

Sphaerodoridae (Annelida: Polychaeta) from the deep south-west Pacific, with the description of a new species of *Sphaerodoropsis*

MICHAEL REUSCHER^{1,2} AND DIETER FIEGE³

¹Universität Heidelberg, Institut für Zoologie, Abteilung Morphologie/Ökologie, Im Neuenheimer Feld 230, D-69120 Heidelberg, Germany, ²Present address: Harte Research Institute, Texas A&M University – Corpus Christi, 6300 Ocean Drive, Unit 5869, Corpus Christi, Texas 78412-5869, USA, ³Senckenberg Forschungsinstitut und Naturmuseum Frankfurt, Sektion Marine Evertibraten II, Senckenberganlage 25, D-60325, Frankfurt/Main, Germany

A new species of Sphaerodoridae (Annelida: Polychaeta), Sphaerodoropsis solis sp. nov., is described from the Challenger Plateau in the Tasman Sea, south-west Pacific. It is the third species of the genus with ventral macrotubercles and is further characterized by the lack of dorsal papillae and the specific arrangement pattern of ventral papillae. A character indicating sexual dimorphism, that has been observed in three morphologically similar species, S. arctowskyensis Hartmann-Schröder & Rosenfeldt, 1988, S. bisphaeroserialis (Hartmann-Schröder, 1974c), and S. garciaalvarezi Moreira, Cacabelos & Troncoso, 2004, is confirmed for S. solis sp. nov. Besides S. solis sp. nov., S. arctowskyensis and S. parva (Ehlers, 1913) are newly recorded from the Challenger Plateau and the East Campbell Plateau in the south-west Pacific. An updated key for the genus Sphaerodoropsis is provided.

Keywords: Sphaerodoridae, *Sphaerodoropsis*, deep sea, identification key, sexual dimorphism

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INTRODUCTION

Sphaerodoridae are mostly small benthic polychaetes with macrotubercles and papillae scattered across their body. They are commonly considered as belonging to Phyllodocida (Rouse & Fauchald, 1997; Pleijel, 2001; Aguado & Rouse, 2006). The position of the family within Phyllodocida, however, is uncertain (Aguado & Rouse, 2006). The present definition of the genera is based on the review of Fauchald (1974) who distinguished the various genera by the shape of macrotubercles and falcigers. Although the generic definitions are accepted by most authors, a plea for a revision, especially for the genus *Sphaerodoropsis* Hartman & Fauchald, 1971, has been expressed (Borowski, 1994). With 47 species described to date, *Sphaerodoropsis* is the most speciose of the sphaerodorid genera. As a first step towards a revision, Borowski (1994) divided the genus into four groups based on number and arrangement of macrotubercles, emphasizing the heterogeneity of the genus. Group 1 is defined as having 1 transverse row with 4 macrotubercles per segment, Group 2 as having 1 transverse row with more than 4 macrotubercles per segment, Group 3 as having 2 transverse rows, an anterior row that is in line with the parapodia (herein referred to as segmental row) and a posterior row that is situated in between the segmental rows (herein referred to as inter-segmental row), and

Group 4 as having macrotubercles randomly scattered over the dorsum, resulting in 3–4 transverse rows per segment.

The genus is found worldwide and is well presented both in Arctic and Antarctic waters. In our study, samples from the deep sub-Antarctic south-west Pacific, i.e. the Challenger Plateau in the Tasman Sea and the Campbell Plateau south-east of New Zealand, from depths between 924 and 1526 m, were examined.

In his review of Sphaerodoridae, Fauchald (1974) presented a key for *Sphaerodoropsis* comprising 20 species. Meanwhile, many new species have been described for this genus with *S. solis* sp. nov. as the 47th species. Therefore, it seemed appropriate to present an updated key for the genus *Sphaerodoropsis*.

