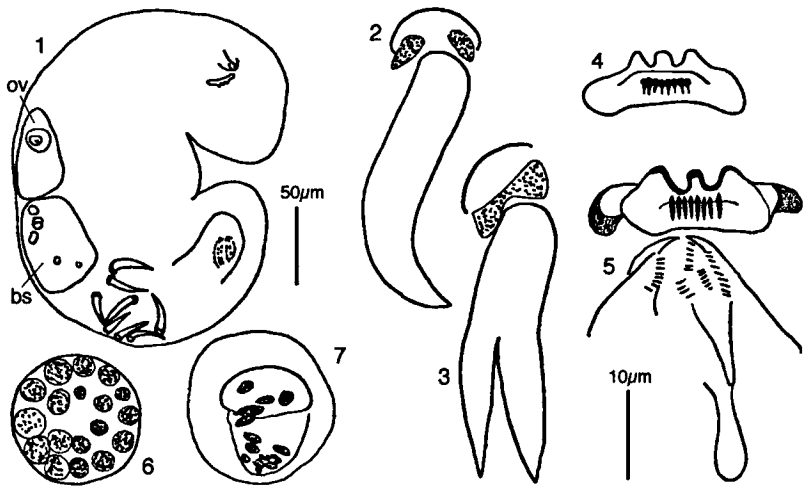
(Fig. 66; Table 36)

Holotype: One adult from 400 m depth off North Carolina (sample 24302) in squeeze preparation, USNMNH 178353.
Etymology: From Greek *bathy* = deep, and Latin *-cola* = dwelling, in reference to its occurrence on deep bottoms.

Diagnosis: *Triplignathia* with basal plate 8 µm long and 23 µm wide (index 0.35), jaws 20 µm long. With large, slender, usually curved conuli (length 44.33 µm, width 12.67 µm; index 3.51) with a small, less than semicircular hat and and a distinct but irregular cingulum.

Organization and behaviour: The single specimen, prematurely squeezed (Fig. 66.1), was about 600 µm long and 100 µm wide (index 6.00).

Digestive tract: The basal plate has a length of 8 µm and a width of 23 µm (Fig. 66.4). All three rostral lobes are prominent. There are only 8, delicate teeth; in the living specimen they appeared rounded anteriorly and pointed posteriorly whereas in the preserved holotype (Fig. 66.5) they appear broadest and rooted a third of their length from the anterior end.



FIGURES 66.1-66.7. *Triplignathia (?) bathycola.* 66.1: Adult, squeezed; *ov* ovary, *bs* bursa seminalis; 66.2: Conulus; 66.3: Twin conulus; 66.4: Basal plate, drawn from living specimen; 66.5: Basal plate and jaws, drawn from preserved wholemount (holotype); 66.6: Spermiogenesis stage; 66.7: Bursa conulus. – One scale applies to 66.1, a second to the remaining figures.

The jaws are 20 µm long, and the symphysis grades into an 8 µm long cauda. In addition to the slender terminal tooth there are two rows of teeth: a long, ventral row of 10 teeth, and a shorter dorsal row of 6-7 teeth. A third row may be present but could not be ascertained on the single specimen.

Male system: The single testis contained 15 conuli of which one (Fig. 66.3) was a twin, *i.e.*, two cones sharing one hat. Conuli (Fig. 66.2) are large (to 45 µm long) but slender (index 3.51), with a small, less than semicircular hat and a distinct but irregular cingulum. Hat and cone are characteristically at an angle; the latter may even be S-shaped. The testis also contained a number of spherical inclusions which I interpret as spermiogenesis stages (Fig. 66.6).

Female system: The ovary extends from U 45.8 to U 61.7; the largest egg measures 85 µm in length. The bursa contained 3 conuli (Fig. 66.7).

TABLE 36

MORPHOMETRIC DATA FOR *TRIPLIGNATHIA (?) BATHYCOLA*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	600				1
Body width of adults	100				1
Body index of adults	6				1
Jaw length	20				1
Basal plate length	8				1
Basal plate width	23				1
Basal plate index	0.35				1
Sperm length	44.33	1.15	45	43	3
Sperm width	12.67	0.58	13	12	3
Sperm index	3.51	0.22	4	3	3

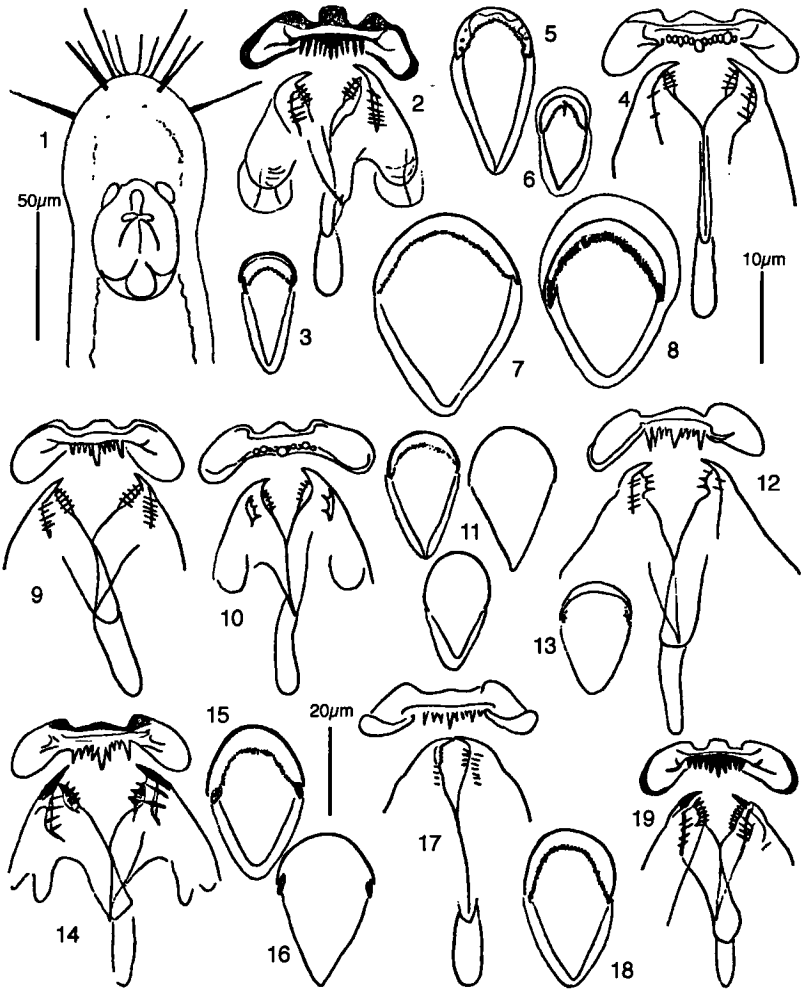
Discussion: Like *G. uncinata*, this species comes from 400 meters (COULL *et al.* 1977), the greatest depth at which Gnathostomulida have ever been encountered. The basal plate of the single specimen is so similar in shape and dimensions to that of *Triplignathia adriatica* Sterrer, 1991 (7.83 µm long by 24.20 µm wide) that it might well be the same species. On the other hand, *T. adriatica* has been described as having similar but much smaller conuli (to 14 µm); these might have been immature. It is not known whether the NC specimen had 2 or 3 rows of jaw teeth. Together with the differences in habitat – *T. adriatica* was described from only 2-10 m depth – these uncertainties lead me to establish a new species rather than prematurely lump several finds.

Austrognathia christianae Farris, 1977

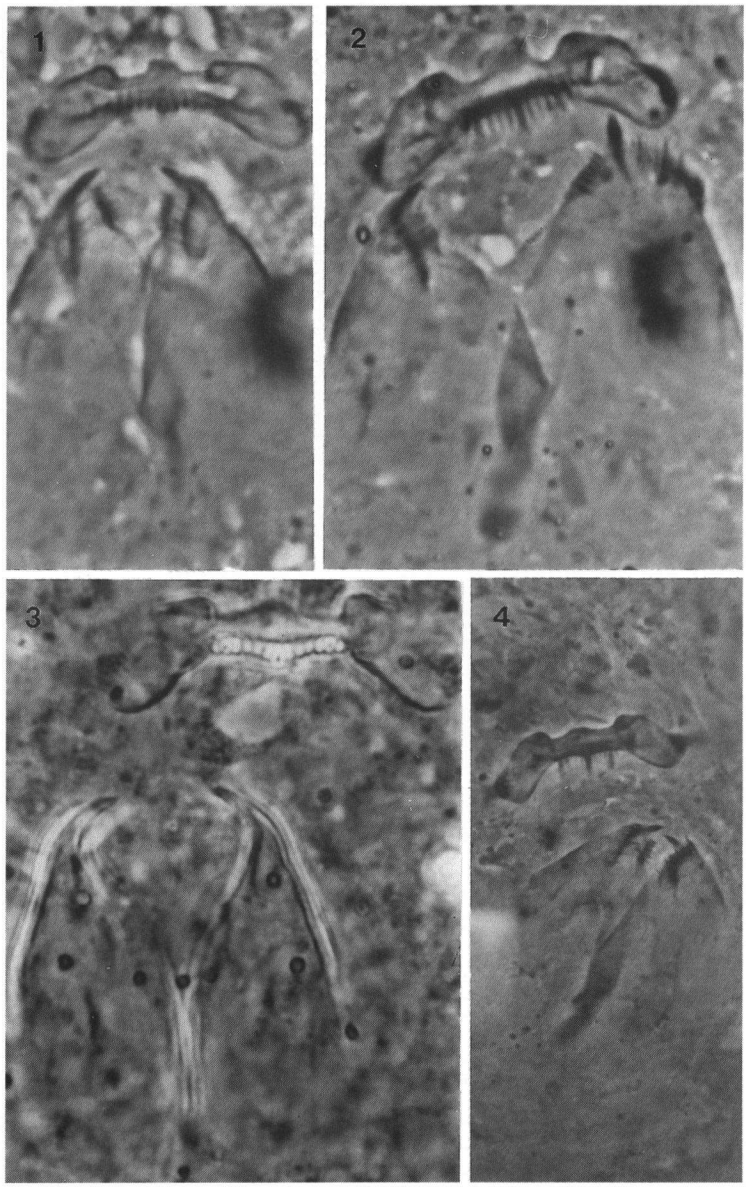
(Figs. 67-69; Table 37)

Material:
- North Carolina: 2 juveniles from samples 79 and 127.
- Bermuda: 30 specimens (9 adults) from samples 29, EoN, 61, 94.02, 94.05, 94.06, 94.07, 131 and 132.
- Georgia: One adult from sample 50m.
- Florida: 9 specimens (5 adults) from samples F14 and F15.
- Puerto Rico: 10 specimens (6 adults) from sample PR95.01.
- Belize: 19 specimens (11 adults) from samples 91.3, 91.6, 91.9, 91.12, 94.4 and 94.5.
- Panama: One adult from sample 94.P3.

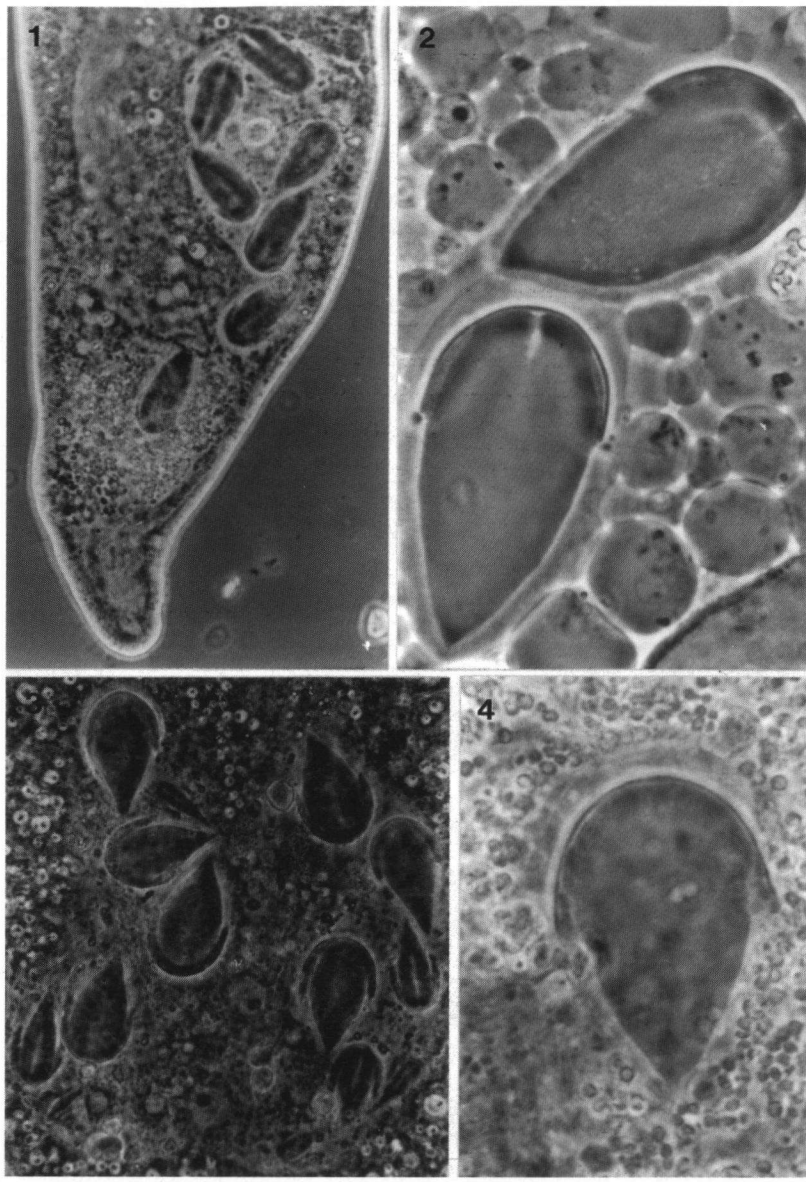
Distribution: North Carolina (FARRIS 1977).



