

STUDIES ON THE FAUNA OF CURAÇAO AND OTHER
CARIBBEAN ISLANDS: No. 125.

A NEW SPECIES OF SPADELLA
(BENTHIC CHAETOGNATHA)

by

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Spadella hummelincki n. sp. is described and compared with *Sp. pulchella*, both from Puerto Rico (Figs. 35-36). The diagnostic characteristics of the various species of the genus are compiled (Table 1). The world distribution of the species of this genus is also included (Table 2).

According to the literature, the genus *Spadella* Langerhans includes several species, *Sp. cephaloptera* (Busch) 1851, *Sp. schizoptera* Conant 1895, *Sp. moretonensis* Johnston & Taylor 1919, *Sp. sheardi* Mawson 1944, *Sp. johnstoni* Mawson 1944, *Sp. angulata* Tokioka 1951, *Sp. nana* Owre 1963, *Sp. pulchella* Owre 1963. This genus apparently includes species having world wide distributions, and species with distribution restricted to small regions. At times, several species have been reported from the same geographical region. For instance, MAWSON (1944) observed *Sp. cephaloptera*, *Sp. sheardi*, and *Sp. johnstoni* off the coasts of New South Wales (from off Post Heaking to off Ulladulla). OWRE (1963) observed *Sp. schizoptera* and *Sp. nana* at Soldier Key (Florida), and *Sp. pulchella* in Magueyes Canal, La Parguera (Puerto Rico). YOSII & TOKIOKA (1939) reported *Sp. cephaloptera* and *Sp. schizoptera* from Misaki (Japan); see Table 2. Specimens of this genus have been obtained from near to surface location to a maximum depth of 100 m (MAWSON, 1944).

Four specimens of *Spadella* were observed in the collections obtained by Dr. P. WAGENAAR HUMMELINCK in the Southwestern part of Bahía Fosforescente, east of La Parguera (Puerto Rico) at 1 meter depth on sandy bottom of *Thalassia* flat with *Halimeda* (Sta.

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TABLE 1

PRINCIPAL DIFFERENTIAL CHARACTERISTICS OF

Characteristics	Species	<i>Spadella cephaloptera</i> Bush 1851	<i>Sp. schizoptera</i> Conant 1895	<i>Sp. moretonensis</i> Johnston & Taylor 1919	<i>Sp. johnstoni</i> Mawson 1944
Body length (in mm)		2-10 Firm, broad, opaque, flattened dorso-ventral- ly, wider at posterior septum. Yellow- brownish	1.9-4.9 Nearly of uniform width, but wider at the level of posterior septum	3.68	4.6 Slender, yellowish with brown spots on the co- rona ciliata
Head		Medium size. Neck dis- tinct. Small individuals present club-shaped prominences at each side. Pads at antero- lateral sides of the mouth	Broader than body, followed by a pro- nounced neck. A pair of pads with denticles in front of the mouth as in <i>Sp. cephaloptera</i> (Yosii & Tokioka 1939)	Broader than long. Neck conspicuous	
Tail segment (in %)		50-58	47-53.7	56.5 Two club-shaped papil- lated bodies on posterior ventral side	52.0
Lateral fins		One pair, long and narrow, extending from the posterior septum to the seminal vesicles. Broadest at midlength	Two pairs; anterior small, posterior entirely on the tail segment (Conant 1895, Mawson 1944) or one pair extending from behind the ventral ganglion to over the ventral side of the seminal vesicles. In this case the fins are narrowest at the level of posterior septum. (Yosii & Tokioka 1939)	From opening of ovi- ducts to seminal vesicles, confluent with tail fin, surrounding seminal vesicles. Com- pletely rayed and cover- ed with sensory spots	Similar to those in <i>Sp.</i> <i>schizoptera</i> .
Caudal fin		Long, spatulate in shape, starts at pos- terior end of seminal vesicles	Long and spatulate in shape.	Spatulate in shape, completely rayed and covered with sensory spots	
Eyes		Pigmented region crescent shaped		Large, without pigment	