MATERIALS AND METHODS

The specimens examined in this study have been collected during cruise So 136 (TASQWA) (Thiede *et al.*, 1999) with the German research vessel RV 'Sonne' to the Challenger Plateau and the Campbell Plateau in the south-west Pacific. Samples were taken using an epibenthic sledge (EBS) and sieved on board. Specimens were fixed in 10% formaldehyde-seawater solution and later transferred to 70% ethanol. Preserved specimens were examined using the stereo microscopes Wild Heerbrugg M5 and Zeiss Stemi 2000-C and the compound microscope Olympus BH-2. Drawings were made using a camera lucida and finalized

Corresponding author:
M. Reuscher
Email: michael.reuscher@tamucc.edu

according to the method described by Coleman (2003). Schematic illustrations were made using Adobe Illustrator 10.0. Illustrations were assembled using Adobe Photoshop CS2.

SYSTEMATICS

Family SPHAERODORIDAE Malmgren, 1867
Genus *Sphaerodoropsis* Hartman & Fauchald, 1971

TYPE SPECIES

Sphaerodoropsis sphaerulifer (Moore, 1909)

GENERIC DIAGNOSIS (FROM AGUADO & ROUSE 2006)

Four or more rows of dorsal sessile macrotubercles without terminal papillae. Anterior end with a median antenna and a pair of lateral antennae. A pair of ventral palps, similar to antennae present. A pair of papillae similar in length to antennae and palps may also be present. Chaetae compound.

REMARKS

The interpretation of the anterior appendages by Aguado & Rouse (2006) as homologous to those of other taxa considered as belonging to Phyllococida is in line with Pleijel (2001) who considered the inferior lateral antennae as palps. However, studies of their innervation are contradictory (Orrhage, 1990). Aguado & Rouse (2006) also argue that the additional 3rd pair of lateral antennae that occur in some of the species are prolonged papillae, although antennae differ histologically from papillae (Fauchald, 1974). Albeit further research is needed to confirm both hypotheses, we follow Aguado & Rouse (2006) and refer to the 'inferior lateral antennae' as palps and the '3rd pair of antennae', if present, as antenna-like papillae.

Sphaerodoropsis arctowskyensis Hartmann-Schröder & Rosenfeldt, 1988

Sphaerodoropsis arctowskyensis Hartmann-Schröder & Rosenfeldt 1988: 49–50, figures 40–44.—Borowski, 1994: table 2.—Moreira *et al.*, 2004: 999–1000, figure 4c, f.

EXAMINED SPECIMENS

1 male specimen (tubercle-like structure on chaetiger 6 absent), complete. (So 136, Station 2 EBS; south-west Pacific, Tasman Sea, Challenger Plateau, 42°17.99'S 170°00.00'E; 937–945 m) (SMF 17639). Collected by T. Jellinek, 17 October 1998. 1 male specimen (tubercle-like structure on chaetiger 6 absent), complete. (So 136, Station 45 EBS; south-west Pacific, East Campbell Plateau, 50°07.77'S 174°40.65'E; 924–927 m) (SMF 17635). Collected by T. Jellinek, 23–24 October 1998.

DIAGNOSIS

1 pair of lateral antennae, 1 median antenna, 1 pair of palps. 2 transverse rows of macrotubercles per segment; segmental row with 6 macrotubercles, inter-segmental row with 7 macrotubercles. Lateralmost macrotubercles somewhat smaller, lacking in first two and last two inter-segmental rows. Parapodia with prechaetal lobe and ventral cirrus, postchaetal lobe lacking. 6 dorsal and 10 ventral papillae per segment in a non-random pattern (see Moreira *et al.*, 2004 for details). Females with tubercle-like structure ventral

to parapodia of chaetiger 6. Blades of falcigers slightly spinulated.

REMARKS

Sphaerodoropsis arctowskyensis has been extensively studied and compared by Moreira *et al.* (2004). Both specimens studied here are males, since they lack a ventrolateral tubercle in chaetiger 6 and sperm is visible in the posterior part of the smaller specimen (SMF 17635). The specimen from the East Campbell Plateau is completely translucent showing its internal anatomy. One pair of nephridia is present, opening into the inflated ventral cirri of chaetiger 6.