FIGURES 67.1-67.19. *Austrognathia christianae.* 67.1: Rostrum of FLO adult; 67.2: Basal plate and jaws of FLO specimen; 67.3: Conulus of FLO specimen; 67.4: Basal plate and jaws of BDA specimen; 67.5-67.8: Conuli of four BDA specimens; 67.9-67.10: Basal plates and jaws of two PR specimens; 67.11: Conuli of a PR specimen; 67.12: Basal plate and jaws of GEO specimen; 67.13: Conulus of GEO specimen; 67.14: Basal plate and jaws of BZE specimen; 67.15-67.16: Conuli of two BZE specimens; 67.17: Basal plate and jaws of PAN specimen; 67.18: Conulus of PAN specimen; 67.19: Basal plate and jaws of NC specimen. – One scale applies to 67.1, a second to all basal plate and jaw figures, and a third to all conuli figures.



FIGURES 68.1-68.4. *Austrognathia christianae.* Basal plates and jaws. 68.1: NC specimen; 68.2: FLO specimen; 68.3: BDA specimen; 68.4: BZE specimen. – Phase contrast micrographs of live specimens.



FIGURES 69.1-69.4. *Austrognathia christianae*. 69.1: Male reproductive system of BDA specimen; 69.2: Conuli of BDA specimen; 69.3: Conuli of BZE specimen; 69.4: Same in higher magnification. – Phase contrast micrographs of live specimens.

Organization and behaviour: The largest adult (from BDA) measured 1,280 µm by 100 µm at U 50.8 (index 12.80). The smallest adult, a FLO specimen which had male organs and a vagina but lacked an ovary, was only 475 µm long and 70 µm wide at U 56.8 (index 6.79). The sensorium (Fig. 67.1) consists of apicalia 1 (16 µm), apicalia 2 (21 µm), frontalia (30 µm), ventralia (50 µm), dorsalia (40 µm), lateralia (55 µm), and a row of occipitalia (25 µm). The tail epithelium, especially on the ventral surface, contains bundles of rhabdoids that may act as adhesiove organs.

Digestive tract: Basal plate length (Figs. 67.2, 67.4, 67.9-67.10, 67.12, 67.14, 67.17, 67.19, 68) ranges from 5-8 µm, and width from 17 to 22 µm (index 0.23-0.39). The median lobe of the basal plate is prominent and square (as in the original description) in the NC and FLO specimens whereas it is low-triangular in all others. Its mediocaudal border is set with 9-17 (usually 11) rather equal teeth; only the median tooth and one pair of lateral teeth are often somewhat stronger. The jaws are 16-25 µm long, with a terminal tooth and two rows of teeth. The shorter, slightly curved dorsal row consists of 4-6 even teeth of which none is rooted. The longer and straighter ventral row has 6-8 often uneven teeth. The symphysis bears a 6-8 µm long pear-shaped cauda.

Male system: The male system contains up to 16 conuli (Figs. 67.3, 67.5-67.8, 67.11, 67.13, 67.15-67.16. 67.18, 69), usually in two size classes; one mature conulus is often found in the penis whereas the remainder are in the testis. Immature conuli (Fig. 67.3) are 18-20 µm long and 5 µm wide, with a less than semicircular hat and a faint cingulum. Mature conuli reach 39 µm in length and 29 µm in width (index 1.26-2.30). They are characterized by a more than semicircular hat, a conspicuous granular cingulum (except in PR specimens where it appeared as a delicate fringe, Fig. 67.11), and a massive cone with more or less straight sides.

Female system: The ovary extends from U 42.2 to U 75.6; the largest egg, which may be 180 µm long, extends from 59.0 to U 76.0. A dorsal vagina, situated at U 79, was distinct in one FLO and one GEO specimen. The bursa usually contains one conulus, more rarely as many as 4, in which the cone portion is granular and hollow.

TABLE 37

MORPHOMETRIC DATA FOR *AUSTROGNATHIA CHRISTIANAE*

North Carolina	Mean	SD	Max	Min	n
Jaw length	16.00	1.41	17	15	2
Basal plate length	6.00	0.00	6	6	2
Basal plate width	17.50	0.71	18	17	2
Basal plate index	0.34	0.01	0.35	0.33	2
Bermuda	Mean	SD	Max	Min	n
Body length of adults	926.00	222.89	1280	690	5
Body width of adults	97.50	9.57	110	90	4
Body index of adults	10.10	1.88	12.80	8.73	4
Rostrum index of adults	1.00	0.16	1.14	0.83	3
Jaw length	21.00	1.44	25	18	29
Basal plate length	6.11	0.69	7	5	28
Basal plate width	20.36	1.03	22	19	28
Basal plate index	0.30	0.03	0.33	0.23	8
Sperm length	33.82	5.21	39	22	17
Sperm width	19.00	6.07	29	10	18
Sperm index	1.85	0.37	2.30	1.26	18
Georgia	Mean	SD	Max	Min	n
Body length of adults	720.00				1
Body width of adults	80.00				1
Body index of adults	9.00				1
Rostrum index of adults	1.03				1
Jaw length	20.00				1
Basal plate length	7.00				1
Basal plate width	19.00				1
Basal plate index	0.37				1
Sperm length	23.00	0.00	23	23	2
Sperm width	13.50	0.71	14	13	2
Sperm index	1.71	0.09	1.77	1.64	2
Florida	Mean	SD	Max	Min	n
Body length of adults	475.00				1
Body width of adults	70.00				1
Body index of adults	6.79				1
Rostrum index of adults	0.95	0.14	1.05	0.85	2
Jaw length	18.75	1.04	21	18	8
Basal plate length	6.50	0.53	7	6	8
Basal plate width	19.50	0.76	20	18	8
Basal plate index	0.33	0.04	0.39	0.30	8
Sperm length	24.71	1.25	26	23	7
Sperm width	12.71	0.49	13	12	7
Sperm index	1.95	0.13	2.08	1.77	7

TABLE 37 (Continued)

Puerto Rico	Mean	SD	Max	Min	n
Body length of adults	728.00	92.57	860	630	5
Body width of adults	82.00	19.24	110	60	5
Body index of adults	9.28	2.35	12.33	5.73	5
Rostrum index of adults	1.01	0.07	1.06	0.96	2
Jaw length	17.40	1.07	19	16	10
Basal plate length	6.10	0.74	7	5	10
Basal plate width	18.30	0.82	20	17	10
Basal plate index	0.33	0.05	0.39	0.25	10
Sperm length	27.55	2.77	31	23	11
Sperm width	16.00	2.53	21	13	11
Sperm index	1.74	0.12	1.92	1.48	11

Belize	Mean	SD	Max	Min	n
Body length of adults	733.11	63.69	845	660	9
Body width of adults	105.78	15.06	130	90	9
Body index of adults	7.01	0.81	8.00	5.58	9
Rostrum index of adults	1.05	0.11	1.20	0.92	5
Jaw length	20.00	1.37	24	18	17
Basal plate length	6.35	0.86	8	5	17
Basal plate width	20.76	1.15	23	19	17
Basal plate index	0.31	0.04	0.38	0.23	17
Sperm length	33.08	2.63	38	28	25
Sperm width	21.44	2.02	25	16	25
Sperm index	1.55	0.10	1.75	1.32	25

Panama	Mean	SD	Max	Min	n
Body length of adults	870.00				1
Body width of adults	110.00				1
Body index of adults	7.91				1
Rostrum index of adults	0.96				1
Jaw length	21.00				1
Basal plate length	6.00				1
Basal plate width	20.00				1
Basal plate index	0.30				1
Sperm length	33.00	0.00	33	33	3
Sperm width	19.00	0.00	19	19	3
Sperm index	1.74	0.00	1.74	1.74	3

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	769.68	155.49	1280	475	22
Body width of adults	95.81	18.09	130	60	21
Body index of adults	8.27	1.92	12.80	5.58	21
Rostrum index of adults	1.01	0.10	1.20	0.83	14
Jaw length	19.79	1.92	25	15	68
Basal plate length	6.22	0.71	8	5	67
Basal plate width	19.94	1.34	23	17	67
Basal plate index	0.32	0.04	0.39	0.23	47
Sperm length	31.00	4.87	39	22	66
Sperm width	18.59	4.58	29	10	66
Sperm index	1.72	0.26	2.30	1.26	66

Discussion: This slender species was first described from North Carolina (FARRIS 1977). While the morphometric range of specimens reported here exceeds that of the type series (jaw length 19-21 µm, basal plate 6-7 µm by 18.5-20 µm, sperm to 31 µm by 16 µm), I consider conulus shape and dimensions distinctive enough to justify assigning them to this species. (However, this leaves my two NC specimens, of which no conuli are known, somewhat in limbo, especially since they also have the smallest jaw and basal plate dimensions). The insufficiently known *A. hymanae* Kirsteuer, 1970 from the Bahamas resembles *A. christianae* in the dimensions of jaws (17 µm), basal plate (7µm by 20 µm), and the shape and size at least of immature conuli (16-18µm by 9-11µm). It remains to be seen whether the differences in the median lobe of the basal plate merit further attention, and whether *A. christianae* may eventually have to be made a junior synonym of *A. hymanae*, or both be merged with the very similar *A. riedli* Sterrer, 1965.

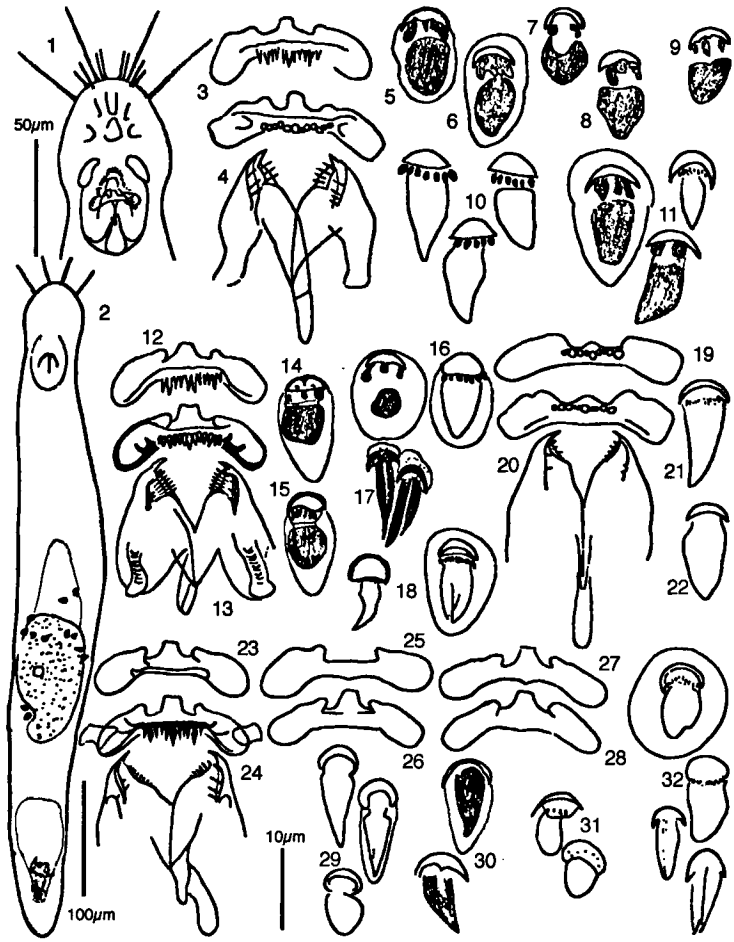
Austrognathia microconulifera Farris, 1977

(Figs. 70-72; Table 38)

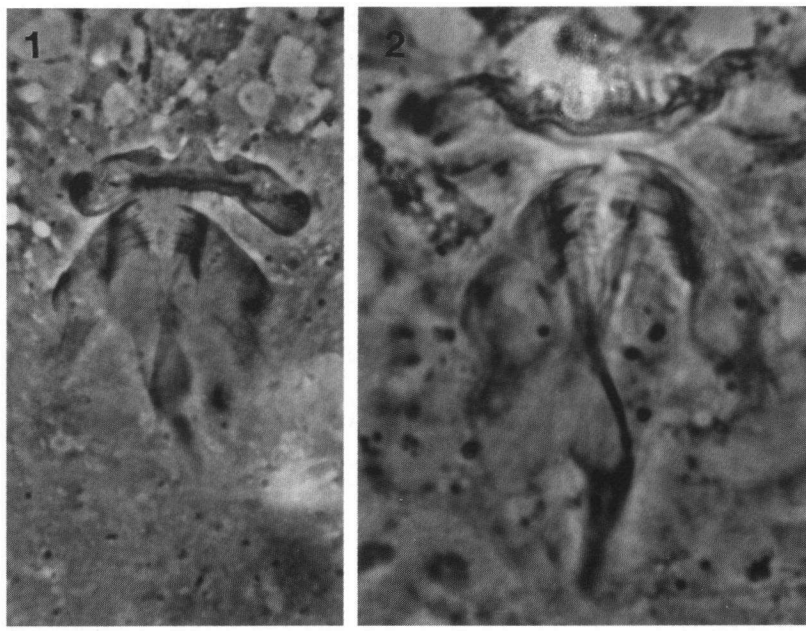
Material:
- Bermuda: 44 specimens (at least 3 adults) from samples 25, 54.3, 126, 127, 131, 132 and 135.
- Belize: 11 specimens (8 adults) from samples 91.8, 91.14, 91.20, 94.2, 94.3 and 94.9.
- Panama: 12 specimens (6 adults) from samples 118 and 94.P3.

Organization and behaviour: The largest adult (from BZE) was 970 µm long and 85 µm wide at U 39.0 (index 11.41); the smallest adult (from PAN) measured 405 µm by 65 µm at U 46.9 (index 6.23). The sensorium (Fig. 70.1) consists of 2 pairs of apicalia of which the first is usually shorter (to 14 µm) than the second (to 18 µm), and one pair each of compound frontalia (to 37 µm), ventralia, dorsalia (to 39 µm). There is a pair of ciliary pits between dorsalia and lateralia.

