On two cephalaspid molluscs (Gastropoda: Opisthobranchia) with two gizzard plates, and description of a new genus and a new family

О двух видах заднежаберных моллюсков отряда Cephalaspidea (Gastropoda: Opisthobranchia) с двумя пластинками в гиззарде, с описанием нового рода и нового семейства

E.M. Chaban* & P.V. Kijashko

Е.М. Чабан, П.В. Кияшко

E.M. Chaban, Zoological Institute, Russian Academy of Sciences, 1 Universitetskaya Emb., St Petersburg 199034, Russia. E-mail: echaban@zin.ru

P.V. Kijashko, Zoological Institute, Russian Academy of Sciences, 1 Universitetskaya Emb., St Petersburg 199034, Russia. E-mail: kija@zin.ru

The morphology of the soft body of two unique cephalaspid species, *Eoscaphander fragilis* Habe, 1952 and *Cylichna magna* Lemche, 1941, having two gizzard plates in their gizzards, is studied. Taxonomic position of both the species is discussed. The morphology of *E. fragilis* is described and illustrated for the first time. The species belongs to the monotypic genus which was considered previously as a junior synonym of the genus *Scaphander*. Feeding of *E. fragilis* on sponges is registered. A new monotypic genus, *Pseudocylichna* **gen. nov.**, is described for *Cylichna magna*. Morphological differences of the gizzard plates and gizzard walls of the genera mentioned before are shown. Both the genera are placed in a new family Eoscaphandridae **fam. nov.** based on their pair gizzard plates and the division of the gizzard wall into four segments by tendons of the connective tissue.

Изучена морфология мягкого тела двух уникальных видов заднежаберных моллюсков с двумя жевательными пластинками в жевательном желудке: *Eoscaphander fragilis* Habe, 1952 и *Cylichna magna* Lemche, 1941. Морфология *E. fragilis* описана и проиллюстрирована впервые, вид относится к монотипическому роду, который ранее считался младшим синонимом рода *Scaphander*. Отмечено питание *Eoscaphander fragilis* губками. Описан новый монотипический род *Pseudocylichna* **gen. nov.** с типовым видом *Cylichna magna* Lemche, 1941. Показаны морфологические отличия жевательных пластинок и стенок жевательного желудка у представителей вышеназванных родов. Оба рода отнесены к новому семейству Eoscaphandridae **fam. nov.** на основе парных жевательных пластинок и подразделения стенки гиззарда на четыре сегмента за счёт обособленных тяжей соединительной ткани.

Key words: opisthobranch molluscs, morphology, taxonomy, north-western part of Pacific Ocean, north of Atlantic Ocean, Eoscaphandridae, *Eoscaphander*, *Pseudocylichna*, new family, new genus

Ключевые слова: заднежаберные моллюски, морфология, таксономия, северо-западная часть Тихого океана, северная часть Атлантического океана, Eoscaphandridae, *Eoscaphander*, *Pseudocylichna*, новое семейство, новый род

**Corresponding author.*

INTRODUCTION

Eoscaphander fragilis Habe, 1952 is a type species of the monotypic genus *Eoscaphander* Habe, 1952. The species was described from the Pacific coast of the north Honshu. Habe (1952) noted a similarity of the species with the European *Scaphander lignarius* (Linnaeus, 1758), type spices of *Scaphander* Montfort, 1810, in "general appearance" and differences in their radula. Brief data only on internal morphology of *Eoscaphander fragilis* were published (Chaban, 1999a). The species was mentioned in the binomen with *Eoscaphander* (Habe, 1964; Higo et al., 1999; Hasegawa, 2001; 2009) or with *Scaphander* (Bouchet, 2015a). The last case reflects the synonymy of *Eoscaphander* with *Scaphander* (Valdés, 2008; Rosenberg et al., 2012; Eilertsen & Malaquias, 2013) and the position of the species in the family Scaphandridae G.O. Sars, 1878.

Cylichna magna Lemche, 1941 is described from the North Atlantic. It has the similarity with species of *Cylichna* Lovén, 1846 in shell and radula morphology, and is mentioned usually as belonging to *Cylichna* in the family Cylichnidae H. Adams et A. Adams, 1854 (Lemche, 1956; Schiøtte, 2005; Bouchet & Gofas, 2014). The internal morphology of *Cylichna magna* was studied by Lemche (1956) in detail.

The both species, *Eoscaphander fragilis* and *Cylichna magna*, share the unique character: two plates in their gizzards with corresponding differences of the gizzard wall. No more cephalaspids have the same number of the gizzard plates. The radula structure with the formula 2:1:1:1:2 is another common character of the both species. Chaban (1999a, b) proposed to combine both the species into the common genus *Eoscaphander* and to relocate the genus into the family Cylichnidae.

In the subsequent comparative morphological study of the radula and gizzard of the both species it was found that *Cylichna magna* differs considerably from *Eoscaphander fragilis* in the morphology of radula teeth, in the form of the gizzard plates, and the composition of the gizzard wall. Therefore, *C. magna* belongs to a new genus *Pseudocylichna* **gen. nov**. The gizzard wall of the both species is divided into four segments by the tendons of the connective tissue, and this character previously was known for Runcinacea only. A new family, Eoscaphandridae **fam. nov.**, was erected based on the mentioned character of the gizzard wall and two gizzard plates of the both genera. This paper presents the description of the new genus for *Cylichna magna* and the new family for both *E. fragilis* and *C. magna*, the description of the soft body morphology of *E. fragilis* and the discussion of the taxonomic position of both the genera and the new family.