DISTRIBUTION

Antarctic: Bransfield Strait, King George Island; 50–458 m (Hartmann-Schröder & Rosenfeldt, 1988). Newly recorded from the south-west Pacific: East Campbell Plateau and Challenger Plateau, 924–945 m.

Sphaerodoropsis parva (Ehlers, 1913)

Sphaerodoropsis parva Ehlers 1913: 504–507, pl. 35, figures 7–12.

Sphaerodoropsis parva Fauchald 1974: 276, figure 3.8 & 3.9.—Hartmann-Schröder & Rosenfeldt, 1988: 48–49, figure 39.—Borowski, 1994: table 2.—Aguado & Rouse, 2006: table 1.

EXAMINED SPECIMENS

6 specimens, complete. (So 136, Station 2 EBS; south-west Pacific, Tasman Sea, Challenger Plateau 42°17.99'S 170°00.00'E; 937–945 m) (SMF 17638). Collected by T. Jellinek, 17 October 1998. 1 specimen, complete. (So 136, Station 12 EBS; south-west Pacific, Tasman Sea, Challenger Plateau, 43°25.15'S 167°50.15'E; 1523–1526 m) (SMF 17640). Collected by T. Jellinek, 18 October 1998. 21 specimens, complete. (So 136, Station 45 EBS; south-west Pacific, East Campbell Plateau, 50°07.77'S 174°40.65'E; 924–927 m) (SMF 17641). Collected by T. Jellinek, 23–24 October 1998.

DIAGNOSIS

1 pair of lateral antennae, 1 median antenna, 1 pair of palps, and one pair of antenna-like papillae. 1 dorsal transverse row of 4 macrotubercles per segment. Parapodia with

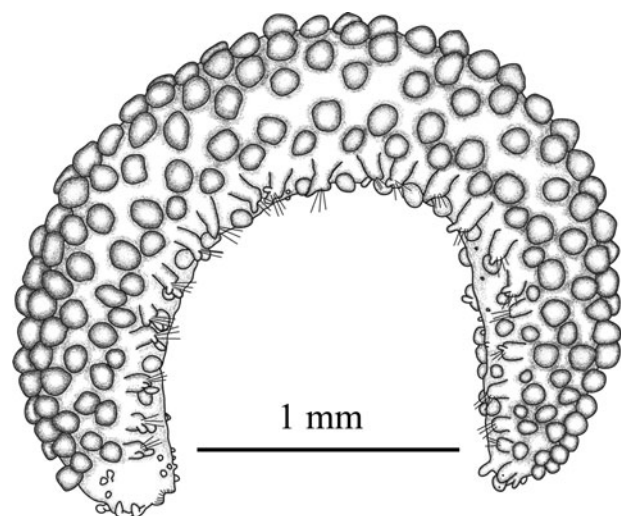


Fig. 1. *Sphaerodoropsis solis* sp. nov. holotype (SMF 17636), lateral view.

prechaetal lobe and ventral cirrus, postchaetal lobe lacking. Numerous dorsal and ventral papillae, randomly distributed. Blades of falcigers spinulated.

REMARKS

A record from the north-east Atlantic (Desbruyères, 1980: Plateau de Meriadzek, 2906 m) is considered doubtful since *Sphaerodoropsis parva* appears to have an Antarctic to sub-Antarctic distribution (see also Aguado & Rouse, 2006).

DISTRIBUTION

Antarctic, sub-Antarctic Islands, Falkland Islands, southern South America, Australia; 56–4758 m (Fauchald, 1974; Hartmann-Schröder & Rosenfeldt, 1988). Newly recorded

from the south-west Pacific: East Campbell Plateau and Challenger Plateau, 924–1526 m.

Sphaerodoropsis solis sp. nov.