Digestive tract: The basal plate (Figs. 70.3-70.4, 70.12-70.13, 70.19-70.20, 70.23-70.28, 71) is 4-9 µm wide long and 17-22 µm wide (index 0.19-0.47). Its square median lobe is distinctive, especially in BDA specimens (Figs. 70.23-70.28) where it usually projects further rostrally than the lateral lobes. In 2 out of 44 basal plates measured in Bermuda, a median lobe



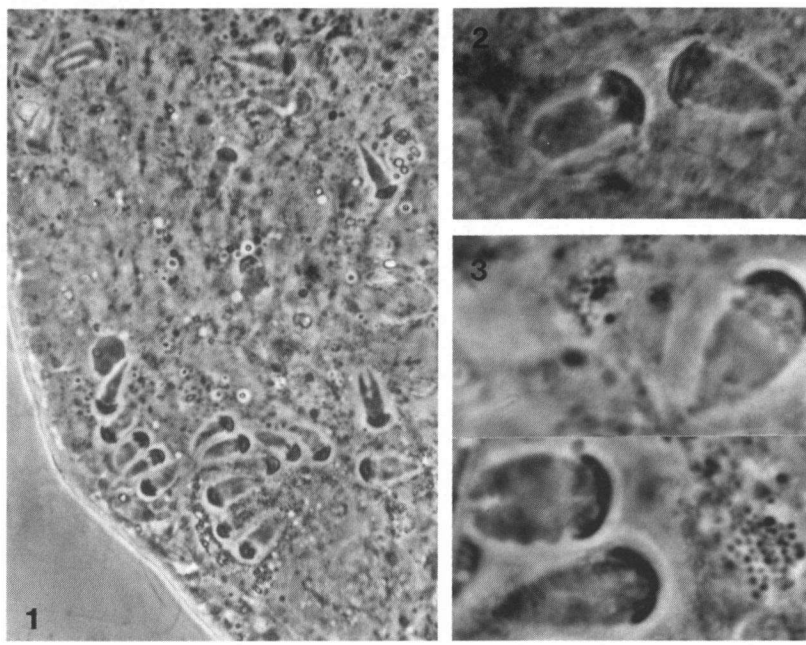
FIGURES 70.1-70.32. *Austrognathia microconulifera.* 70.1: Rostrum of PAN adult; 70.2: Habitus of PAN adult; 70.3: Basal plate of BZE specimen; 70.4: Basal plate and jaws of another BZE specimen; 70.5-70.8: Conuli from a BZE specimen; 70.9: Bursa conulus from the same BZE specimen; 70.10: Conuli from another BZE specimen; 70.11: Conuli from a third BZE specimen; 70.12: Basal plate of PAN specimen; 70.13: Basal plate and jaws of another PAN specimen; 70.14-70.15: Conuli of a PAN specimen; 70.16-70.17: Conuli of another PAN specimen (70.16 gives the aspect of the conulus before, left, and after squeezing, right); 70.18: Conuli of a third PAN specimen; 70.19: Basal plate of PAN (San Blas) specimen; 70.20: Basal plate and jaws of another PAN (San Blas) specimen; 70.21-70.22: Conuli of two PAN (San Blas) specimens; 70.23: Basal plate of BDA specimen; 70.24: Basal plate and jaws of another BDA specimen; 70.25-70.28: Basal plates of four more BDA specimens; 70.29-70.32: Conuli of four BDA specimens. – One scale applies to 70.1, another to 70.2, and a third to all remaining figures.



FIGURES 71.1-71.2. *Austrognathia microconulifera*. Basal plate and jaws. 71.1: BZE specimen; 71.2: PAN specimen. – Phase contrast micrographs of live specimens.

was lacking altogether (Fig. 70.25); in all others its length exceeded that of the lateral lobes. Only in the 3 PAN specimens from San Blas (Figs. 70.19-70.20) the median lobe was considerably less prominent. The basal plate is set caudally with 11-13 fairly even-sized teeth; only the median and one pair of lateral teeth are slightly stronger than the rest. The jaws are 16-21 µm long, with a sharp terminal tooth and two rows of smaller teeth. The dorsal row is 4 µm short, and carries 5-6 short, even teeth in a semicircular arrangement; the posterior-most tooth is usually reinforced (rooted). The ventral row is somewhat longer (7 µm), straight, and set with 8-10 long but often uneven teeth. The symphysis extends into a pear-shaped hyaline cauda.

Male system: The single testis (Fig. 72.1) extends caudally from behind the mature egg to the penis. Its rostral limit is difficult to ascertain, and in several specimens conuli were found rostrally to the mature egg. Caudally the testis empties into a small seminal vesicle which is usually filled with



FIGURES 72.1-72.3. *Austrognathia microconulifera*. 72.1: Testis of BZE specimen; 72.2: Conuli of BZE specimen; 72.3: Conuli of PAN specimen. – Phase contrast micrographs of live specimens.

conuli whose capitula (caps) point toward the penis. The penis is tubular. Testis, vesicle and penis may contain up to 24 conuli. Conuli (Figs. 70.5-70.11, 70.14-70.18, 70.21-70.22, 29-70.32, 72) are maximally 15 µm long and 8 µm wide (index 1.25-2.50), with a sickle-shaped capitulum (hat) which is usually separated from the blunt or pointed cone by a constricted neck region set with an irregular yet conspicuous cingulum (belt). 'Twin conuli', *i.e.*, conuli in which two cones seem to share one hat, are not infrequent (Fig. 72.3), as are early stages in which the cone seems split longitudinally (Figs. 70.17, 70.32). In several PAN specimens, conuli seemed irregular at first but assumed a typical shape under stronger squeezing (Fig. 70.17).

Female system: The dorsal ovary extends from U 41.3 to U 73.4; a mature egg may be 220 µm long.

TABLE 38

MORPHOMETRIC DATA FOR AUSTROGNATHIA MICROCONULIFERA

Bermuda	Mean	SD	Max	Min	n
Body length of adults	630.00	70.71	680	580	2
Body width of adults	75.00	7.07	80	70	2
Body index of adults	8.48	1.74	9.71	7.25	2
Rostrum index of adults	1.03	0.16	1.15	0.92	2
Jaw length	17.80	0.98	20	16	44
Basal plate length	6.70	0.79	9	5	44
Basal plate width	18.59	0.84	20	17	44
Basal plate index	0.36	0.05	0.47	0.26	44
Sperm length	9.60	0.55	10	9	5
Sperm width	5.80	0.84	7	5	5
Sperm index	1.68	0.23	2.00	1.43	5

Belize	Mean	SD	Max	Min	n
Body length of adults	701.88	150.76	970	470	8
Body width of adults	72.00	5.70	80	65	5
Body index of adults	9.66	1.27	11.14	8.00	5
Rostrum index of adults	1.18	0.10	1.32	1.04	7
Jaw length	19.40	1.17	21	18	10
Basal plate length	7.10	0.88	8	6	10
Basal plate width	20.70	1.16	22	19	10
Basal plate index	0.35	0.06	0.42	0.27	10
Sperm length	12.15	1.42	15	10	20
Sperm width	6.25	0.91	8	5	20
Sperm index	1.97	0.29	2.50	1.25	20

Panama	Mean	SD	Max	Min	n
Body length of adults	503.00	93.18	620	405	5
Body width of adults	70.00	7.91	80	60	5
Body index of adults	7.20	1.22	8.92	5.86	5
Rostrum index of adults	0.98	0.04	1.02	0.94	4
Jaw length	17.17	0.94	19	16	12
Basal plate length	6.33	1.23	8	4	12
Basal plate width	19.67	1.07	22	19	12
Basal plate index	0.32	0.08	0.42	0.19	12
Sperm length	11.25	1.39	13	7	16
Sperm width	5.31	0.79	7	4	16
Sperm index	2.14	0.24	2.50	1.71	16

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	626.00	151.32	970	405	15
Body width of adults	71.67	6.51	80	60	12
Body index of adults	8.44	1.67	11.14	5.86	12
Rostrum index of adults	1.10	0.13	1.32	0.92	13
Jaw length	17.92	1.19	21	16	66
Basal plate length	6.70	0.91	9	4	66
Basal plate width	19.11	1.22	22	17	66
Basal plate index	0.35	0.6	0.47	0.19	66
Sperm length	11.49	1.55	15	7	41
Sperm width	5.83	0.95	8	4	41
Sperm index	2.00	0.30	2.50	1.25	41

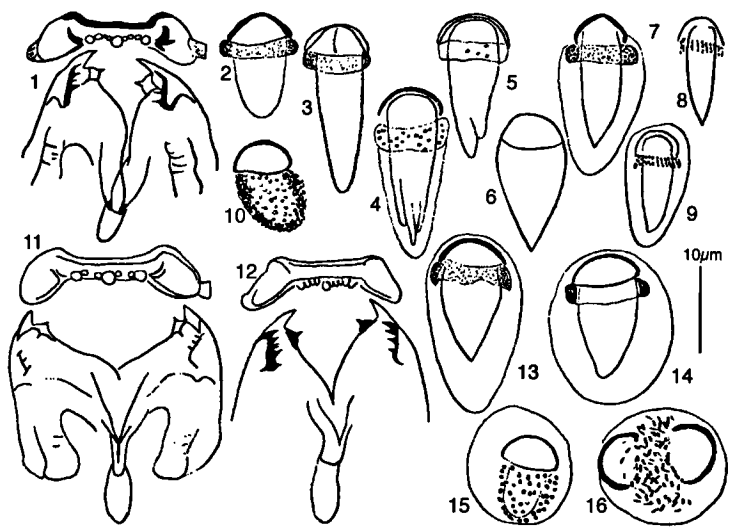
Discussion: Described from Bermuda (FARRIS 1977), this species is well-characterized by the prominent, square median lobe of its basal plate, and the small dimensions and neck constriction of its conuli. While *Austrognathia nannulifera* Sterrer, 1991a, known from Fiji and Tahiti (STERRER 1991a, 1991c), has virtually identical conuli, its basal plate lacks a median lobe altogether.

Austrognatharia kirsteueri Sterrer, 1970

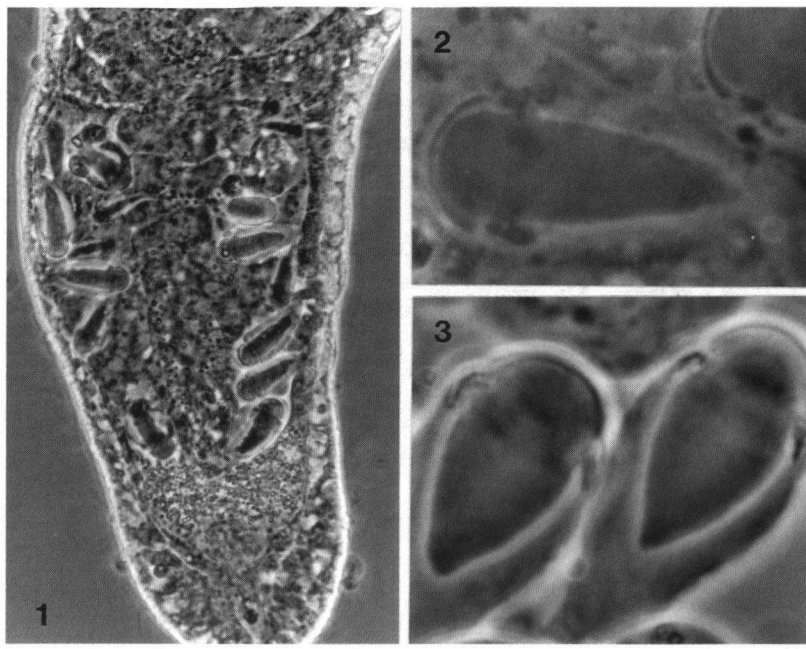
(Figs. 73, 74; Table 39)

Material: North Carolina: 7 specimens (4 adults) from sample 58, and another 3 specimens (2 adults) from sample 126.

Description: Emphasizes data from the deepwater sample 126 (second table), whereas data used for the original description are summarized in the first part of the table.



FIGURES 73.1-73.16. *Austrognatharia kirsteueri*. 73.1: Basal plate and jaws of NC specimen; 73.2-73.3: Conuli of NC specimen; 73.4-73.5: Conuli of another NC specimen; 73.6-73.9: Conuli of a third NC specimen; 73.10: Bursa conulus of a NC specimen; 73.11-73.12: Basal plates and jaws of two NC (deepwater) specimens; 73.13-73.14: Conuli of two NC (deepwater) specimens; 73.15-73.16: Bursa conuli of two NC (deepwater) specimens. – All to the same scale.



FIGURES 74.1-74.3. *Austrognatharia kirsteueri*. 74.1: Male reproductive system of NC specimen; 74.2: Conuli of NC specimen; 74.3: Conuli of NC (deepwater) specimen. – Phase contrast micrographs of live specimens.

Organization and behaviour: The 2 adults were 520-540 µm long and 55-70 µm wide at U 33.3-48.1 (index 7.43-9.82). In one specimen the ventral epidermis, from behind the pharynx to the tail, contained groups of 3-5 banana-shaped rhabdoids, which measured 5 µm by 1 µm in the anterior body portion and 8 µm by 1 µm in the tail region.

Digestive tract: The basal plate (Figs. 73.1, 73.11-73.12) is 7 µm long and 22-23 µm wide (index 0.31). The mediofrontal outline is gently concave and grades imperceptibly into the flat lateral lobes. Of the 10-11 teeth, the median tooth is strongest, followed by the lateral-most pair; flanking teeth are somewhat weaker, and then there is a group of 2-3 thin teeth on either side separating the median from the lateral groups. Jaws are 23-24 µm long, with a strong terminal and one rhomboid subterminal (dorsal) tooth. The ventral row is made up of 3-4 uneven but mostly delicate teeth. The cauda is 6 µm long.