THE SPECIES OF SPADELLA

<i>Sp. sheardi</i> Mawson 1944	<i>Sp. angulata</i> Tokioka 1951	<i>Sp. nana</i> Owre 1963	<i>Sp. pulchella</i> Owre 1963	<i>Sp. hummelincki</i> n. sp.
3.9-6.5 Opaque and flat. Mauve-brownish pigment on dorsal side along 3 longitudinal bands and 2 transverse at level opening of oviducts. Yellow spots over body	2.5-4-18, including tail fin. Body more slender than in <i>Sp. cephaloptera</i> , broadest at the posterior septum	0.75-2.40, not including tail fin	1.9-2.7, not including tail fin. Close to the anus the thick wall of intestine contains conspicuous clusters of reddish cells	2-3, not including tail fin. Broadest at the trunk
	Faint orange-brown spots near anterior end.	Broader than the widest part of the body. Neck distinct. A pair of papillate prominences between the anterior teeth and the mouth	Slightly broader than the widest part of the trunk. Neck distinct. A pair of prominences as in <i>Sp. nana</i> , with less papillae than in either <i>Sp. nana</i> or <i>Sp. schizoptera</i> .	Large, roundish, smaller than in <i>Sp. pulchella</i> . Neck thick but distinct
44-48	51.2-57.9, including tail fin	41-50	52-55	49
Wide. Anterior fin short almost rectangular, extending at the posterior part of the trunk to the opening of oviducts. Posterior fins from opening of oviducts to seminal vesicles	One pair, extending from posterior part of trunk to the anterior end of seminal vesicles, broadest at midlength, no rayless zone present, well separated from tail fin by seminal vesicles	One pair, extending from a point anterior to the opening of oviducts to the anterior end of seminal vesicles. Margins of fins irregular due to fewer, shorter or missings rays	One pair, extending from a point anterior but close to the opening of oviducts to the seminal vesicles.	One pair. Long, narrow, broadest at midlength; extending from a point anterior to the opening of the oviducts to the seminal vesicles, extending ventrally over the seminal vesicles forming the adhesive organs. No rayless zone
Spatulate in shape	Spatulate in shape	Spatulate, extending from the posterior end of seminal vesicles	Spatulate in shape, starting at a distance of the posterior end of the seminal vesicles. This distance appears to be equal to the length of the vesicle.	Long, spatulate in shape, starting at a distance of the posterior end of the seminal vesicles equal to half the length of the seminal vesicles. No rayless zone
Small, widely spaced and overlain by brown pigment	Pigmented region roundish		The pigment a longitudinal band crossed perpendicularly by a short band at the center. This is towards the center of head	Large, roundish. Larger than in <i>Sp. pulchella</i> . Pigmented region in a thick X shape.

TABLE 1
Continued

Characteristics	Species	<i>Spadella cephaloptera</i> Bush 1851	<i>Sp. schisoptera</i> Conant 1895	<i>Sp. moretonensis</i> Johnston & Taylor 1919	<i>Sp. johnstoni</i> Mawson 1944
Hooks		7-11 Slender, usually slightly saginated. Points sharp and curved	8-11 Points sharp	9 Slightly curved like in <i>Eukrohnia hamata</i>	10-11
Anterior teeth		2-5 Long and thin. Inner- most teeth longer than the others	2-3 Long, slender, curved towards the midline where they meet	3-4 Stout curved teeth, 0.03 mm long	2 Long, about half the length of the hooks
Posterior teeth		0-4 Short, thick	None	None	None
Corona ciliata		Elliptical, rectangular, or crescent shaped, slightly waved posteri- orly. On the neck only, longest axis transverse	Three cornered shape or pyriform, roughly tri- angular. Partly on head and partly on neck	Roughly elliptical, slightly pointed at an- terior end	Elliptical-rectangular, mainly on neck
Ventral ganglion			Large, thick, overlaid by numerous sensory spots	Large, at anterior half of trunk	
Sensory spots			Numerous, arranged in longitudinal and trans- versal rows	On tail fin, lateral fins, sides of body and head	
Ovaries		Reaching neck or an- terior end of ventral ganglion. Ova large and closely pressed together	Reaching neck, anterior end of ventral ganglion or to midlength of ventral ganglion	Reach up to level of ventral ganglion. Few and large ova. Opening of oviducts swollen and trilobed	
Seminal vesicles		Small, spherical or reni- form, touching both the posterior end of lateral fins and the tail fin	Ellipsoidal-reniform, touching both lateral fins and tail fin	Small, inconspicuous, on the posterior third of tail segment	Oval and yellow in living specimens
Intestinal diverticula		Present	Present (Yosii & Tokio- ka, 1939) Absent (Ritter-Zahony 1911 and Mawson 1944)		Absent