Figures 1–3

TYPE MATERIAL

Holotype: male (tubercle-like structure of chaetiger 6 absent) 4 mm, complete. (So 136, Station 12 EBS; south-west Pacific, Tasman Sea, Challenger Plateau, 43°25.15'S 167°50.15'E; 1523–1526 m) (SMF 17636). Collected by T. Jellinek, 18 October 1998.

Paratype: female (tubercle-like structure of chaetiger 6 present) 4 mm, complete. (So 136, Station 2 EBS; south-west Pacific, Tasman Sea, Challenger Plateau, 42°17.99'S

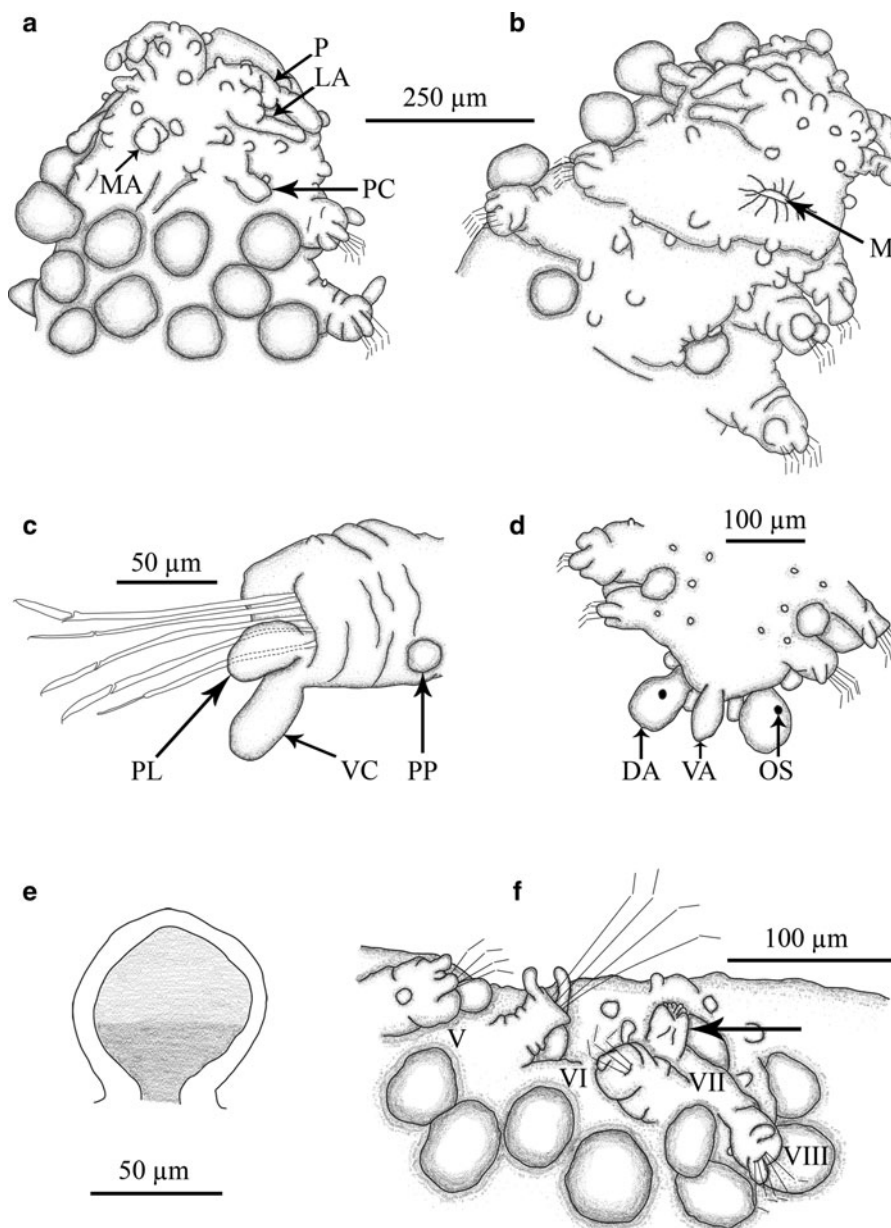


Fig. 2. *Sphaerodoropsis solis* sp. nov. (a–e: holotype, SMF 17636; f: paratype, SMF 17637). (a) Anterior end, dorsal view; (b) anterior end, ventral view; (c) parapodium, anterolateral view; (d) pygidium, ventral view; (e) ventral macrotubercle, lateral view; (f) chaetigers 5–8 (from left to right), dorsolateral view, with additional tubercle (arrow) of female specimen (paratype). DA, dorsal anal cirrus; LA, lateral antenna; M, mouth; MA, median antenna; OS, orange spot; P, palps; PC, peristomial cirrus; PL, prechaetal lobe; PP, parapodial papilla; VA, ventral anal cirrus; VC, ventral cirrus.

170°00.00'E; 937–945 m) (SMF 17637). Collected by T. Jellinek, 17 October 1998.

DIAGNOSIS

2 transverse rows of macrotubercles per segment; segmental rows with 6 macrotubercles, inter-segmental rows with 7 macrotubercles. Lateralmost macrotubercles somewhat smaller, lacking in first two and last two inter-segmental rows. 2 rows of ventrolateral, inter-segmental macrotubercles present, of same size as lateralmost dorsal macrotubercles, lacking in first and last segment. 6 ventral papillae per segment in a non-random pattern, dorsal papillae lacking. Females with tubercle-like structure ventral to parapodia. Blades of falcigers not spinulated.

DESCRIPTION

Holotype male, 4 mm long and 0.7 mm wide. Body grub-like, with 22 chaetigers (Figure 1). Anterior end bluntly rounded. Prostomium fused to peristomium. Eyes absent. One pair of lateral antennae and one median antenna present (Figure 2a). Lateral antennae slender, digitiform with broadened bases and blunt ends. Median antenna short and broad, spherical. One pair of palps and one pair of peristomial