Male system: The testis (Fig. 74.1) extends from U 83.3 to U 92.6 (length 50 µm). The penis has a coarse-granular region adjacent to the testis, which grades into a 30 µm long, straight, narrow tube lined with fine granula. The male pore is inconspicuous. The male system contained 5-9 conuli (Figs. 73.3-73.9, 73.13-73.14, 74). The largest conuli are 15-16 µm long and 9-10 µm wide (index 1.59). A less than semicircular hat caps a plump but pointed cone. The cingulum is prominent, sometimes giving the impression of 'floppy ears' (Figs. 73.13, 74.3).

Female system: An inconspicuous vagina was noted in one adult at U 85.1. The bursa contained twin conuli in one (Fig. 73.16), and a single conulus in the other adult (Fig. 73.15); both with the cone portion in granular degeneration.

TABLE 39

MORPHOMETRIC DATA FOR *AUSTROGNATHARIA KIRSTEUERI*

North Carolina	Mean	SD	Max	Min	n
Body length of adults	730.00				1
Body width of adults	50.00				1
Body index of adults	14.60				1
Rostrum index of adults	1.46				1
Jaw length	20.25	0.96	21	19	4
Basal plate length	6.14	0.38	7	6	7
Basal plate width	19.00	0.00	19	19	7
Basal plate index	0.32	0.02	0.37	0.32	7
Sperm length	19.22	2.05	22	17	9
Sperm width	7.44	0.73	9	7	9
Sperm index	2.61	0.44	3.14	2.00	9
Sample 126	Mean	SD	Max	Min	n
Body length of adults	530.00	14.14	540	520	2
Body width of adults	62.50	10.61	70	55	2
Body index of adults	8.62	1.69	9.82	7.43	2
Rostrum index of adults	1.34				1
Jaw length	23.67	0.58	24	23	3
Basal plate length	7.00	0.00	7	7	3
Basal plate width	22.67	0.58	23	22	3
Basal plate index	0.31	0.01	0.32	0.30	3
Sperm length	15.33	0.58	16	15	3
Sperm width	9.67	0.58	10	9	3
Sperm index	1.59	0.16	1.78	1.50	3

TABLE 39 (Continued)

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	596.67	115.90	730	520	3
Body width of adults	58.33	10.41	70	50	3
Body index of adults	10.62	3.65	14.60	7.43	3
Rostrum index of adults	1.40	0.08	1.46	1.34	2
Jaw length	21.71	1.98	24	19	7
Basal plate length	6.40	0.52	7	6	10
Basal plate width	20.10	1.79	23	19	10
Basal plate index	0.32	0.02	0.37	0.30	10
Sperm length	18.25	2.49	22	15	12
Sperm width	8.00	1.21	10	7	12
Sperm index	2.36	0.60	3.14	1.50	12

Discussion: The deepwater specimens from sample 126 differ from the original description mainly in the larger dimensions of basal plate and jaws, and the smaller length of the conuli. Since the two deepwater adults had only a maximum of 9 conuli, *vs.* 13 in the specimens of the original description, it is possible that their conuli had not yet reached their full length. The 'floppy-ear' conuli of one of the deepwater specimens are identical with those of *Austrognathia novaezelandiae* Sterrer, 1991a, as are for that matter most other characteristics, with the exception of the jaws which, in *A. novaezelandiae*, have a dorsal row with 4 teeth, as befits the genus *Austrognathia*.

Austrognatharia medusifera nov. spec.

(Figs. 75-78; Table 40)

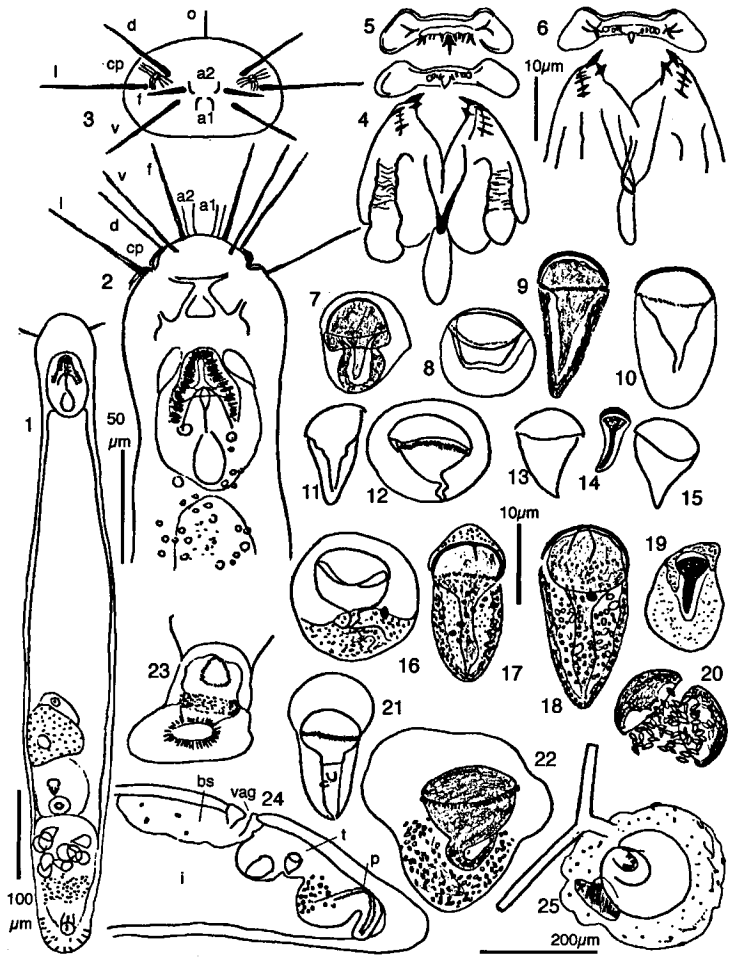
Holotype: One adult from Panama (sample 118) in squeeze preparation, USNMNH 178354.

Further material:

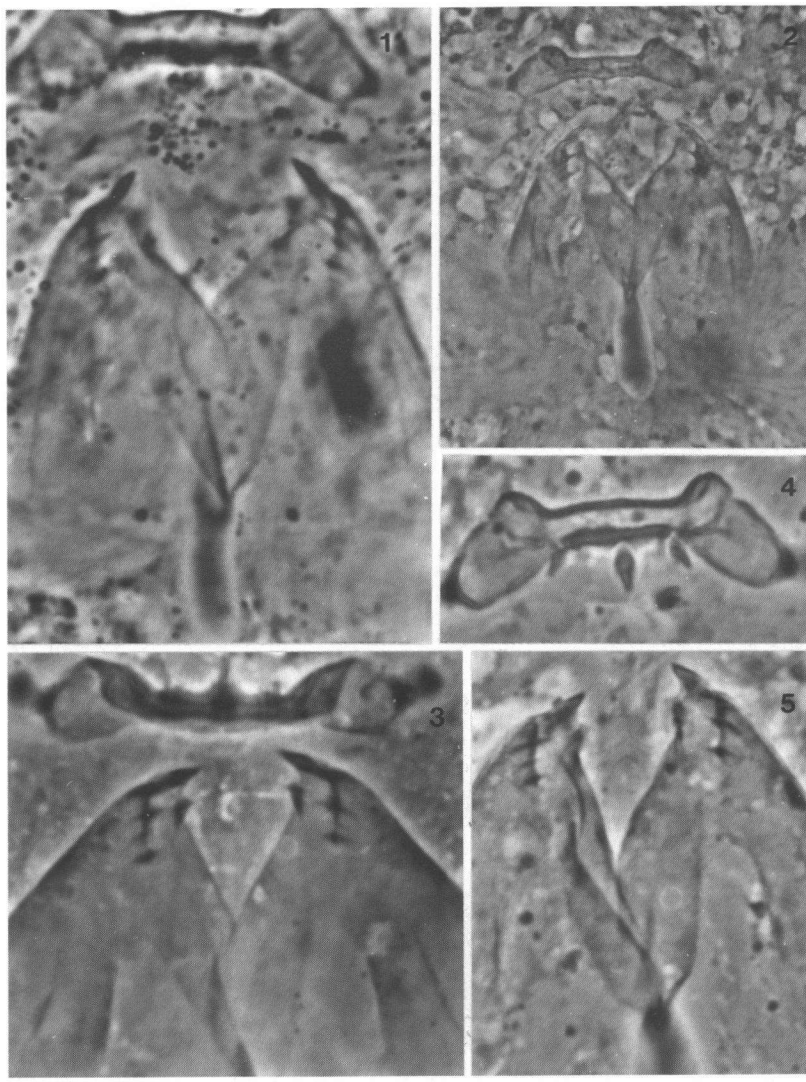
- Florida: 2 adults from samples F8 and F15.
- Belize: 8 adults from samples 91.5, 91.6, 91.7, 91.9, 91.21 and 94.7.
- Panama: 10 specimens (6 adults) from sample 118.

Etymology: From Latin *medusa* = jellyfish, and *-fera* = carrying, in reference to the shape of the conuli.

Diagnosis: Small, plump *Austrognatharia* (length 628.13 µm, width 97.50 µm; index 6.47) with stout rostrum (index 0.88). Basal plate 6.28 µm long and 22.72 µm wide (index 0.28), with medium-high lateral lobes; 9.94 teeth arranged 5 groups, with the lateral group made up of 2 teeth. Jaws 22.94 µm long, with one tooth in dorsal and 4.08 unequal teeth in ventral



FIGURES 75.1-75.24. *Austrognatharia medusifera*. 75.1: Habitus of PAN adult; 75.2: Rostrum of PAN adult; 75.3: Sensorium in frontal view (reconstruction; *a1* apicalia 1, *a2* apicalia 2, *cp* ciliary pit, *d* dorsalia, *f* frontalia, *l* lateralia, *o* occipitalia, *v* ventralia); 75.4: Basal plate of PAN specimen; 75.5: Basal plate of another PAN specimen; 75.6: Basal plate and jaws of FLO specimen; 75.7: Conulus of FLO specimen; 75.8-75.10: Conuli of BZE specimen; 75.11-75.12: Conuli of another BZE specimen; 75.13-75.15: Conuli of a third BZE specimen; 75.16-75.17: Conuli of PAN specimen; 75.18-75.19: Conuli of another PAN specimen; 75.20: Bursa conulus of same; 75.21-75.22: Conuli of a third PAN specimen; 75.23: Vagina and bursa of PAN specimen, dorsal view; 75.24: Posterior body region of FLO specimen, left lateral view; *bs* bursa seminalis, *p* penis, *t* testis, *vag* vagina; 75.25: Encysted PAN specimen. – One scale applies to 75.1, a second to 75.2-75.3 and 75.23-75.24, a third to 75.25, a fourth to all basal plate and jaw figures, and a fifth to all conuli figures.



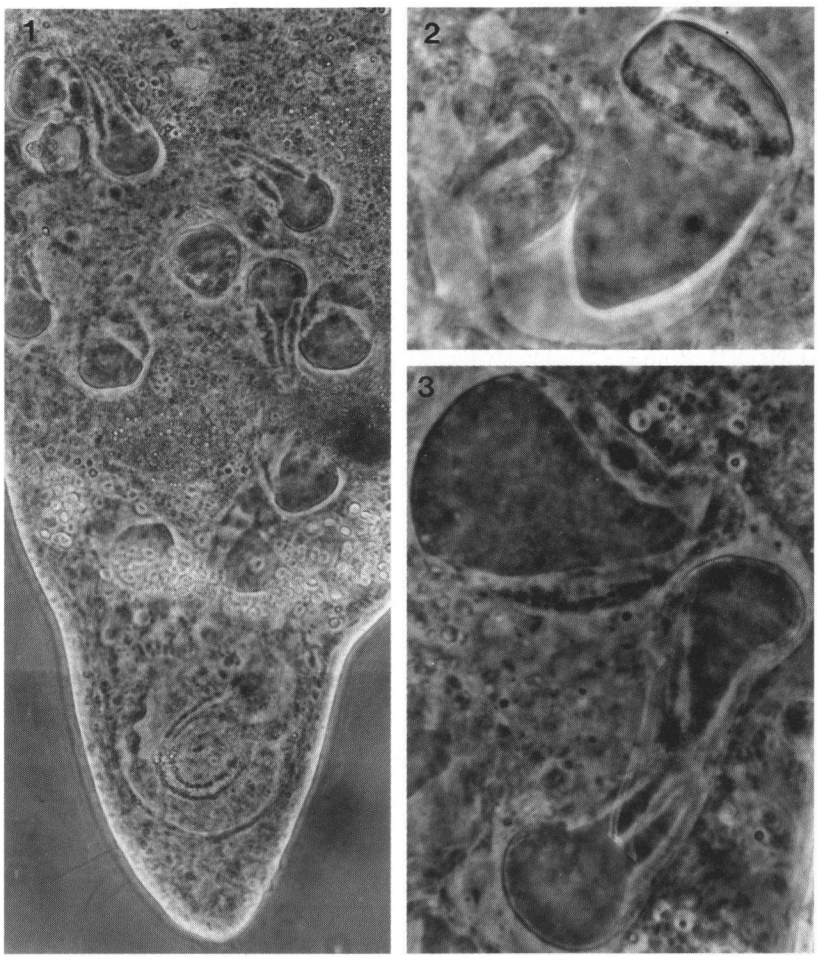
FIGURES 76.1-76.5. *Austrognatharia medusifera.* Basal plates and jaws. 76.1: FLO specimen; 76.2: BZE specimen; 76.3: PAN specimen; 76.4-76.5: Another PAN specimen. – Phase contrast micrographs of live specimens.

row. Conuli 30.86 µm long and 19.81 µm wide (index 1.57), jellyfish-like, with a more or less semicircular capitulum and a tapering, often curved cone. With ability to encyst.