<i>Sp. sheardi</i> Mawson 1944	<i>Sp. angulata</i> Tokiooka 1951	<i>Sp. nana</i> Owre 1963	<i>Sp. pulchella</i> Owre 1963	<i>Sp. hummelincki</i> n. sp.
Up to 11	8-10	5-9	8-10	8-9 at each side. Slender, slightly curved
3 Long, about 1/3 to 1/2 of the length of hooks.	2-4	1-3 The innermost longer than the others and curved towards the midline	2-4 Long, slender and curved	4 at each side. Long, thin, bended at about midlength
None	None	None	None	None
Triangular	Transversely elongated oval, with a protruding ondulation at the an- terior half	Variable in shape, lo- cated at the neck and extending over the head	Broad and irregular oval, located entirely on the neck except for a short loop at mid- length of anterior part, extending into the head. Edges irregular.	On the neck region. Roundish with a peak towards the center of the head
	Large, about 1/3 of the length of trunk	As broad as long	Large. Midway between the posterior border of co- rona ciliata and the posterior septum	Large, thick, about half the length of the trunk, and almost as wide as the trunk. Closer to the posterior septum than to the neck
Arranged in two sym- metrical groups over the body			Arranged symmetrically as in <i>Sp. nana</i> . The lateral spots located on the collarette and on the outer edges of the lateral fins are con- spicuous.	Numerous
Extending up to neck region. Open at the clear space between posterior end of anterior fins and anterior end of posterior fins	Up to level of posterior end of ventral ganglion. Ova roundish and of regular size	Reaching up to neck region. With 2-5 huge ova, thus the intestine is pushed into an S shape	Up to midlength of the trunk. 2-3 large ova	Reaching neck or an- terior end of ventral ganglion. Few and large ova
	Elongated ellipsoidal in shape, breaking laterally at the anterior half, with a thickening at the posterior end of this rupture line, which may be a pointy prominence protruding obliquely forward from postero- lateral corner	Oval-roundish, anterior to the tail fin and pro- tected ventrally by the prolongation of the lateral fins	Oval in shape, extend- ing from the posterior end of lateral fins to the adhesive organs	Oval or pearshaped. Touching posterior end of lateral fins and apart from the tail fin. Open by a latero-dorsal slit at about midlength
Absent	Short but distinct at the beginning of intestine	Absent	Absent	Absent

TABLE 1 *Continued*

Characteristics	Species	<i>Spadella cephaloptera</i> Bush 1851	<i>Sp. schizoptera</i> Conant 1895	<i>Sp. moretonensis</i> Johnston & Taylor 1919	<i>Sp. johnstoni</i> Mawson 1944
Adhesive organs		None. Many adhesive cylindrical cell groups, large and small glandular lobes of wart-like appearance, on the ventral surface of the body, mainly on the caudal segment	Hand shaped, as a prolongation of lateral fins, with 4, 5, 6 finger-like processes extending from posterior end of posterior fins. Innermost branch longest and outermost shortest. All have many adhesive papillae. A sensory spot near the base of outermost branch	Rudimentary	At ventral side of seminal vesicles, extending these processes over the length of tail fin
Collarette		Wide at the neck region, diminishing in thickness towards the tail septum	Thick at the neck, and extending along the base of lateral fins to the seminal vesicles	Extensive at the pronounced neck region, reaching the lateral fins. The neck region thus appears wider than the head	