cirri, each similar to lateral antennae in shape. Mouth opening encircled by lip-like ridge. Numerous prostomial and peristomial papillae (Figure 2a, b). Parapodia uniramous with ventral cirrus and a slightly shorter prechaetal lobe (Figure 2c). Postchaetal lobe absent. Parapodia with one papilla on anterior face. Composite falcigers numbering up to ten per fascicle. Blades of chaetae straight or slightly convex with curved tips. No spinulation visible in light microscope, even under highest magnification (1000×). Pygidium with one digitiform ventral cirrus and two spherical dorsolateral cirri, reminiscent of macrotubercles, with a single orange spot each (Figure 2d). Three papillae between spherical anal cirri. Dorsum densely covered with sessile macrotubercles, spherical in shape, without terminal papilla (Figure 2e). Macrotubercles basally filled with brown granulate. Few of them with single orange spot. Macrotubercles arranged in two alternating (segmental and inter-segmental) transverse rows, per segment, resulting in a typical zigzag pattern (Figure 3a). Segmental rows with six dorsal macrotubercles

per segment. Inter-segmental rows with five dorsal tubercles on first two and last two chaetigers and seven dorsal tubercles on intermediate chaetigers (Figure 3a). Lateralmost macrotubercles slightly smaller than remaining ones. All chaetigers, except for first and last one, with one additional ventrolateral macrotubercle on each side. Macrotubercles of ventral side situated in line with inter-segmental rows of dorsal tubercles. Ventral macrotubercles of same size as lateralmost ones of dorsal inter-segmental rows and with more brown pigment than dorsal ones, but without distinctive differences visible under compound microscope. Overall, both first and last chaetiger with 11 dorsal macrotubercles, arranged 6 + 5, both second and second to last chaetiger with same set of dorsal macrotubercles plus 2 ventrolateral ones, remaining segments with 13 dorsal macrotubercles, arranged 6 + 7, plus 2 ventrolateral ones. Dorsal papillae absent. Six ventral papillae per segment, consistently arranged in a non-random pattern (Figure 3b).