Organization and behaviour: This small, plump species (Fig. 75.1) is opaque in transmitted light due to densely arranged round skin inclusions and brown granula in the gut lumen. Largest adult (from BZE) 760 µm long and 130 µm wide at U 52.6 (index 6.64), smallest adult (from BZE) 445 µm long and 85 µm wide at U 51.7 (index 5.24). Rostrum (Fig. 75.2) stout, rounded, 47-67 µm long and 52-70 µm wide at U 4.9-7.6 (index 0.78-0.94). Posterior end fairly blunt, not drawn out into a tail, and densely set with bundles of rhabdoids. The sensorium (Figs. 75.2-75.3) consists of paired apicalia 1 (to 12 µm), apicalia 2 (15 µm), frontalia (47 µm), ventralia (25 µm), dorsalia (35 µm), lateralia (28 µm), and unpaired occipitalia (32 µm). There is a pair of conspicuous ciliary pits between dorsalia and lateralia.

Two of the PAN specimens, which had been extracted from the sediment and placed in a small dish, were found in gelatinous cysts (Fig. 75.25) 3 hours later. Each animal, coiled to a ball of 150 µm diameter, was surrounded by a transparent, sand-encrusted cocoon 50-100 µm thick in which it rotated slowly. One of the animals, which had been in the cyst for 16 hours, seemed to have shed its cilia and round skin inclusions; it is possible that the latter jelled in the surrounding seawater to produce the cocoon. The cysts, together with the animals, finally disintegrated 36-48 hours after encystment had begun, usually in a flurry of bacterial activity.

Digestive tract: The basal plate (Fig. 75.4-75.6, 76.1-76.4) is 5-8 µm long and 21-25 µm wide (index 0.19-0.36). There is no median lobe or, at most, a shallow bump, whereas the lateral lobes are quite elevated. The 7-13 (9.94) basal plate teeth are in 5 groups: a central group of one strong tooth flanked by a pair of smaller ones; two lateral groups each made up of two fairly strong teeth; and two groups of 1-3 very weak teeth each separating the central from the lateral groups. During squeeze preparation, the basal plate more often than not tilts such that its teeth point rostrally, rather than caudally as in most other species. Jaws are 21-27 µm long. The terminal tooth is strong; the dorsal row consists of one blunt, rooted tooth. The ventral row is made up of 2-7 (4.08) rather uneven teeth. The cauda is 8-10 µm long.

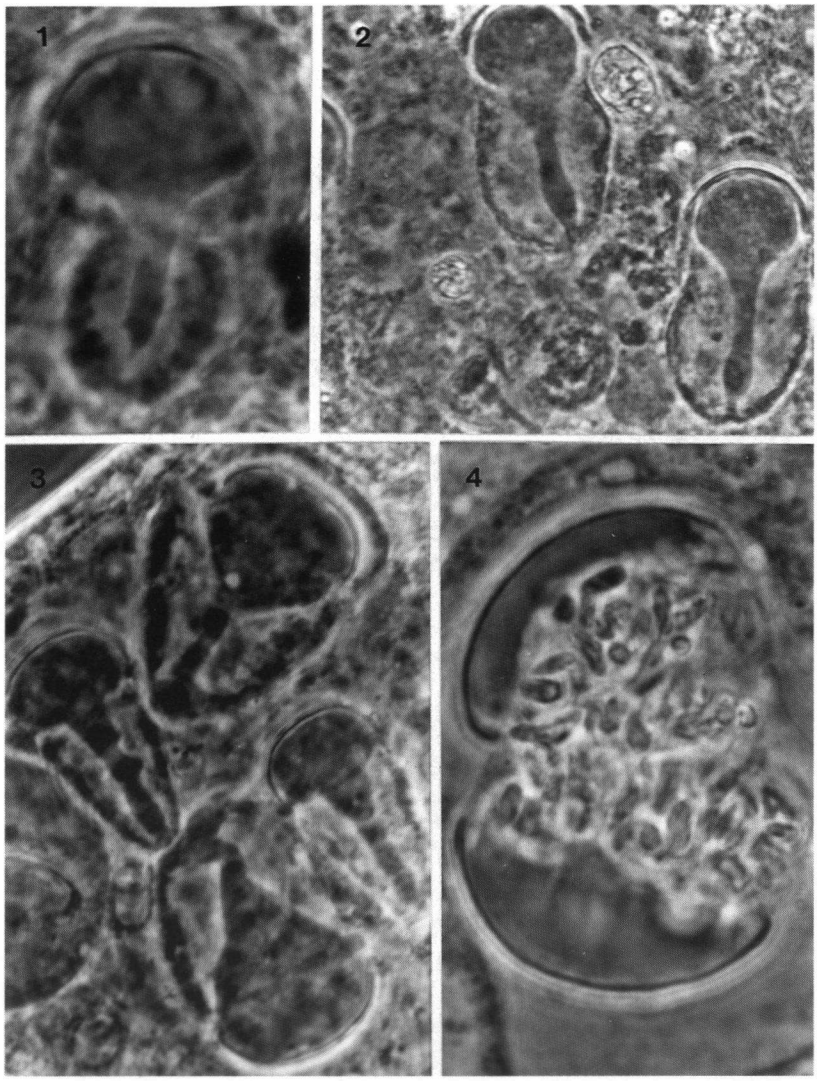


FIGURES 77.1-77.3. *Austrognatharia medusifera*. 77.1: Male reproductive system of BZE specimen; 77.2: Conuli of BZE specimen; 77.3: Conuli of another BZE specimen. – Phase contrast micrographs of live specimens.

Male system: The testis (Figs. 75.1, 75.24, 77.1) extends from U 77.7 to U 88.5 (length 70-90 µm). It contains up to 12 conuli in various stages of maturation. In spite of considerable variability in shape, mature conuli are always reminiscent of a jellyfish, hence the species name. Two basic types can be distinguished, both of which usually occur together in the same individual. The first (*e.g.*, Figs. 75.7, 75.17, 75.18, 78.-78.3), which is up to 45 µm long, has a semicircular hat to 16 µm wide and 8 µm long, which tops an elongated, rapidly tapering cone. One of the conuli in a BZE specimens had two such cones next to each other. The hat is bordered by a straight granular cingulum, and the cone is usually surrounded by a hollow bladder the wall of which is finely granular on the outside, and coarsely granular on the inside. The second conulus type (*e.g.*, Figs. 75.12, 75.16, 75.22, 77.3) has a broader (to 22 µm) but less than semicircular hat fringed by a straight cingulum. The cone is broad near the hat, then tapers to a wavy tail that connects it with the wall of the large surrounding bladder. Early conuli stages (Figs. 75.14, 75.19) are small versions of the first type except that the hat is much less than semicircular.

The penis, which extends from U 88 to U 96, is always conspicuously curved (Fig. 77.1). Immediately behind the testis it appears as a wide region marked by coarse granula; it then narrows to a 40 µm long straight canal followed by a 40-50 µm long semicircular canal. The straight portion ascends towards the dorsal body surface, is finely granular, and circled by what might be a sphincter muscle, whereas the curved portion descends to the ventral surface and is lined by intermediate granules. The ventral male opening is always conspicuously circular.

Female system: The dorsal ovary extends from U 58.7 to U 70.7; the largest egg, which may be 80 µm long, from U 60.0 to U 70.7. A conspicuous dorsal vagina, located at U 78.1, was recorded in 2 of 17 mature specimens. An oval opening 4 µm long and 10 µm wide that is surrounded by ring of cells, it widens rostro-ventrally into a small, blind pouch. The hyaline bursa extends rostrally from the vagina, often containing one or two conuli, the latter sometimes joined like Siamese twins (Figs. 75.20, 78.4). Bursa conuli typically appear with the hat more or less intact, but the cone portion dissolved into coarse, lentil-shaped granula.



FIGURES 78.1-78.4. *Austrognatharia medusifera.* 78.1: Conulus of FLO specimen; 78.2: Conuli of PAN specimen; 78.3: Conuli of another PAN specimen; 78.4: Bursa conulus of PAN specimen. – Phase contrast micrographs of live specimens.

TABLE 40

MORPHOMETRIC DATA FOR *AUSTROGNATHARIA MEDUSIFERA*

Florida	Mean	SD	Max	Min	n
Body length of adults	500.00				1
Body width of adults	70.00				1
Body index of adults	7.14				1
Rostrum index of adults	0.88				1
Jaw length	25.33	1.53	27	24	3
Basal plate length	6.67	1.15	8	6	3
Basal plate width	23.00	1.73	24	21	3
Basal plate index	0.29	0.04	0.33	0.25	3
Sperm length	23.00				1
Sperm width	15.00				1
Sperm index	1.53				1

Belize	Mean	SD	Max	Min	n
Body length of adults	578.33	162.97	760	445	3
Body width of adults	98.33	27.54	130	80	3
Body index of adults	5.90	0.70	6.63	5.25	3
Rostrum index of adults	0.78				1
Jaw length	22.00	1.10	24	21	6
Basal plate length	6.83	0.41	7	6	6
Basal plate width	22.00	0.63	23	21	6
Basal plate index	0.31	0.02	0.33	0.27	6
Sperm length	28.21	5.99	37	22	14
Sperm width	19.15	1.95	23	16	13
Sperm index	1.49	0.33	1.94	1.05	13

Panama	Mean	SD	Max	Min	n
Body length of adults	697.50	53.77	750	630	4
Body width of adults	103.75	4.79	110	100	4
Body index of adults	6.72	0.35	7.14	6.30	4
Rostrum index of adults	0.94	0.01	0.94	0.93	2
Jaw length	23.00	1.25	25	21	10
Basal plate length	6.00	1.05	8	5	10
Basal plate width	23.20	1.75	26	20	10
Basal plate index	0.26	0.06	0.36	0.19	10
Sperm length	31.40	6.72	45	20	10
Sperm width	19.70	3.37	24	15	10
Sperm index	1.62	0.37	2.05	1.05	10

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	628.13	122.41	760	445	8
Body width of adults	97.50	18.90	130	70	8
Body index of adults	6.47	0.66	7.14	5.24	8
Rostrum index of adults	0.88	0.07	0.94	0.78	4
Jaw length	22.94	1.59	27	21	18
Basal plate length	6.28	0.89	8	5	18
Basal plate width	22.72	1.53	26	20	18
Basal plate index	0.28	0.05	0.36	0.19	18
Sperm length	30.86	7.72	50	20	28
Sperm width	19.81	3.09	25	15	27
Sperm index	1.57	0.33	2.05	1.05	27

Discussion: Being sympatric with *A. sterreri* (Kirsteuer, 1969), at least in BZE, and having similar body and pharynx measurements, this species was at first difficult to recognize as distinct. However, the shape of the conuli as well as the curved penis provide positive identification characteristics. In addition, the fact that during squeezing the basal plate usually tips forward is unique, whereas the arrangement of basal plate teeth, especially the fact that the lateral tooth group is made up of only 2 (rather than the customary 3) teeth, is shared with *A. stirialis* (see below). The ability to encyst is shared only with *A. boadeni* Sterrer, 1971a from the Irish Sea. *A. medusifera* is closely related (and possibly identical) with *A. atraclava* Ehlers & Ehlers, 1973 from Galapagos, which also has a curved penis and jellyfish-like conuli. However, the conuli of *A. atraclava* have a somewhat flatter hat, and typically 2 or 4 slender cones rather than the single (or rarely 2) found in *A. medusifera.*

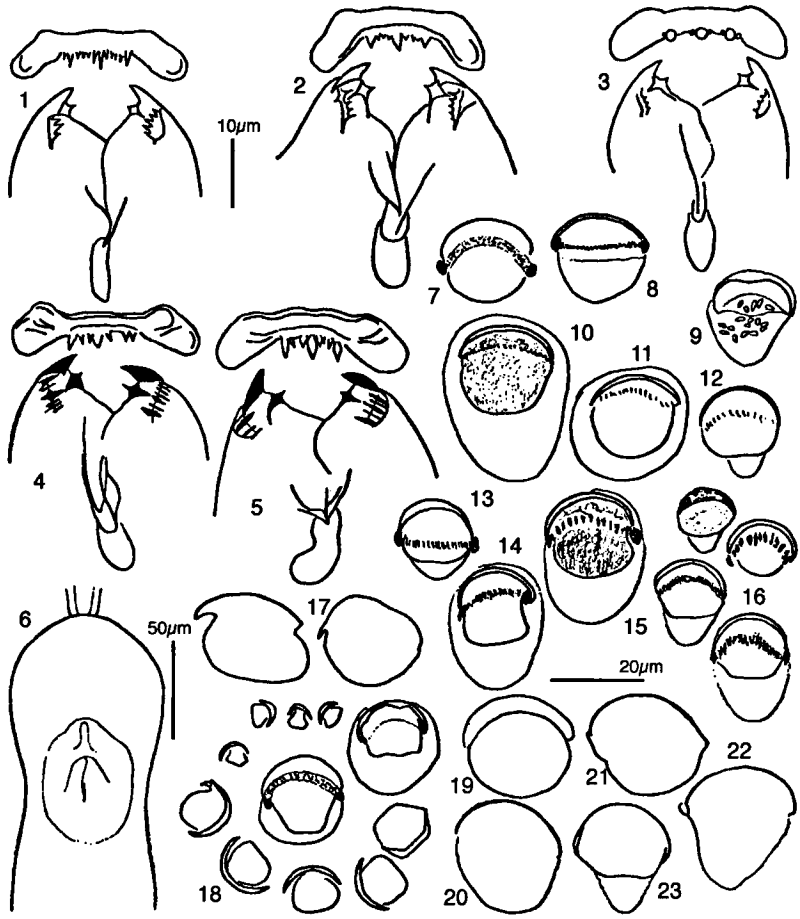
Austrognatharia sterreri (Kirsteuer, 1969)

(Figs. 79, 80; Table 41)