<i>Sp. sheardi</i> Mawson 1944	<i>Sp. angulata</i> Tokioika 1951	<i>Sp. nana</i> Owre 1963	<i>Sp. pulchella</i> Owre 1963	<i>Sp. hummelincki</i> n. sp.
Placed laterally at the ventral side of the tail, between posterior fins and seminal vesicles arranged in two groups at each side, one towards the anterior end and the other towards the posterior end. 10-11 processes on each side of these organs, which are covered with papillae	None	Extending ventrally from the posterior end of lateral fins to the seminal vesicles. Divided into 2 stout distally tubercular processes with muscular fibers. The innermost process is the longer of the two. In the smallest specimens only one process per organ	Extending from posterior end of seminal vesicles to the point the caudal fin begins. Not associated with lateral fins nor attached to caudal fin. Adhesive organs at each side divided into 2-3 finger-like processes, the inner one longer, slender, undivided, the other may be split at the tip. Numerous papillae cover the tips of the 2 or 3 digitations	One hand-shaped at each side, with 3 short, thick, stout fingers each, covered by thin papillae. They appear as extensions of the lateral fins, strengthened by ray like pattern, continuation of the lateral fins and rising from the latero-ventral side of tail segment between posterior end of seminal vesicles and start of tail fin. Attached by a point at the tail fin, at the sensory club
	Well developed at the neck, diminishing in thickness in its extension towards the seminal vesicles	Continuous with the hood, thickest at the neck, extending at the base of the lateral fins and reaching to the seminal vesicles	Especially prominent at the neck and anterior part of the trunk, extending along the base of lateral fins to the level of posterior septum	Wide, thick, extending from head to posterior septum, widest at anterior half of the trunk

TABLE 2

DISTRIBUTION OF THE SPECIES OF SPADELLA

Species	Geographical region	Author
<i>Spadella angulata</i>	Nanao Bay (Japan), and Malay	TOKIOKA, 1951; TOKIOKA & PATHANSALI, 1964
<i>Sp. cephaloptera</i>	Skagerak Orkney Islands Scilly Islands St. Vaast de la Hougue (France) Capri Scilly Islands, Plymouth Valencia (Ireland) Alboran Sea (off Almeria), Azores, and east of Great Banks (Newfoundland) Gulf of Naples Villefranche Roscoff Trieste and Messina Messina Madeira Philippines Black Sea Cette (France) Near Misaki (Japan) Sacol Island, Zamboanga province (Philippines)	AURIVILLIUS, 1899 BUSCH, 1851 BROWNE & VALLENTINE, 1904; LEWES, 1858 CLAPARÈDE, 1863 DONCASTER, 1903 FOWLER, 1906 GAMBLE, 1900 GERMAIN & JOUBIN, 1916 GHIRARDELLI, 1952 GHIRARDELLI, 1963 GIARD & BARROIS, 1875 GRASSI, 1883 HERTWIG, 1880 LANGERHANS, 1880 MICHAEL, 1919 MOLTSCHANOFF, 1909, ULJANIN, 1870 PAGENSTECHEER, 1863 YOSHII & TOKIOKA, 1939 ALVARIÑO (unpublished data) *
<i>Sp. johnstoni</i>	Off the coasts of New South Wales, from Port Haeking to Ulladulla	MAWSON, 1944
<i>Sp. moretonensis</i>	Caloundra, Queensland	JOHNSTON & TAYLOR, 1919
<i>Sp. nana</i>	Soldier Key, Florida	OWRE, 1963
<i>Sp. pulchella</i>	Magueyes Canal, Puerto Rico	OWRE, 1963
<i>Sp. schizoptera</i>	Bahamas Off New South Wales Soldier Key, Florida Near Misaki (Japan)	CONANT, 1895 MAWSON, 1944 OWRE, 1963 YOSHII & TOKIOKA, 1939
<i>Sp. shearði</i>	Off the coasts of New South Wales, from Port Heaking to Ulladulla	MAWSON, 1944

*) Material collected by Dr. E. G. MENEZ, the 19th September, 1967, at 06°56' N-122°11' E at 10 m depth on *Caulerpa* and *Eucheuma* during the DOTY Smithsonian Institution Project.

1423A), on the 17th September, 1963. This locality is close to the place where *Sp. pulchella* occurred (OWRE, 1963). However, the four specimens of *Spadella* from the present collections showed diagnostic characteristics different from those of *Sp. pulchella* and the other species of *Spadella* previously described. In order to compare the specimens here studied with the species that is most closely related morphologically, I requested the paratypes of *Spadella pulchella* Owre from the U.S. National Museum. In Table 1 are included the differential characteristics for the various species of *Spadella*, and Figure 36 presents illustrations of *S. pulchella* for comparison with those of the proposed new species.