VARIATION

Paratype 4 mm long and 0.4 mm wide; specimen presumably female with an additional pair of tubercles situated dorsally to ventrolateral tubercles of chaetiger 6. Additional tubercles with distal opening (Figure 2f).

REMARKS

With its high number of macrotubercles in two transverse rows per segment, arranged in a zigzag pattern, this new species belongs to Group 3 *sensu* Borowski (1994). Within this group *Sphaerodoropsis arctowskyensis*, *S. bisphaeroserialis* and *S. garciaalvarezi*, extensively studied and compared by Moreira *et al.* (2004), are morphologically similar to *S. solis* sp. nov. according to number and arrangement of dorsal macrotubercles and shape of parapodia. Additionally, *S. solis* sp. nov. shows the same sexual dimorphism with respect to the ventrolateral tubercles of chaetiger 6 in the female specimen as shown by Moreira *et al.* (2004) for the three related species mentioned above. *Sphaerodoropsis solis* sp. nov. can be distinguished from these species by the presence of two regular, longitudinal rows of ventrolateral macrotubercles, the different arrangement of ventral papillae, and the lack of dorsal papillae. The only other species of this genus showing

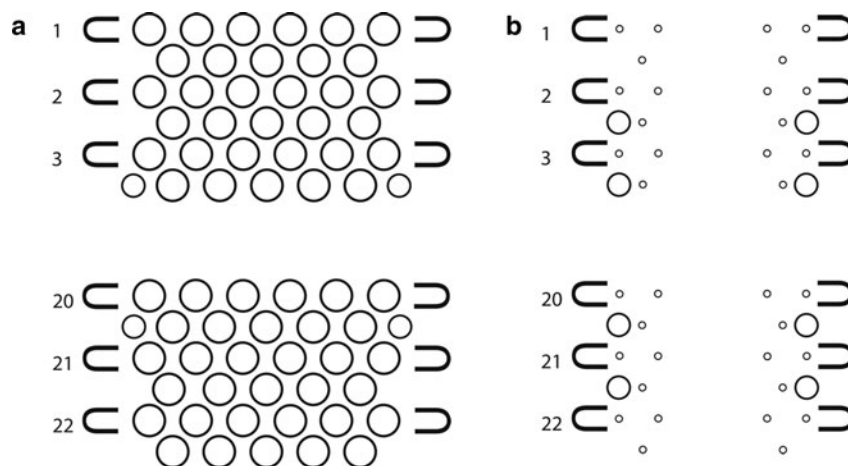


Fig. 3. *Sphaerodoropsis solis* sp. nov. (a) Scheme of arrangement of dorsal macrotubercles, chaetigers 1–3 and 20–22, dorsal view; (b) scheme of arrangement of ventral macrotubercles and papillae, chaetigers 1–3 and 20–22, ventral view.

regular, longitudinal rows of ventral macrotubercles are *S. malayana* (Augener, 1934) and *S. spissum* (Benham, 1921). While *S. malayana* has only four longitudinal rows of dorsal, and one median row of ventral macrotubercles, *S. spissum* has five rows of ventral macrotubercles and its parapodia lack ventral cirri.

ETYMOLOGY

The species is named after the research vessel RV 'Sonne'.

DISTRIBUTION

South-west Pacific: Challenger Plateau, 937–1526 m.

