

New genus (*Entokrohnia*) and new species of family Tokiokaispadellidae Salvini-Plaven, 1986 (Chaetognatha) from south-west Pacific Ocean

Новый род (*Entokrohnia*) и новый вид семейства Tokiokaispadellidae Salvini-Plaven, 1986 (Chaetognatha) из юго-восточной части Тихого океана

A.P. KASSATKINA

А.П. КАСАТКИНА

A.P. Kassatkina, V.I. Il'ichev's Pacific Institute of Oceanography, Far East Division, Russian Academy of Sciences, Baltiyskaya 43, Vladivostok 690041, Russia. E-mail: apkas@mail.ru

A detailed description and figures of a new species *Entokrohnia entiptera* **sp. nov.** are presented. Diagnoses of the families Protoeukrohniidae **fam. nov.** and Tokiokaispadellidae Salvini-Plaven, 1986, and all the three genera of the latter family: *Tokiokaispadella* Kassatkina, 1980, *Aberrospadella* Kassatkina 1971, and *Entokrohnia* **gen. nov.** are given.

Приводятся описания и рисунки нового вида *Entokrohnia entiptera* **sp. nov.** Даны диагнозы семейств Protoeukrohniidae **fam. nov.**, Tokiokaispadellidae Salvini-Plaven, 1986 и всех трёх родов, входящих во второе из указанных семейств: *Tokiokaispadella* Kassatkina, 1980, *Aberrospadella* Kassatkina 1971, *Entokrohnia* **gen. nov.**

Key words: taxonomy, Chaetognatha, Protoeukrohniidae, Tokiokaispadellidae, *Tokiokaispadella*, *Aberrospadella*, *Entokrohnia*, new family, new genus, new species

Ключевые слова: Chaetognatha, Protoeukrohniidae, Tokiokaispadellidae, *Tokiokaispadella*, *Aberrospadella*, *Entokrohnia*, новое семейство, новый род, новый вид

INTRODUCTION

Salvini-Plaven (1986) revised the chaetognathan taxonomy based on previously published schemes of Tokioka (1965a, 1965b). He emphasised some specific features of the family Spadellidae connected with the capacity of dwelling in the coastal tidal zone of the sublittoral that was considered as a significant secondary adaptation. Thus, Salvini-Plaven (1986) provided a strong argument against the hypothesis on the origin of all Chaetognatha from *Spadella*-like forms (Molchanov, 1907; Tokioka, 1965a, 1965b) and described a new family, Tokiokaispadellidae, based on

Tokiokaispadella Kassatkina, 1980, evaluated as “фрагма функционально регрессиве”. Bieri (1989) did not consider Tokiokaispadellidae to be a valid family because he wrongly assumed that *Tokiokaispadella lata* Kassatkina, 1980 is a junior synonym of *Pterosagitta draco* Costa, 1869. However, no support was given to this assumption. Genus *Aberrospadella* Kassatkina, 2010 was later included into Tokiokaispadellidae.

The aim of the present paper is to give diagnoses of and comparative remarks on families Protoeukrohniidae **fam. nov.** and Tokiokaispadellidae, and to describe all the genera of the latter family, a new genus, and a new species from south-west Pacific Ocean.

MATERIAL

Plankton samples were collected by hydrobiologist V.G. Tarasov from the southwest Pacific Ocean during cruises of RV "Akademik Nesmeyanov", using Jeddy net, in April 1990. Holotype and paratypes are deposited in the collection of V.I. Il'ichev's Pacific Institute of Oceanography, Far East Division, Russian Academy of Sciences, Vladivostok.

TAXONOMIC PART

Subclass EUKROHNIONES

Kassatkina, 2011

Diagnosis. One pair of SGS or one pair of fins on lateral fields of body. Internal ring of corona ciliata (sometimes absent in bathypelagic species) without secretory cells. Eyes of everted type. Alveolar tissue commonly single-layered, composed of flat rhomboid cells. Teeth in two or one pairs of rows. Neck glands present. Eggs released into water, not adhered to substrate, commonly in marsupial sacs hanging from opening of oviducts and carried by individual.

The subclass Eukrohniones contains three orders: Biphragmoeukrohniformes, Monophragmoeukrohniformes, and Aphragmoeukrohniformes. More information on Eukrohniones see Kassatkina (2003, 2011, 2012).

Order PHRAGMOEUKROHNIFORMES

Diagnosis. Both the trunk and the tail sections of the body with transverse muscle (phragma, apparently supercontraction). The body can curve laterally in a serpentine fashion. Glandular tubules (canaliculi) are absent.