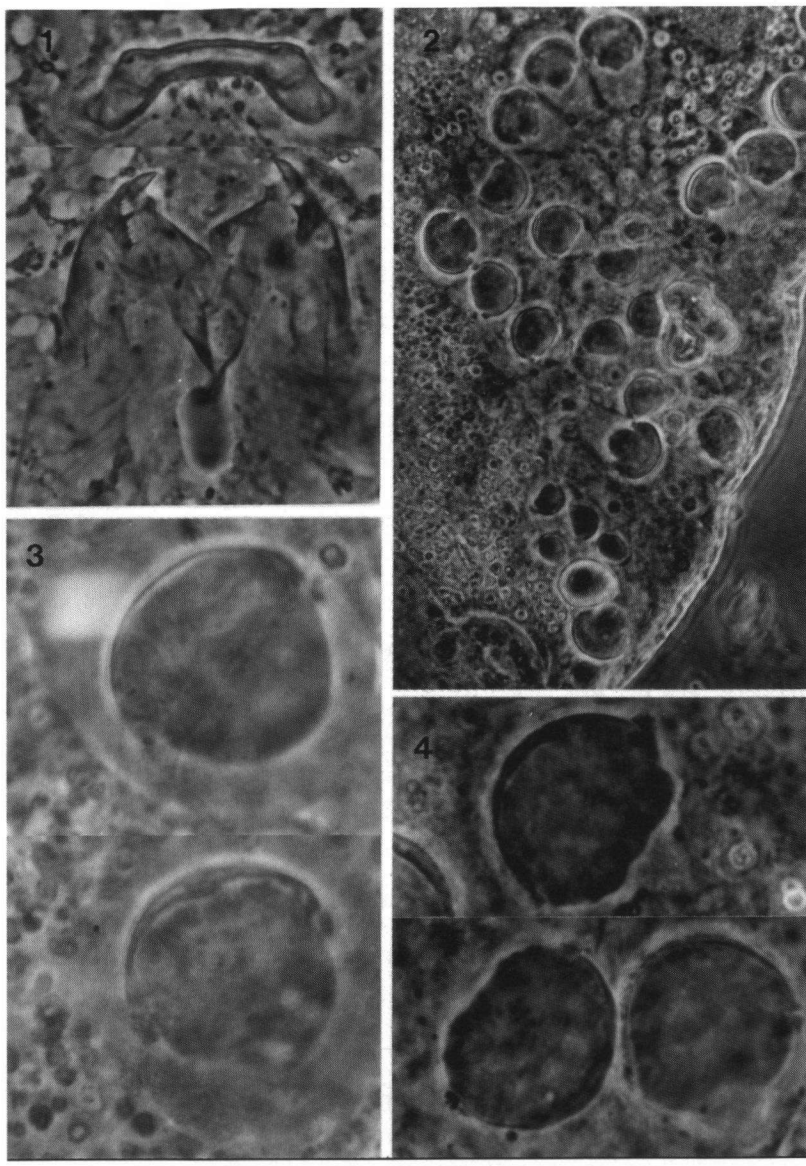
Synonymy: *Austrognathia sterreri* Kirsteuer, 1969.
Material:
- Bermuda: 18 specimens (at least 3 adults) from samples 128, 131, 134, 135 and 94.06.
- Belize: 8 specimens (5 adults) from samples 91.3, 91.9, 91.11 and 91.12.
- Panama: 8 specimens (4 adults) from sample 94.P3.

Distribution: Bahamas (KIRSTEUER 1969a).

Organization and behaviour: Uniformly opaque in transmitted light. Largest adult (from PAN) 1,000 µm long and 130 µm wide at U 45.0 (index 7.69); smallest adult (from BZE) was 650 µm long and 75 µm wide at U 38.5 (index 8.66). Rostrum short, stout (70-85 µm long and 75-90 µm wide at U 4.65-5.56; index 0.78-0.96). The only measurements taken of the sensorium are: apicalia 1 (to 13 µm long), apicalia 2 (13 µm), frontalia (45 µm), and lateralia (40 µm). The posterior end tapers gently to a pointed tail. The ventral epidermis immediately anterior of the tail end contains globular, protruding glands that are likely to serve an adhesive function, similar to those described for *Austrognathia christianae* by FARRIS (1977: fig 44). The cilia of the tail region have their effective beat directed anteriorly.



FIGURES 79.1-79.23. *Austrognatharia sterreri.* 79.1: Basal plate and jaws of BZE specimen; 79.2-79.3: Basal plates and jaws of two PAN specimens; 79.4-79.5: Basal plates and jaws of two BDA specimens; 79.6: Rostrum of PAN adult; 79.7: Conulus of PAN specimen; 79.8: Conulus of another PAN specimen; 79.9: Bursa conulus of same; 79.10-79.12: Conuli of a BDA specimen; 79.13-79.15: Conuli of another BDA specimen; 79.16: Conuli of a third BDA specimen; 79.17: Conuli of a BZE specimen; 79.18: All the conuli of another BZE specimen; 79.19-79.20. Conuli of a third BZE specimen; 79.21-79.22. Conuli of a fourth BZE specimen; 79.23. Conulus of a fifth BZE specimen. One scale applies to 79.6, a second to all basal plate and jaw figures, and a third to all conuli figures.



FIGURES 80.1-80.4. *Austrognatharia sterreri*. 80.1: Basal plate and jaws of BZE specimen; 80.2: Testis of BZE specimen; 80.3: Conuli of BZE specimen; 80.4: Conuli of another BZE specimen. – Phase contrast micrographs of live specimens.

Digestive tract: The basal plate (Figs. 79.1-79.5) is 6-8 µm long and 21-30 µm wide (index 0.21-0.33). A median lobe is consistently lacking, and the lateral lobes rise only slightly above the convex frontal contour. Of the 11-14 teeth, the median tooth and one pair of lateral teeth are more prominent than the remainder. The jaws are 20-27 µm long, with a strong terminal tooth and one broadly rhomboid dorsal tooth. The ventral row is short, often comb-like (as in *A. pecten* (STERRER 1991a), and made up of 2, rarely as many as 5, irregular, mostly rooted teeth. The cauda is 6-11 µm long.

Male system: Testis (Fig. 80.2) from 71.1 to U 84.3 (110 µm long), containing up to 28 soft, easily deformable conuli. Mature conuli (*e.g.* Figs. 79.7-79.8, 79.15, 80.3-80.4) are mushroom-shaped, to 25 µm long and 27 µm wide (index 0.76-1.26). A usually less than semicircular hat caps a blunt or squared-off cone whose sides, in the largest conuli, may actually be straight, or flare out rather than converge. The clear matrix which surrounds the conuli is extended beyond the tip of the cone. The penis is somewhat curved.

Female system: The ovary extends from U 34.7 to U 65.3, the largest egg, which may reach 240 µm in length, from U 45 to 67. A vagina was noticed in one BDA (at U 68.7) and one BZE specimen. The bursa may contain up to 3 conuli (Fig. 79.9).

TABLE 41

MORPHOMETRIC DATA FOR *AUSTROGNATHARIA STERRERI*

Bermuda	Mean	SD	Max	Min	n
Body length of adults	905.00	106.07	980	830	2
Body width of adults	155.00	7.07	160	150	2
Body index of adults	5.86	0.95	6.53	5.19	2
Rostrum index of adults	0.86	0.12	0.94	0.78	2
Jaw length	25.89	0.76	27	25	18
Basal plate length	7.00	0.77	8	6	18
Basal plate width	27.72	1.07	30	25	18
Basal plate index	0.25	0.03	0.30	0.21	18
Sperm length	16.78	2.28	19	13	9
Sperm width	18.33	1.12	20	17	9
Sperm index	0.91	0.09	1.00	0.76	9

TABLE 41 (Continued)

Belize	Mean	SD	Max	Min	n
Body length of adults	650.00				1
Body width of adults	75.00				1
Body index of adults	8.66				1
Jaw length	24.00	1.77	27	22	8
Basal plate length	7.00	0.53	8	6	8
Basal plate width	26.00	1.41	28	24	8
Basal plate index	0.27	0.03	0.31	0.21	8
Sperm length	19.00	3.61	25	11	16
Sperm width	21.19	3.43	27	13	16
Sperm index	0.90	0.14	1.14	0.69	16

Panama	Mean	SD	Max	Min	n
Body length of adults	795.00	141.54	1000	680	4
Body width of adults	125.00	19.15	150	110	4
Body index of adults	6.41	1.06	7.69	5.13	4
Rostrum index of adults	0.92	0.04	0.96	0.88	3
Jaw length	23.14	2.48	26	20	7
Basal plate length	7.00	0.82	8	6	7
Basal plate width	24.00	2.16	27	21	7
Basal plate index	0.29	0.03	0.33	0.26	7
Sperm length	17.29	1.25	19	16	7
Sperm width	19.29	2.14	21	17	7
Sperm index	0.90	0.04	0.94	0.86	7

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	805.71	138.91	1000	650	7
Body width of adults	126.43	30.10	160	75	7
Body index of adults	6.57	1.28	8.66	5.13	7
Rostrum index of adults	0.90	0.07	0.96	0.78	5
Jaw length	24.85	1.89	27	20	33
Basal plate length	7.00	0.71	8	6	33
Basal plate width	26.52	2.05	30	21	33
Basal plate index	0.27	0.03	0.33	0.21	33
Sperm length	18.00	3.01	25	11	32
Sperm width	19.97	2.92	27	13	32
Sperm index	0.90	0.11	1.14	0.69	32

Discussion: Described by KIRSTEUER (1969a) as *Austrognathia sterreri* on the basis of 4 mature specimens found in Bimini, Bahamas, this species has since been assigned (STERRER 1970a) to the genus *Austrognatharia,* as defined by STERRER (1971a) and emended by STERRER (1991a). My BDA, BZE and PAN finds agree so well with KIRSTEUER's measurements (body length 900-1000 µm, basal plate width 20-23 µm, jaw length 25 µm, and mushroom-shaped conuli with a width of 20 µm) that I have no hesitation in regarding them as conspecific. Minor differences in jaw, basal plate and conulus structure may well be due to the use of light field *vs.* phase con-

trast microscopy (*cf.* my early *Pterognathia* descriptions based on light field (STERRER 1966a) with later ones based on phase contrast (STERRER 1969). However, since I was unable to find the holotype in its vial, it would be desirable eventually to collect specimens at the type locality.

The conuli of *A. sterreri* are remarkably similar to those of *A. strunki* except that in the latter species they are larger (to 29 µm by 38 µm), and the cone is usually short and rounded, rarely stalk-shaped and truncated. Otherwise the two species, both of which have been found in Belize but never in the same sample, can be distinguished mainly by the much larger dimensions of body and mouth parts of *A. strunki.* On the other hand it was initially difficult to separate *A. sterreri* from *A. medusifera,* which occurred sympatrically in at least one BZE locality (91.9), shares similar body and mouth part dimensions, and has the occasional conulus that is not jellyfish-shaped but truncated-conical (Fig. 75.8).

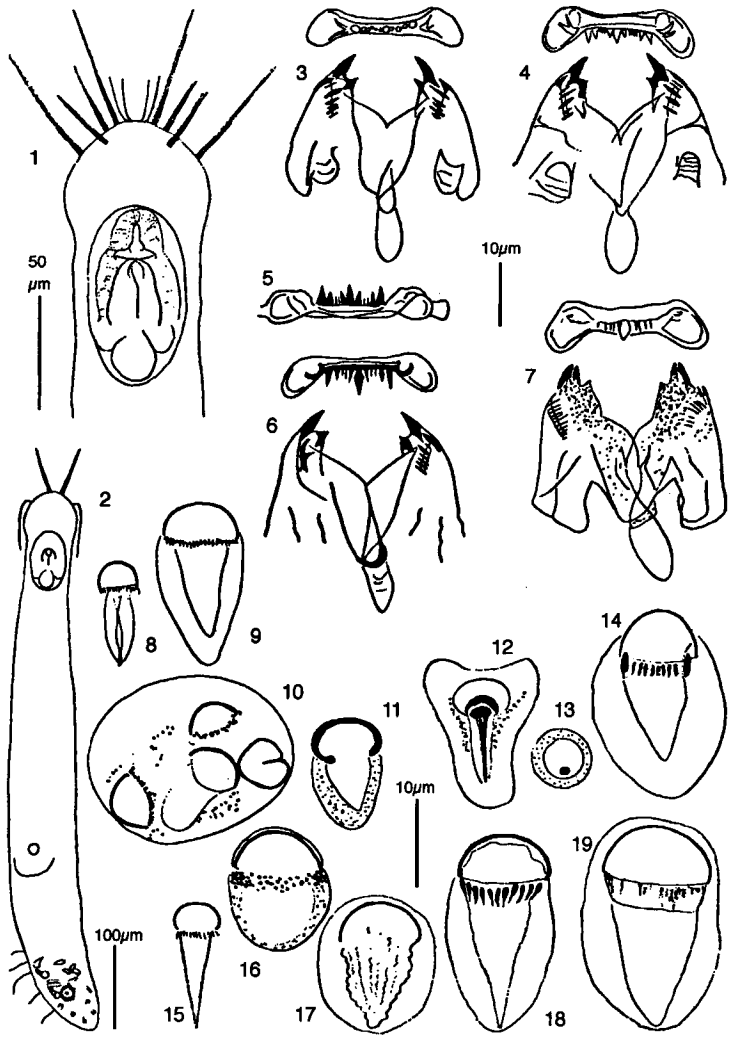
Austrognatharia stirialis n. sp.