KEY TO SPECIES OF *SPHAERODOROPSIS*

1. Ventral macrotubercles present 2
 - Ventral macrotubercles absent..... 4
2. 4 longitudinal dorsal rows and 1 longitudinal ventral row of macrotubercles present.....
 - *S. malayana* (Augener, 1934)
 - More than 4 longitudinal dorsal rows and more than 1 longitudinal ventral row of macrotubercles present..... 3
3. 5 longitudinal rows of ventral macrotubercles present..
 - *S. spissum* (Benham, 1921)
 - 2 longitudinal rows of ventral macrotubercles present *S. solis* sp. nov.
4. 4 dorsal macrotubercles per segment, arranged in 1 transverse row..... 5
 - More than 4 dorsal macrotubercles per segment, arranged in 1–4 transverse rows 24
5. First chaetiger with 4 macrotubercles
 - *S. vittori* Kudenov, 1987b
 - First chaetiger with 2 macrotubercles..... 6
6. Parapodia with dorsal cirri..... *S. longiparapodium*
 - (Katzmann, 1973)
 - Parapodia without dorsal cirri..... 7
7. Prechaetal lobe present..... 8
 - Prechaetal lobe absent 21
8. Postchaetal lobe present..... 9
 - Postchaetal lobe absent 10
9. 1 pair of antenna-like papillae present.....
 - *S. longipalpa* Hartman & Fauchald 1971
 - Antenna-like papillae absent.....
 - *S. furca* Fauchald, 1974
10. Papillae on parapodia present..... 11
 - Papillae on parapodia absent 20
11. 1 pair of antenna-like papillae present 12
 - Antenna-like papillae absent..... 17
12. Macrotubercles with distal invaginations.....
 - *S. discolis* Borowski, 1994
 - Macrotubercles without distal invaginations..... 13
13. Median antenna long and slender, similar to lateral antennae..... *S. anae* Aguado & Rouse, 2006
 - Median antenna short and conical 14
14. Parapodia with only 2 big papillae, located on superior edge *S. triplicata* Fauchald, 1974
 - Parapodia with more than two papillae 15
15. Median dorsal macrotubercles larger than lateral ones..
 - *S. philippi* (Fauvel, 1911)
 - Median and lateral macrotubercles of same size... 16
16. Parapodia with 1 papilla on each face and two papillae on superior edge... *S. biserialis* (Berkeley & Berkeley, 1944)
 - Parapodia with 10–15 papillae.....
 - *S. sibuetae* Desbruyères, 1980
17. Macrotubercles with distal invaginations..... 18
 - Macrotubercles without distal invaginations..... 19
18. Median antenna bifurcate..... *S. laureci*
 - Desbruyères, 1980
 - Median antenna not bifurcate.....
 - *S. stellifer* Aguirrezabalaga & Ceberio 2005
19. Antenna-like papillae shorter than lateral antennae and palps..... *S. parva* (Ehlers, 1913)
 - Antenna-like papillae, lateral antennae, and palps of same length..... *S. longipapillata* Desbruyères, 1980
20. Median macrotubercles larger than lateral ones; aciculae straight *S. exmouthensis* Hartmann-Schröder in Hartmann-Schröder & Hartmann, 1981
 - Median and lateral macrotubercles of same size; aciculae curved..... *S. martinae* Desbruyères, 1980
21. Papillae on parapodia and ventrum present..... 22
 - Papillae on parapodia and ventrum absent..... 23
22. Postchaetal lobe present.....
 - *S. elegans* Hartman & Fauchald, 1971
 - Postchaetal lobe absent.....
 - *S. corrugata* Hartman & Fauchald, 1971
23. Papillae on prostomium present; postchaetal lobe present *S. laevis* Fauchald, 1974
 - Papillae on prostomium absent; postchaetal lobe absent
 - *S. simplex*, Amoureux, Rullier & Fishelson, 1978
24. Dorsal macrotubercles in one transverse row per segment 25
 - Dorsal macrotubercles in two or more transverse rows per segment..... 34
25. One or two postchaetal lobes present 26
 - Postchaetal lobe absent 32
26. One postchaetal lobe present..... 27
 - Two postchaetal lobes present..... 30
27. Median segments with 10 macrotubercles.....
 - *S. aestuarium* Averincev, 1990
 - All segments with less than 10 macrotubercles.... 28
28. 24–30 dorsal papillae per segment.....
 - *S. amoureuixi* Aguirrezabalaga & Ceberio 2005
 - 15 or less dorsal papillae per segment 29
29. 6–8 macrotubercles per segment; 13–15 dorsal papillae per segment *S. uzintunensis* Kudenov, 1987a
 - 8–9 macrotubercles per segment; 11 dorsal papillae per segment..... *S. katchemakensis* Kudenov, 1987a
30. 10–14 macrotubercles per segment
 - *S. minuta* (Webster & Benedict, 1887)
 - Less than 10 macrotubercles per segment 31
31. Parapodia with 2 papillae
 - *S. octopapillata* Hartmann-Schröder, 1965
 - Parapodia with at least 6 papillae.....
 - *S. balticum* (Reimers, 1933)
32. Mid-body segments with 12–13 dorsal macrotubercles *S. polypapillata* Hartmann-Schröder & Rosenfeldt, 1988
 - All segments with less than 10 dorsal macrotubercles 33
33. Ventral cirrus papilla-like not projecting beyond prechaetal lobe *S. benguellarum* (Day, 1963)
 - Ventral cirrus different from papillae, projecting beyond prechaetal lobe
 - *S. sphaerulifer* (Moore, 1909)