Comparative Remarks. The family differs from Monophragmoeukrohniformes in having transverse muscles in both trunk and tail sections (vs. in the tail section only) and the absence of the glandular tubules (canaliculi) on sides of the head (vs. presence). Biphragmoeukrohniformes can be distin-

guished from Aphragmoeukrohniformes in having transverse muscles in both trunk and tail sections (vs. complete absence of transverse muscles).

The order Biphragmoeukrohniformes contains three families: Tokiokaispadellidae Salvini-Plaven, 1986, Heterokrohniidae Casanova, 1986, and Protoeukrohniidae **fam. nov.**

Family PROTOEUKROHNIIDAE **fam. nov.**

Type genus: *Protoeukrohnia* Kassatkina, 2003 (type species: *Protoeukrohnia macrophthalmia* Kassatkina, 2003).

Diagnosis. One pair of rows of teeth on head: anterior teeth present, posterior ones absent. Single pair of lateral saclike gelatinous structures. Sometimes, narrow fin-like fold lacking rays present along lateral sides of gelatinous structures. Rays found only in tail fin. No gut diverticula at midgut. Tail section less than 50% of body length (commonly less than 45%). Corona ciliata and eyes present. Tentacles on head and neck absent.

The family comprises a single genus: *Protoeukrohnia* Kassatkina, 2003.

Family TOKIOKAISPADELLIDAE Salvini-Plaven, 1986

Type genus: *Tokiokaispadella* Kassatkina, 1980.

Diagnosis. Two pairs of rows of teeth on head. Tail region less than 50% of body length (no more than 45%). Corona ciliata and eyes present. Tentacles on head and neck ducts absent.

Comparative remarks. Tokiokaispadellidae differs from the family Heterokrohniidae Casanova 1985 in the presence of the corona ciliata and eyes. It can be distinguished from Protoeukrohniidae **fam. nov.** by the absence of lateral saclike gelatinous structures (vs. presence) and the presence of the posterior teeth and the gut diverticula at the midgut (vs. absence).

The family comprises three genera: *Tokiokaispadella* Kassatkina, 1980, *Aberrospadella* Kassatkina 1971, and *Entokrohnia* **gen. nov.**

Genus *Tokiokaispadella* Kassatkina, 1980

Type species: *Tokiokaispadella lata* Kassatkina, 1980

Diagnosis. Corona ciliata located at eye level, sometimes on neck. Fins located only on tail section. Thick rays present in fins. Gut diverticula present. Inner nuclear eye zone larger than peripheral one. Hooks not serrated.

A single species is benthopelagic (a lagoon of the Ninigo Atoll, the Pacific Ocean).

Genus *Aberrospadella* Kassatkina 1971

Type species: *Aberrospadella verruculosa* Kassatkina 1971.

Diagnosis. Corona ciliata located below eye level, sometimes on neck. Portion of corona ciliata situated in trunk section equal to its cephalic part. Greater part of lateral fins located on tail section. Thick rays absent in lateral and caudal fins. Gut diverticula present. Inner nuclear eye zone smaller than peripheral one. Hooks and teeth not serrated.

A single species is benthopelagic (Sea of Japan).

Genus *Entokrohnia* **gen. nov.**

Type species: *Entokrohnia entiptera* **sp. nov.**

Diagnosis. Corona ciliata located below eye level. Portion of corona ciliata situated on trunk section smaller than its cephalic section. Fins located only on tail section. Thick rays absent in lateral and caudal fins. Gut diverticula present. Inner nuclear eye zone smaller than peripheral one. Hooks and teeth not serrated.

Comparative remarks. *Entokrohnia* **gen. nov.** differs: 1) from *Aberrospadella* in having the lateral fins only on the tail section

and 2) from *Tokiokaispadella* in having the corona ciliata located below the eye level and in the absence of thick rays in the lateral and caudal fins.