***Spadella hummelincki* n. sp.**

(Fig. 35)

Body rigid, strong, opaque, flattened dorso-ventrally, well developed muscles. Total length when mature, 2 to 3 mm, tail fin not included. The body is widest at the posterior part of the trunk (Fig. 35A-B).

The head is roundish, slightly broader than the neck, which is distinct, but covered by a thick collarette (Fig. 35C).

The caudal segment constitutes 49 per cent of the total length of the animal.

The eyes are roundish. The pigmented region is large and in a thick X shape (Fig. 35D).

The hooks are slender, not strongly curved, but almost straight; they ranged from 8 to 9 in number at each side of the head.

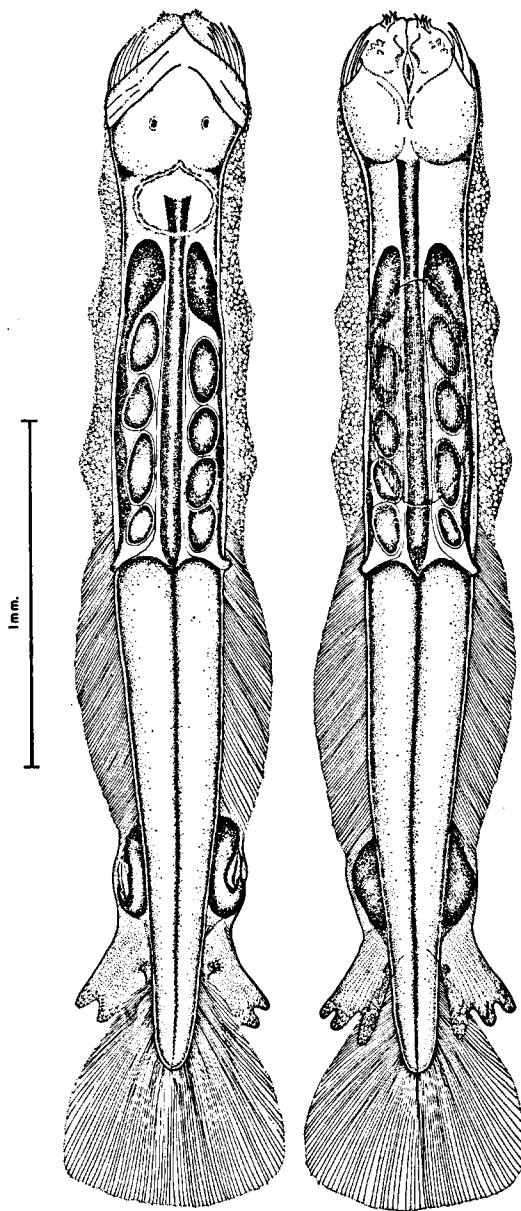
The anterior teeth are long, slender and curved at the terminal end. There are 4 at each side of the head.

No posterior teeth.

The corona ciliata is located at the neck region. It is roundish oval, with a small peak towards the center of the head (Fig. 35C).

The collarette is thick, well developed, extending from the head to the level of the posterior septum, widest at about the anterior half of the trunk.