34. Dorsal macrotubercles in 2 alternating transverse rows per segment 35
 – Dorsal macrotubercles in 3–4 irregular rows per segment.....
 *S. multipapillata* (Hartmann-Schröder, 1974b)
35. Two types of dorsal macrotubercles present: spherical and bell-shaped ones
 *S. campanulata* Borowski, 1994
 – Only spherical macrotubercles present 36
36. Palps with polyp-like accessory papillae.....
 *S. sexantenella* Kudenov, 1993
 – Palps without polyp-like accessory papillae..... 37
37. 36–40 dorsal macrotubercles per segment.....
 *S. paracapense* (Hartmann-Schröder, 1974a)
 – Less than 20 macrotubercles per segment 38
38. Prechaetal lobe present..... 39
 – Prechaetal lobe absent... *S. chardyi* Desbruyères, 1980
39. 9 dorsal macrotubercles per segment.....
 *S. distichum* (Eliason, 1962)
 – 10 or more dorsal macrotubercles per segment ... 40
40. Prechaetal lobe large and foliose
 *S. pycnos* Fauchald, 1974
 – Prechaetal lobe digitiform 41
41. 5 dorsal macrotubercles in segmental rows
 *S. oculata* Fauchald, 1974
 – More than 5 dorsal macrotubercles in segmental rows 42
42. 6 dorsal macrotubercles in segmental rows 43
 – 8 dorsal macrotubercles in segmental rows
 *S. fauchaldi* Hartmann-Schröder
 in Hartmann-Schröder & Hartmann, 1979
43. 7–12 dorsal macrotubercles in irregular inter-segmental rows
 *S. translucida* Borowski, 1994
 – 7 dorsal macrotubercles in regular inter-segmental rows 44
44. 6 ventral papillae per segment
 *S. garciaalvarezi* Moreira, Cacabelos & Troncoso, 2004
 – 10 ventral papillae per segment..... 45
45. Lateral antennae short, globular; prechaetal lobes papilliform *S. arctowskyensis* Hartmann-Schröder &
 Rosenfeldt, 1988
 – Lateral antennae and prechaetal lobes slender, digitiform *S. bisphaeroserialis*
 (Hartmann-Schröder, 1974c)

Sphaerodoropsis longesetosa (Averincev, 1972) was not included because of its insufficient description.

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Correspondence should be addressed to:

M. Reuscher
 Harte Research Institute
 Texas A&M University–Corpus Christi
 6300 Ocean Drive, Unit 5869, Corpus Christi
 Texas 78412-5869, USA
 email: michael.reuscher@tamucc.edu