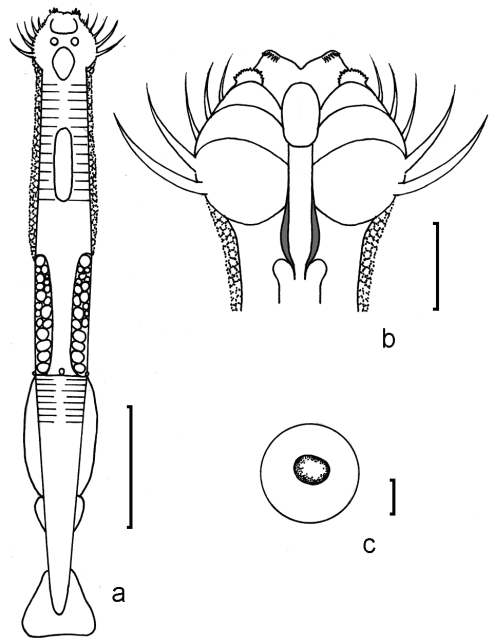
Entokrohnia entiptera **sp. nov.**

(Figs 1a–c, 2, 3)

Holotype. Inventory No. ENTOKR-1/1. south-west Pacific, 16°39'S 168°28'E. RV «Akademik Nesmeyanov», station 1, sample 1, horizon 100–0 m over depth 1020 m, plankton sample using Jeddy net, 4 Apr. 1990; Pacific Institute of Oceanography, Far East Division, Russian Academy of Sciences, Vladivostok.

Paratypes. 29 specimens from the same sample as holotype in the same collection.

Diagnosis. Corona ciliata short, located below eye level. Portion of corona ciliata situated on trunk section smaller than its cephalic section. Seminal vesicles elongate, contacting both pairs of lateral fins, but far from tail fins. Seminal vesicles very simple,



Figs 1 a–c. *Entokrohnia entiptera* **sp. nov.** (specimens at 4th maturity stage, holotype): habitus (a); head region (b); eye (c). Scale bar: 1 mm (a), 2 mm (b), 0.3 mm (c)

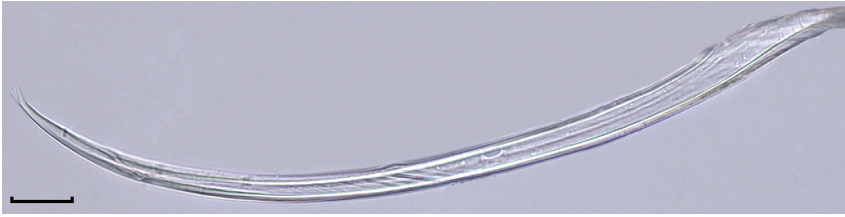


Fig. 2. *Entokrohnia entiptera* sp. nov. (specimen at 2nd maturity stage, paratype): first hook. Scale bar: 0.06 mm.

differing from those in Sagittidae by the absence of any internal structure.

Description (holotype). Transverse muscle (phragma, apparently supercontraction) in trunk 39% of entire trunk length, and transverse muscle in tail 16.4% of entire tail region length. Body rigid and muscular. Head nearly square, wide, broader than trunk. Trunk narrow; no considerable narrowing in region of seminal receptacles. Trunk region non-transparent, dark brown. Terminal end of body not sharp.

Body length 5 mm. Head section short, 10.3% of entire body length. Tail section 39.4%, ventral ganglion 11.8% of entire body length. Distance between anterior end of trunk-head septum and anterior end of ventral ganglion nearly 1.3 times shorter than length of ventral ganglion. Protuberances around mouth without papillae. Gut with small diverticula. One pair of rows of hooks, and two pairs of rows of teeth on head. Hooks (5 on left side and 7 on right side) without unguiculus and not serrated (Fig. 2). Front teeth (7 on left side and 8 on right side) apically located. Posterior teeth: 14 or 15 on each side. One pair of fins on lateral fields. Fins located only on tail section. Thick rays absent in lateral and caudal fins. Length of lateral fins 39.4% of body length and 50% of tail section length. Tail fin about 7.4% of body length and 19% of tail section length. Posterior end of tail fin concave (lyre-shaped) as in *Pseudosagittilyra* (Krohn, 1853). Ovaries 39% of trunk section length, containing numerous mature eggs set in one row. Ovarian eggs large ($\text{Ø} = 0.075\text{--}0.125$ mm). The specimen is

at the 4th maturity stage. Seminal vesicles elongate, contacting both pairs of lateral fins, but far from tail fins. Seminal vesicles very simple and differ from those in Sagittidae by the absence of any internal structure. Corona ciliata (elongated, without gyri) located below eye level, nearly equally situated on head and trunk section. Alveolar tissue fringes neck, ventral and dorsal body nearly to middle trunk region. Eyes rounded, with dark pigmented zone in the center of eye. Terminal end of body not sharp.