(Figs. 81-83; Table 42)

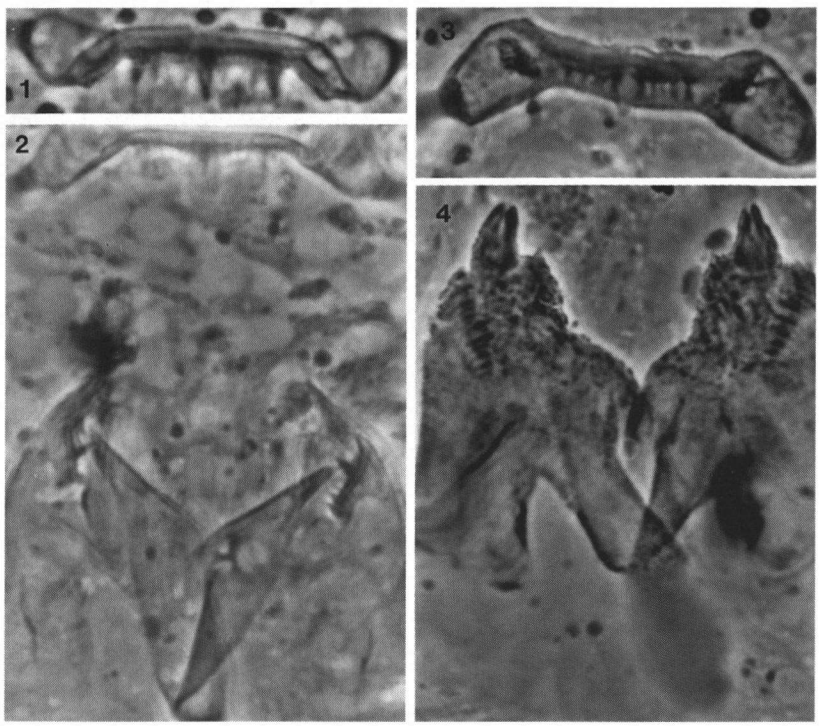
Holotype: One adult from Florida (sample F15) in squeeze preparation, USNMNH 178355.
Further material:
– North Carolina: 7 specimens (2 adults) from sample 76.
– Florida: 7 specimens (2 adults) from sample F15.
Etymology: From Latin *stiria* = icicle, in reference to the shape of the conuli which are like icicles, or ice-cream cones.

Diagnosis: Small, slender *Austrognatharia* (length 660.00 µm, width 66.00 µm; index 10.20) with stout rostrum (index 0.88). Basal plate 6.80 µm long and 26.33 µm wide (index 0.26), with very low to absent lateral lobes; 11.86 teeth arranged 5 groups, with the lateral group made up 2 teeth. Jaws 26.93 µm long, with one tooth in dorsal and 6.80 unequal teeth in ventral row. Conuli 19.45 µm long and 9.45 µm wide (index 2.08), shaped like an ice-cream cone.

Organization and behaviour: Largest adult 700 µm by 80 µm at U 57.1 (index 8.75). Rostrum (Figs. 81.1-81.2) 53-70 µm long and 52-68 µm wide at U 5.-6.4 (index 0.78-1.06). The sensorium consists of apicalia 1 (to



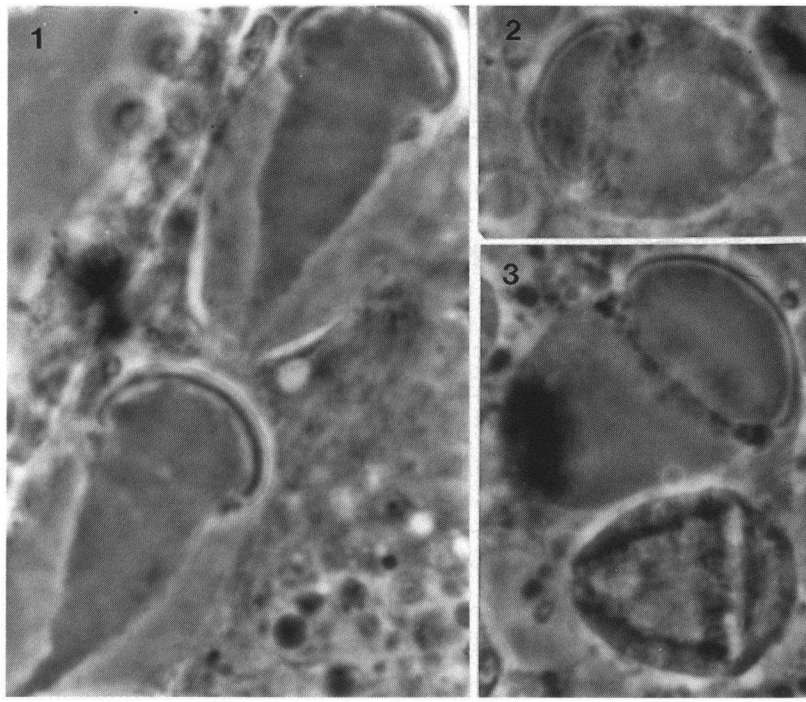
FIGURES 81.1-81.19. *Austrognatharia stirialis*. 81.1: Rostrum of FLO adult; 81.2: Habitus of NC adult; 81.3-81.4: Basal plates and jaws of two FLO specimens; 81.5: Basal plate of a NC specimen; 81.6-81.7: Basal plates and jaws of two other NC specimens (81.7 in grainy degeneration); 81.8-81.9: Conuli of FLO specimen; 81.10-81.11: Conuli of another FLO specimen; 81.12-81.14: Conuli of a third FLO specimen (81.12 is immature, 81.13 is an early stage in conulus formation); 81.15-81.18: Conuli of a NC specimen; 81.19: Conulus of another NC specimen. – One scale applies to 81.1, another to 81.2, a third to all basal plate and jaw figures, and a fourth to all conuli figures.



FIGURES 82.1-82.4. *Austrognatharia stirialis*. Basal plates and jaws of NC specimens (82.4 in grainy degeneration). – Phase contrast micrographs of live specimens.

23 µm), apicalia 2 (23 µm), frontalia (45 µm), ventralia (30 µm), dorsalia (36 µm), lateralia (55 µm), and occipitalia (30 µm). There is a pair of ciliary pits behind the dorsalia. Apicalia 1 originate just ventrally from the rostrum midline and and point ventrally whereas apicalia 2 originate and point dorsally. Tail end short-conical, with bundles of spindle-shaped rhabdoids (4-6 µm by 1 µm) in the epidermis.

Digestive tract: Basal plate (Figs. 81.3-81.7) 6-8 µm long, 25-29 µm wide (index 0.21-0.32). A medio-frontal lobe is lacking, and the slightly concave to almost straight median contour completely subsumes the lateral lobes. The 10-15 (mostly 11) teeth are uneven in size, with the median tooth strongest, the lateral-most pair next, followed by flanking teeth; the median triplet is separated from each lateral duplet by 2-4 very delicate



FIGURES 83.1-83.3. *Austrognatharia stirialis*. 83.1-81.2: Conuli of a NC specimen; 83.3: Conuli of another NC specimen. – Phase contrast micrographs of live specimens.

teeth. Jaws 26-29 µm long, with coarse dentition. Dorsal row of one (subterminal) tooth. Ventral row of 3-11, usually 7, unequal teeth of which 2-3 are stronger than the rest. The jaws and basal plates of two adult specimens from NC were in grainy degeneration (Figs. 81.7, 82.3).

Male system: The testis extends from U 63.6 to U 87.9. It contains up to 12 conuli which, at first, often appear irregularly lumpy, and only reveal their regular features under squeezing. Mature conuli of the NC specimens (Figs. 81.18-81.19, 83) were up to 25 µm long and 14 µm wide (index 2.06), with a less-than-semicircular hat capping a pointed, sometimes terminally curved cone. The cingulum is an inconspicuous, straight fringe of droplet-shaped granula. Other conuli in the same specimen (Figs. 81.15) were similar but smaller (15 µm by 6 µm), or short and compact (15 µm by 10-12 µm), with a rounded or wavy-edged cone (Figs. 81.16-81.17). Mature conuli

of FLO specimens (Figs. 81.9) were somewhat smaller (to 20 µm by 10 µm), and the cone is more high-domed. The penis is coarsely granular proximally, then continues into a vertically descending tube of 20 µm diameter whose conspicuous circular outline is characteristic for this species.

Female system: Ovary from U 54.4 to U 80.9; largest egg from U 57.1 to U 73.4 (length 70-150 µm). A vagina was not observed in any of the adults.

TABLE 42

MORPHOMETRIC DATA FOR AUSTROGNATHARIA STIRIALIS

North Carolina	Mean	SD	Max	Min	n
Body length of adults	670.00	14.14	680	660	2
Body width of adults	65.00	7.07	70	60	2
Body index of adults	10.83	1.35	11.33	9.43	2
Rostrum index of adults	1.06				1
Jaw length	27.43	1.27	29	26	7
Basal plate length	6.71	0.76	8	6	7
Basal plate width	26.00	1.00	27	25	7
Basal plate index	0.26	0.03	0.30	0.22	7
Sperm length	24.50	0.58	25	24	4
Sperm width	12.00	1.41	14	11	4
Sperm index	2.06	0.27	2.27	1.71	4

Florida	Mean	SD	Max	Min	n
Body length of adults	653.33	45.09	700	610	3
Body width of adults	66.67	15.28	80	50	3
Body index of adults	10.08	1.86	12.20	8.75	3
Rostrum index of adults	0.89	0.10	0.97	0.78	3
Jaw length	26.50	0.76	28	26	8
Basal plate length	6.88	0.83	8	6	8
Basal plate width	26.63	1.60	29	25	8
Basal plate index	0.26	0.04	0.32	0.21	8
Sperm length	16.57	2.57	20	12	7
Sperm width	8.00	1.00	10	7	7
Sperm index	2.10	0.41	2.86	1.50	7

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	660.00	33.91	700	610	5
Body width of adults	66.00	11.40	80	50	5
Body index of adults	10.20	1.48	12.20	8.75	5
Rostrum index of adults	0.93	0.12	1.06	0.78	4
Jaw length	26.93	1.10	29	26	15
Basal plate length	6.80	0.77	8	6	15
Basal plate width	26.33	1.35	29	25	15
Basal plate index	0.26	0.04	0.32	0.21	15
Sperm length	19.45	4.48	25	12	11
Sperm width	9.45	2.30	14	7	11
Sperm index	2.08	0.35	2.86	1.50	11

Discussion: Although slightly different in the structure of their conuli, the NC and FLO specimens share all major characteristics such as body dimensions, stout rostrum shape, dimensions and robustness of jaws and basal plate, and the straight, vertically descending penis. It is these features that distinguish *A. stirialis* from *A. kirsteueri* whose conuli are fairly similar.

Austrognatharia strunki Farris, 1973

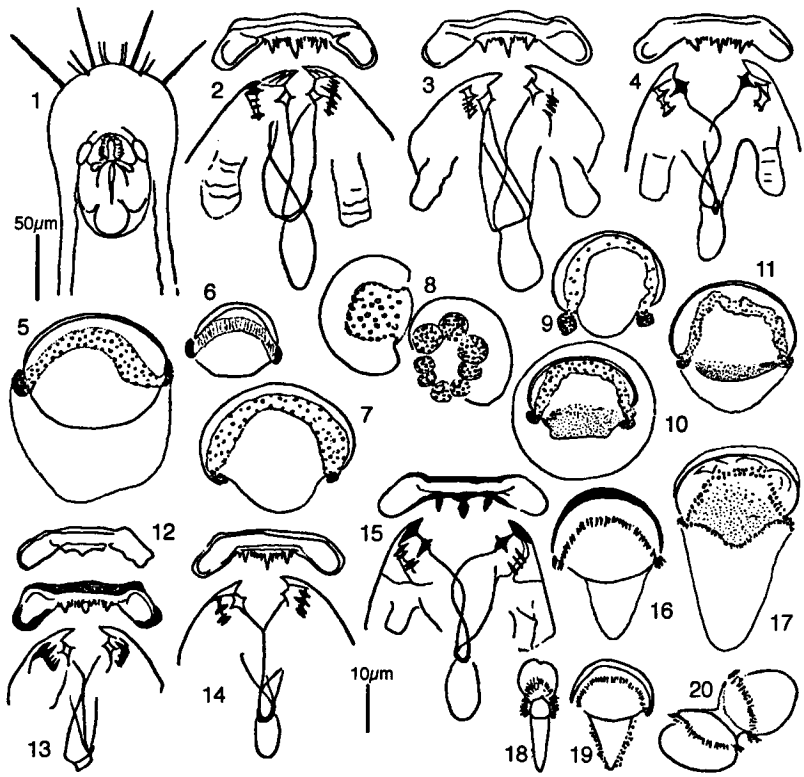
(Figs. 84-87; Table 43)

Material:
- Georgia: 3 specimens (one adult) from sample 50 m.
- Florida: 2 adults from sample F14.
- Belize: 19 specimens (8 adults) from samples 84, 91.4, 91.5, 91.6, 91.18, 91.19 and 94.13.
- Puerto Rico: 2 juveniles from sample 95.04.

The original description by FARRIS (1973) was partly based on the two Florida specimens included here. The following analysis, therefore, emphasizes the new records from Georgia, Belize and Puerto Rico.

Organization and behaviour: Yellowish-opaque throughout. The largest adult (from BZE) was 1,560 µm long and 200 µm wide at U 57.7 (index 7.80). The smallest adult (from FLO) measured 960 µm by 130 µm at U 54.2 (index 7.38). The rostrum (Fig. 84.1) is short and stout (85 µm long by 105 µm wide; index 0.78-0.82). The sensorium consists of apicalia 1 (to 15 µm long), apicalia 2 (20 µm), frontalia (70 µm), ventralia (50 µm), dorsalia (75 µm), and lateralia (80 µm). There is a pair of ciliary pits behind the ventralia. The opaqueness of the body is due to the large number of skin inclusions. Animals move sluggishly, and can adhere stubbornly to the substrate.

Digestive tract: The basal plate (Figs. 84.2-84.4, 84.12-84.15, 85-86) is 7-12 µm long and 29-38 µm wide (index 0.21-0.35). It lacks a median lobe, and the lateral lobes barely rise above the slightly convex rostral outline. Caudally it is set with 13-15 teeth which are arranged such that 3 groups of 3 strong teeth each (looking somewhat like tridents) are separated by 2 groups each composed of 2-3 weak teeth. During squeeze preparation the basal plate frequently tilts forward and ends up facing caudally (*cf. A.*



FIGURES 84.1-84.20. *Austrognatharia strunki*. 84.1: Rostrum of BZE adult; 84.2-84.4: Basal plates and jaws of three BZE specimens; 84.5-84.7: Conuli of three BZE specimens; 84.8: Bursa conuli of BZE specimen; 84.9-84.10: Conuli of a fourth BZE specimen; 84.11: Conulus of a fifth BZE specimen; 84.12: Basal plate of GEO specimen; 84.13: Basal plate and jaws of another GEO specimen; 84.14: Basal plate and jaws of PR specimen; 84.15: Basal plate and jaws of FLO specimen; 84.16: Conulus of FLO specimen; 84.17-84.20: Conuli of another FLO specimen (84.18 and 84.19 are two aspects of the same immature conulus). – One scale applies to 84.1, a second to the remaining figures.

medusifera!). The jaws are 29-36 µm long, with a strong terminal tooth. The dorsal, subterminal tooth is deep-rooted and broad but drawn to a sharp point. The ventral tooth row has 2-4 uneven teeth which, almost as a rule, are not symmetric on the two sides. The cauda is 8-15 µm long.