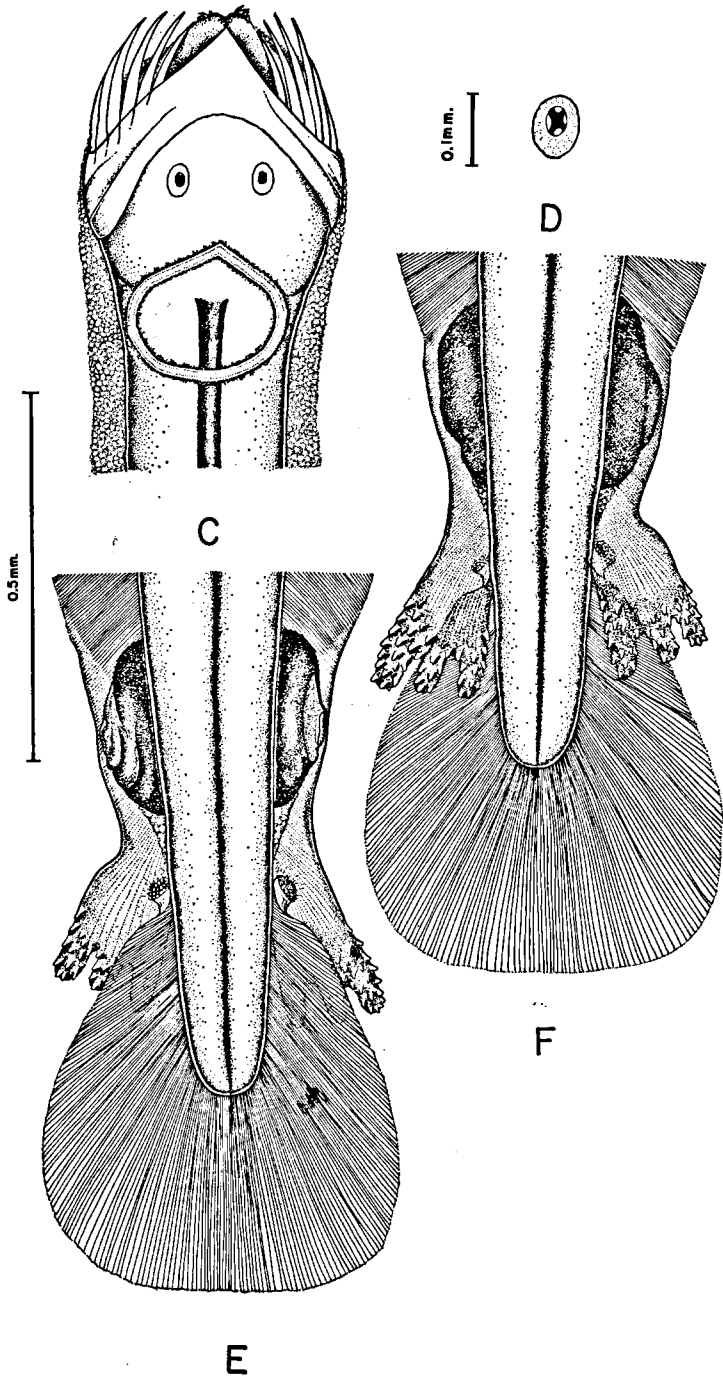
Intestinal diverticula are absent.