Remarks. 29 specimens at the 1st, 2nd and 3rd maturity stages were found in the same sample as the holotype and are kept in the same collection. The paratypes at the

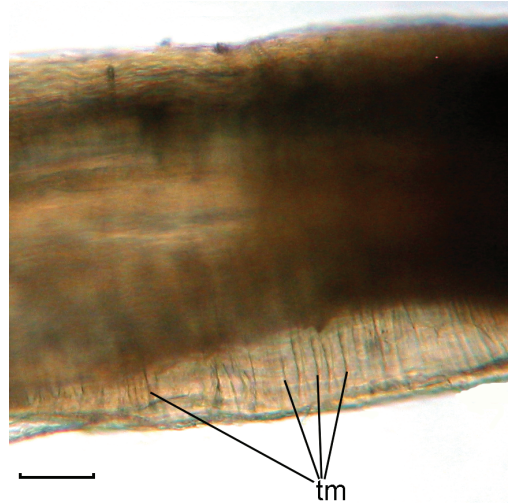


Fig. 3. *Entokrohnia entiptera* sp. nov. (specimen at 2nd maturity stage, paratype): trunk section (dorsal view), part with transverse muscle (*tm*). Scale bar: 0.1 mm.

1st and 3rd maturity stages are without defects. Specimens at the 2nd maturity stage have traces of lysis of the muscles. This defect shows some resemblance to the abnormality of the chaetognath species which was described from a volcanic bay (Kraternaya Bay, Ushishir Island) (Kassatkina, 1995; Kasatkina & Stolyarova, 2010). This fact can probably be attributed to some influence of geophysical activity in this region in the south-west Pacific Ocean, where the samples of this plankton chaetognath were collected.

Etymology. From Latin: enti (transparent) and from Greek: ptera (wing).

ACKNOWLEDGEMENTS

The study was supported by the Far Eastern Branch of Russian Academy of Sciences no. 06-III-A-07-253.

REFERENCES

- Bieri R.** 1995. Krohnitellidae and Bathybellidae, new families in the phylum Chaetognatha; the rejection of the family Tokiokaispadellidae, Zahonya and Aberrospadella. *Proceedings of the Biological Society of Washington*, **102**: 973–976.
- Kassatkina A.P.** 1995. Mass abnormalities in plankton of Far-Eastern Seas and adjacent waters of the Pacific Ocean. *Dokladi Akademii Nauk SSSR*, **345**(6): 845–848. (In Russian).
- Kasatkina A.P.** 2003. Genera and species of arrowworms of the order Phragmophora (Chaetognatha). *Russian Journal of Marine Biology*, **29**(1): 1–2.
- Kassatkina A.P.** 2011. Three new species, two new genera and family Biphragmosagittidae fam.nov. (Chaetognatha) from south-west Pacific with the presumed evolutionary pathway. *J. Zoosystematica Rossica*, **20**(1): 161–173.
- Kassatkina A.P.** 2012. *Shchetinkochelyustnyye (Chaetognatha) zapadnoy chasti Tikhogo okeana (morfologiya, sistematika, filogeniya)* [Chaetognatha of the western Pacific Ocean (morphology, systematics and phylogeny). Abstract of Dissertation Doctor Sci. (Biol.). Vladivostok: Il'ichev's Pacific Institute of Oceanography, Far East Division, Russian Academy of Sciences. 35 p. (In Russian).
- Kassatkina A.P. & Stolyarova M.V.** 2010. *Morfologiya, taksonomiya, ekologiya shchetinkochelyustnykh Yaponskogo morya i so-predel'nykh akvatoriy* [Morphology, taxonomy, and ecology of Chaetognatha of the Sea of Japan and adjacent regions]. Vladivostok: Dalnauka. 250 p. (In Russian).
- Molchanov L.A.** 1909. Die Chaetognathen des Schwarzen Meeres. *Bulletin de l'Academie Imperiale des Sciences de St.-Petersbourg*, **6**: 887–902.
- Salvini-Plaven L., von.** 1986. Systematic notes on *Spadella* and on the Chaetognatha in general. *Zeitschrift für Zoologische Systematik und Evolutionsforschung*, **24**: 122–128.
- Tokioka T.** 1965a. The taxonomical outline of Chaetognatha. *Publications of Seto Marine Biological Laboratory*, **12**(5): 335–357.
- Tokioka T.** 1965b. Supplementary notes on the systematic of Chaetognatha. *Publications of Seto Marine Biological Laboratory*, **13**(3): 231–242.

Received February 4, 2012 / Accepted December 10, 2012