Male system: The single testis (Fig. 87.1) extends from U 78.7 to U 95.1. Mature conuli (*e.g.*, 84.5, 84.7, 84.9-84.11) are shaped like button

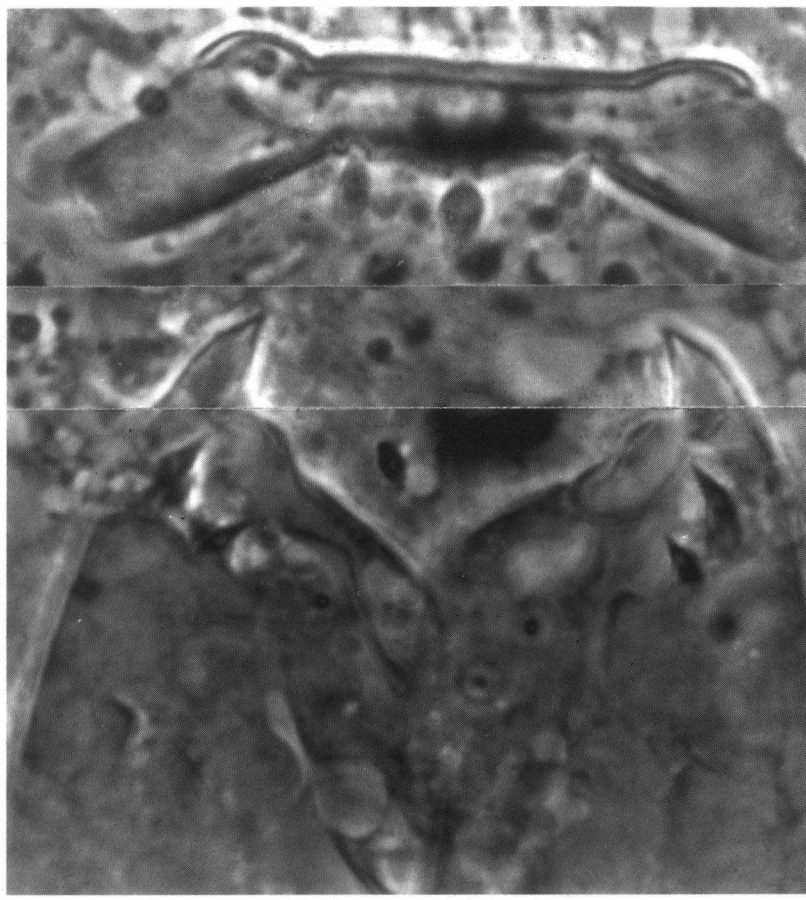


FIGURE 85. *Austrognatharia strunki.* Basal plate and jaws of FLO specimen. – Phase contrast micrograph of live specimen.

mushrooms, *i.e.*, with a large hat up to 38 µm wide, topping a short, rounded, rarely pointed or (rarely) truncated stalk. The hat is always at least semicircular; more often, especially in the largest conuli, it is nearer two thirds of a circle. I am not sure whether the 'stalk', which appears dark in phase contrast, is part of the 'head' region of the conulus, as proposed by FARRIS (1973 43: 582), or actually corresponds to the 'cone' region. Indeed, in FLO specimens (Figs. 84.16-84.17, 87.2) there is an additional, hyaline 'cone' region which I never observed in BZE specimens.

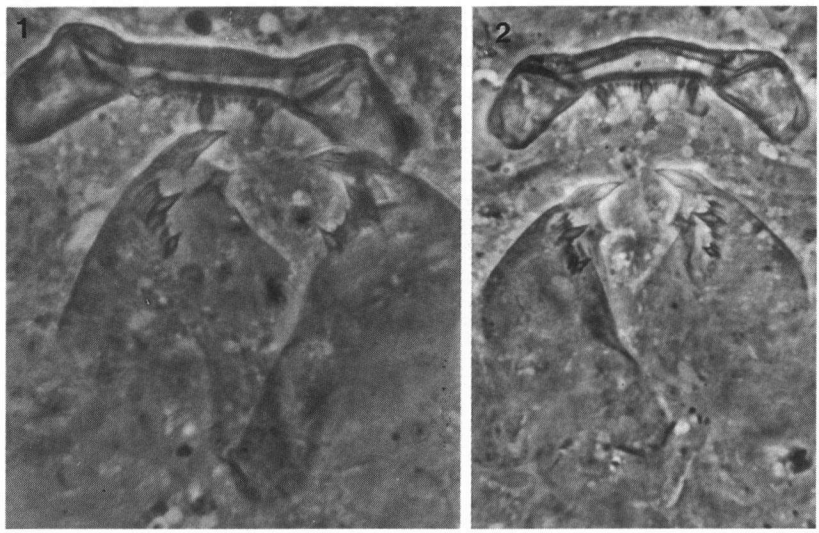


FIGURE 86.1-86.2. *Austrognatharia strunki.* Basal plates and jaws of two BZE specimens. – Phase contrast micrographs of live specimens.

The length measurements given in the tables below (to 29 µm) do not include this hyaline region, and are therefore smaller than those of FARRIS (1973 43: 583); this is also reflected in the sperm index (0.67-1.04). The cingulum is prominent and coarsely granular. In a rare side view, a conulus revealed itself to be quite flat, with the hat topping it like half of a rubber tyre, and the cingulum protruding like a frill. Four conuli of similar size and shape are frequently found next to each other in the testis, which suggests they originated from the same spermatogonium.

Female system: A well-defined dorsal vagina was recorded in one BZE as well as the two FLO specimens. Bursa conuli, never more than two at a time, appear to have the hat region intact but the cone in various stages of dissolution (Fig. 84.8).

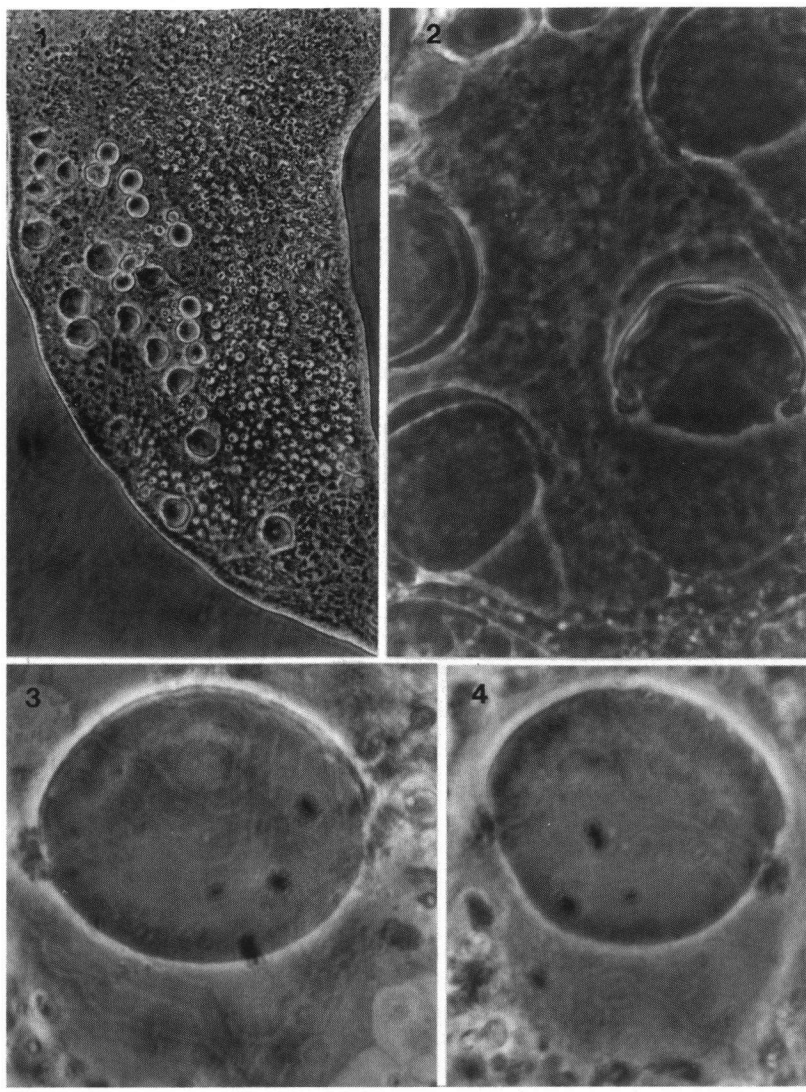


FIGURE 87.1-87.4. *Austrognatharia strunki*. 87.1: Testis of BZE specimen; 87.2: Conuli of FLO specimen; 87.3-87.4: Conuli of two BZE specimens. – Phase contrast micrographs of live specimens.

TABLE 43

MORPHOMETRIC DATA FOR *AUSTROGNATHARIA STRUNKI*

Georgia	Mean	SD	Max	Min	n
Body length of adults	1210.00				1
Body width of adults	180.00				1
Body index of adults	6.72				1
Rostrum index of adults	0.82				1
Jaw length	30.33	0.58	31	30	3
Basal plate length	8.33	1.53	10	7	3
Basal plate width	31.33	2.08	33	29	3
Basal plate index	0.27	0.05	0.31	0.21	3
Sperm length	17.67	0.58	18	17	3
Sperm width	20.00	1.00	21	19	3
Sperm index	0.88	0.02	0.90	0.86	3

Florida	Mean	SD	Max	Min	n
Body length of adults	1090.00	183.85	1220	960	2
Body width of adults	170.00	56.57	210	130	2
Body index of adults	6.60	1.11	7.38	5.81	2
Rostrum index of adults	0.80	0.03	0.82	0.78	2
Jaw length	32.00	1.41	33	31	2
Basal plate length	9.00	0.00	9	9	2
Basal plate width	36.00	2.83	38	34	2
Basal plate index	0.25	0.02	0.26	0.24	2
Sperm length	19.00	3.83	22	14	4
Sperm width	23.75	3.95	27	18	4
Sperm index	0.80	0.07	0.88	0.72	4

Puerto Rico	Mean	SD	Max	Min	n
Jaw length	32.00	0.00	32	32	2
Basal plate length	9.00	1.41	10	8	2
Basal plate width	32.50	0.71	33	32	2
Basal plate index	0.28	0.05	0.31	0.24	2

Belize	Mean	SD	Max	Min	n
Body length of adults	1473.33	150.11	1560	1300	3
Body width of adults	175.00	35.36	200	150	2
Body index of adults	8.23	0.61	8.67	7.80	2
Rostrum index of adults	0.81		0.81	0.81	1
Jaw length	33.13	1.87	36	29	30
Basal plate length	10.90	0.88	13	10	30
Basal plate width	35.67	1.99	38	31	30
Basal plate index	0.31	0.03	0.38	0.26	30
Sperm length	23.31	5.19	29	14	16
Sperm width	28.38	5.61	38	21	16
Sperm index	0.82	0.12	1.04	0.67	16

TABLE 43 (Continued)

ALL DATA	Mean	SD	Max	Min	n
Body length of adults	1301.67	230.34	1560	960	6
Body width of adults	174.00	33.62	210	130	5
Body index of adults	7.28	1.08	8.67	5.81	5
Rostrum index of adults	0.81	0.02	0.82	0.78	4
Jaw length	32.78	1.89	36	29	37
Basal plate length	10.49	1.26	13	7	37
Basal plate width	35.16	2.35	38	29	37
Basal plate index	0.30	0.04	0.38	0.21	37
Sperm length	21.83	5.08	29	14	23
Sperm width	26.48	5.78	38	18	23
Sperm index	0.83	0.10	1.04	0.67	23

Discussion: In the large dimensions of body and mouth parts, *A. strunki* is only surpassed by *A. pecten* Sterrer, 1991, from Fiji and Tahiti (STERRER 1991a, 1991c). The similarities between *A. strunki* and *A. sterreri* (KIRSTEUER, 1969) have been pointed out already.

Austrognatharia(?) spec.

Material: One adult from Belize (sample 92.2) in squeeze preparation.

Description: The single specimen measured 930 µm in length and 90 µm in width at U 65 (index 10.3). It totally lacked a pharynx, basal plate and jaws, and probably also a mouth opening. Yet it had a mature egg, 145 µm long and 85 µm wide; behind it a dorsal vagina, and a testis with 2 large conuli. Conuli were 58 µm long and 27 µm wide (index 2.15), with a more than semicircular capitulum, an insignificant cingulum, and a slightly convex cone.

Discussion: Gnathostomulids with missing mouth parts have been occasionally reported; in most cases it is the basal plate that is lacking (as in 2 juveniles out of 84 specimens of *Pterognathia swedmarki* (STERRER 1969: 35). STERRER 1991a (p. 126) reports one immature specimen of *Austrognatharia homunculus* from Fiji, of 900 µm length, that was lacking pharynx, basal plate and jaws; the mouth opened directly into the gut lumen. The BZE specimen is remarkable because, in spite of the absence of mouth

parts (and probably also a mouth) it is sexually mature, and must therefore have had access to a source of nutrition.

This specimen cannot be positively assigned to a known species, nor even the genus. It shares the large size and more than semicircular hat of its conuli with *Austrognathia clavigera* Sterrer, 1997 in which, however, the conuli are usually curved.

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