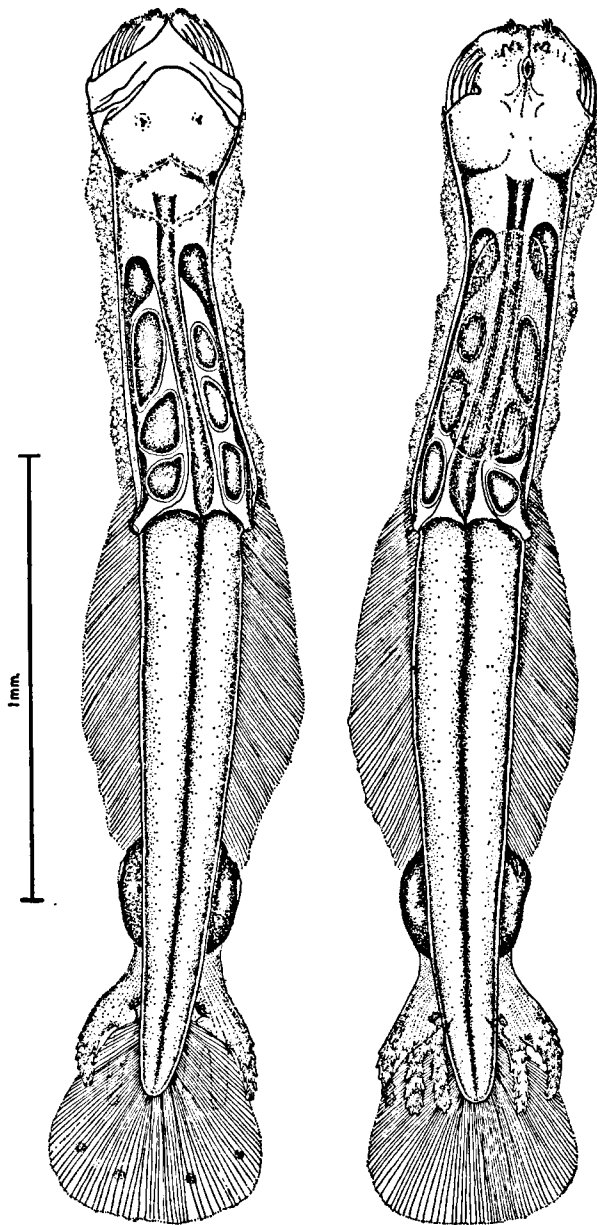


A

B

FIGURE 35. *Spadella hummelincki* n. sp. from Puerto Rico. - A. Dorsal view. - B. Ventral view. - C. Detail of the head, neck, corona ciliata (dorsal view). - D. Detail of the left eye. - E. Detail of the posterior part of the tail, seminal vesicles, adhesive organs (dorsal view). - F. Detail of the posterior part of the tail, seminal vesicles, adhesive organs (ventral view).

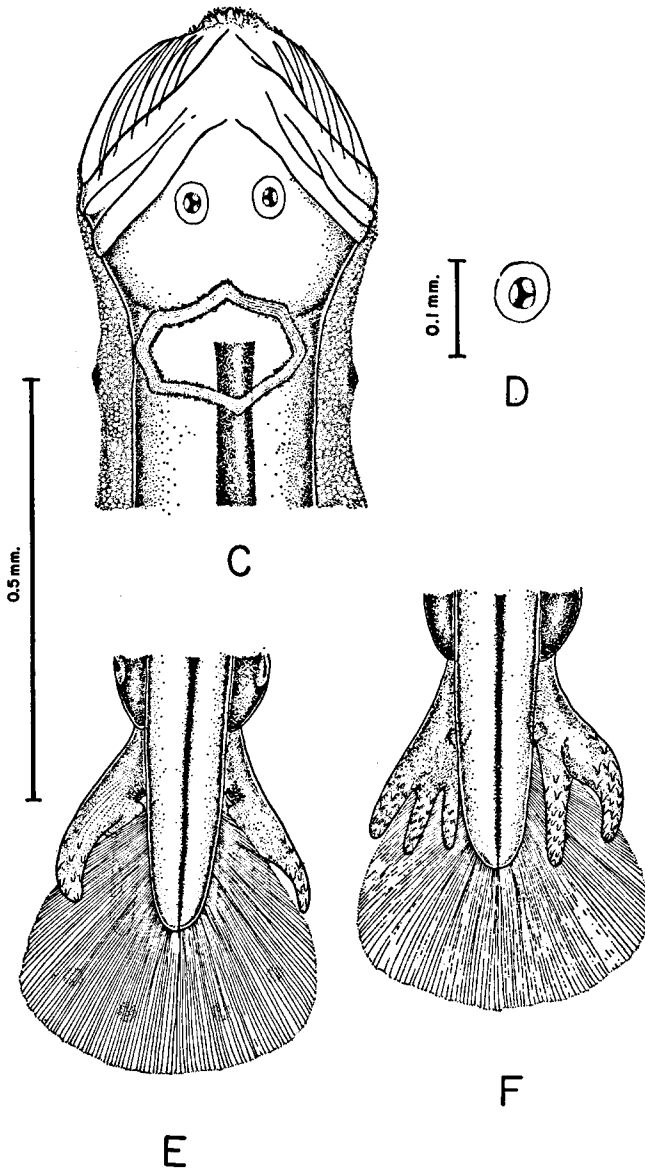




A

B

FIGURE 36. *Spadella pulchella* Owre from Puerto Rico. - A. Dorsal view. - B. Ventral view. - C. Detail of the head, neck, corona ciliata (dorsal view). - D. Detail of the left eye. - E. Detail of the posterior part of the tail, seminal vesicles, adhesive organs (dorsal view). - F. Detail of the posterior part of the tail, seminal vesicles, adhesive organs (ventral view).



Groups of reddish dots appear at the level of the anterior and posterior part of the digestive tube. This pigmentation, probably epidermic, could be a remnant of a more extensive pigmented pattern on the body, faded out with death and preservation.

The ventral ganglion is large, more than half the length of the trunk, and covering almost totally the width of the trunk, extending at midlength from the neck to the posterior septum, but closer to the later.

There is one pair of lateral fins, which are long and narrow, broadest at midlength, extending from a point anterior to the opening of the oviducts to the seminal vesicles. They are completely rayed, and progress towards the caudal end over the ventral side of the seminal vesicles, extending posteriorly with the adhesive organs.

The caudal fin is long, spatulate, completely rayed, apart from the posterior end of the seminal vesicles. The distance from the beginning of the tail fin to the posterior end of the seminal vesicles is approximately half the length of the seminal vesicles.

The adhesive organs are hand shaped, extending along the ventral side of the animal. They are attached in small part to the ventral side of the caudal segment, and only at a point to the beginning of the tail fin, just where the cup-like structures (sensory buttons) are located (Fig. 35E-F). The adhesive organs appear to be strengthened by long thin rays (muscle-like fibers), continuations of the rays of the lateral fins and arising from the ventro-lateral side of the part of the tail segment between the seminal vesicles and the beginning of the tail fin. The finger-like processes are three on each adhesive organ, and they are wide, short, stout, and all of about the same length, although the one closest to the tail segment appears to be longer than the other two. The finger-like structures are covered by small papillae, which may fasten the animal strongly to the substratum (Fig. 35E-F); they function during the crawling motion, while the fins are used in the darting swimming these animals perform. The analysis of the diagnostic characteristics of the species of the genus *Spadella* shows that the shape and position of the adhesive organs are the most definite specific characteristics.

The ovaries extend to the neck region, reaching the level of the

posterior end of the corona ciliata. The ova are large and in small number.

The seminal vesicles touch the posterior end of the lateral fins and are apart from the tail fin. They are oval, pearshaped, wider at the middle. They open at the dorsal side by a slit extending along the lateral edge (Fig. 35E). The ventral extension of the lateral fins, covering the seminal vesicles ventrally, may function as a soft protecting membranous shield, a device to ensure copulation; during this function it may press against the vesicle forcing the release of the sexual cells.

The apparently faded sensory spots are numerous. They are located at the edges of the body and collarette, lateral fins and posterior part of the tail fin. The cup-shaped structures with wart-like formations at the dorsal side of the starting point of the tail fin are recognized as sensory spots, but different from the above mentioned, having a ganglionic appearance.

The eggs are deposited along a small stem and are surrounded by a layer of jelly. They are fastened to foreign objects such as algae, stones, over which these animals crawl. Each jelly pack contains generally 5 to 10 eggs fastened to short stalks (HERTWIG, 1880).

It is interesting to note that *Spadella* specimens are opaque, while the pelagic Chaetognatha are more transparent, ranging from the crystal clear transparency of *Sagitta pulchra* to the translucent *Pterosagitta draco*, *Sagitta robusta*, *S. zetesios* etc.

Another characteristic difference between the pelagic and benthonic Chaetognatha is their relative ability to survive in captivity. The pelagic specimens are extremely delicate and often die soon after being collected, while the benthic specimens may be retained alive for several weeks behaving apparently normally, swimming, attaching to objects, crawling and feeding at normal rate. Also the *Spadella* specimens regenerate any injured part of the body more easily than the pelagic chaetognaths.

The species was named after the collector Dr. P. WAGENAAR HUMMELINCK, secretary of the Foundation for Scientific Research in Surinam and the Netherlands Antilles, Zoologisch Laboratorium, Utrecht. – Holotype: deposited at the Zoologisch Museum of Amsterdam (ZMA, CH1017). Paratypes: 3 specimens at the same zoological museum.

I wish to thank Dr. P. WAGENAAR HUMMELINCK for providing the material for this study and for his valuable advice and encouragement. I am also grateful to Dr. E. G. MENEZ for the specimens of *Spadella cephaloptera* collected in the Philippines region during the DOTY Smithsonian Institution Project, and to Dr. W. DUANE HOPE, Associate Curator of the Smithsonian Institution for his kindness in providing the paratypes of *Spadella pulchella* for examination and comparative studies. I am indebted to my colleague EDWARD BRINTON for reading the manuscript and for his helpful comments.

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