MATERIAL AND METHODS

The material examined was collected during the Russian expeditions of the research vessel "Vityaz'" in the Kuril-Kamchatka Trench in 1966 (*Eoscaphander fragilis*) and the icebreaker "Ob" in the Greenland Sea in 1956 (*Cylichna magna*).

Several specimens of *Cylichna alba* (Brown, 1827), *Cylichnoides scalptus* (Reeve, 1855) from the Kara Sea (73°27′N, 80°00′E, 34 m depth, 6 Aug. 1931, coll. G.P. Gorbunov) and *Scaphander punctostriatus* (Mighels et Adams, 1842) from the Barents Sea (68°25′N, 38°29′E, 50 m depth, research vessel "Diana", 12 July 1955, station 46A) were studied for the comparison.

The gizzard plates, gizzard and head penial complex were examined using the light microscopes: Leica DM LS2, Leica DME and (Zeiss) Opton. The structure of the gizzard wall was studied at temporary preparations of sections. The shells and gizzard plates were photographed by the camera Olympus Pen PL1.

The radula and shell of each species were viewed by FEI SEM Quanta-250 scanning electron microscope. The radulae were cleaned from adjacent tissues in sodium hypochlorite, washed in water and air-dried.

All studied specimens of *E. fragilis* and *C. magna* are stored in the Zoological Institute, Russian Academy of Sciences (ZISP) for a long time being fixed with 70% ethanol, and therefore they were studied without molecular-genetic analysis.

Abbreviations:

ZISP – Zoological Institute, Russian Academy of Sciences, St Petersburg, Russia

ZMUC – Zoological Museum of the University of Copenhagen, Denmark

RESULTS

Order **CEPHALASPIDEA**

Family **EOSCAPHANDRIDAE fam. nov.**

Type genus: *Eoscaphander* Habe, 1952.

Diagnosis. Shell external, involuted, oval or cylindrical, with visible body whorl and sunken spire; spiral sculpture composed of spiral grooves. Radula 2:1:1:1:2, with denticulated bilobate rachidals. Gizzard with two oval plates of equal form and size; gizzard wall divided into four segments by tendons of connective tissue.

Composition. The new family includes the genera *Eoscaphander* Habe, 1952 and *Pseudocylichna* **gen. nov.**

Genus ***Eoscaphander*** Habe, 1952

Type species: *Eoscaphander fragilis* Habe, 1952, by original designation; recent.

Diagnosis. Shell large, oval, with visible body whorl and sunken spire; apical umbilicus closed; radula 2:1:1:1:2; bilobate rachidals well developed and equipped with several rows of numerous sharp denticles; laterals equipped with densely located numerous short denticles arranged in several lines; gizzard with two large oval square plates of equal form and size; plates slightly concave; gizzard wall with thickening of circular muscles between plates and divided into four segments by tendons of connective tissue. Copulative apparatus very short, embedded into body wall, and not protruded into head cavity.

Notes. *Eoscaphander* is a monotypic genus. It differs from all cephalaspids (excluding individuals of *Pseudocylichna* **gen. nov.**) in the number of the gizzard plates. This genus differs from *Pseudocylichna* **gen. nov.** and *Scaphander* in the shape of the rachidal teeth and in the morphology of the gizzard wall and the copulative apparatus. The gizzards of *Scaphander punctostriatus* (Mighels et Adams, 1842) (Fig. 1f) and *Scafander lignarius* (Linnaeus, 1758) have three different plates, two of which are paired. The paired plates are rotated in opposite directions and the muscles between the paired plates and an unpaired plate are oblique.

Eoscaphander fragilis Habe, 1952 (Figs 1, 2, 4d)

Eoscaphander fragilis Habe, 1952: 75, 76, text–fig. 7, 8; 1954: 307, pl. 38, fig. 28; 1964: 140, pl. 43, fig. 21; Chaban, 1999a: 41; Higo et al., 1999: 392; Habe, 2001: 975, text–figs 7, 8; Hori, 2000: 741, pl. 369, fig. 1; Hasegawa, 2001: 153; 2009: 354–355, figs 423–426; Chaban & Martynov, 2006: 254–255, pl. 126, fig. J.
Scaphander fragilis: Bouchet, 2015a.

Type locality: Kashima-Nada, Ibaraki Prefecture, (35°59.00´N, 140°59.25´E), 216 m (Pacific coast of the north Honshu).

Holotype, NSMT-Mo 50263 (National Sciences Museum, Tokyo), not examined.

Material examined. **Japan**: entrance to Tsugaru Strait, 13 Sept. 1953, R/V "Vityaz", station 4053, depth 290 m, mud, 6 specimens. **Russia**: Kuril-Kamchatka Trench, 10 Sept. 1966, R/V "Vityaz", station 5641, depth 485–492 m, 14 specimens, 2 shells; South Kurile Is, 10 Sept. 1991, R/V "Akademik Oparin", station 94, 43°10´N, 146°18´E, depth 535 m, muddy sand, coll. A.V. Smirnov, 1 specimen.

Description. Shell large (length up to 33 mm), oval, white, covered with thin yellow periostracum, with visible body whorl and sunken spire; apical umbilicus closed; apex oblique truncated. Aperture as long as shell, wider anteriorly and narrower posteriorly; outer lip thin, slightly convex; internal lip S-like curved; parietal end of inner lip covered with callus, columella thickened, without fold. Growth lines slightly visible;

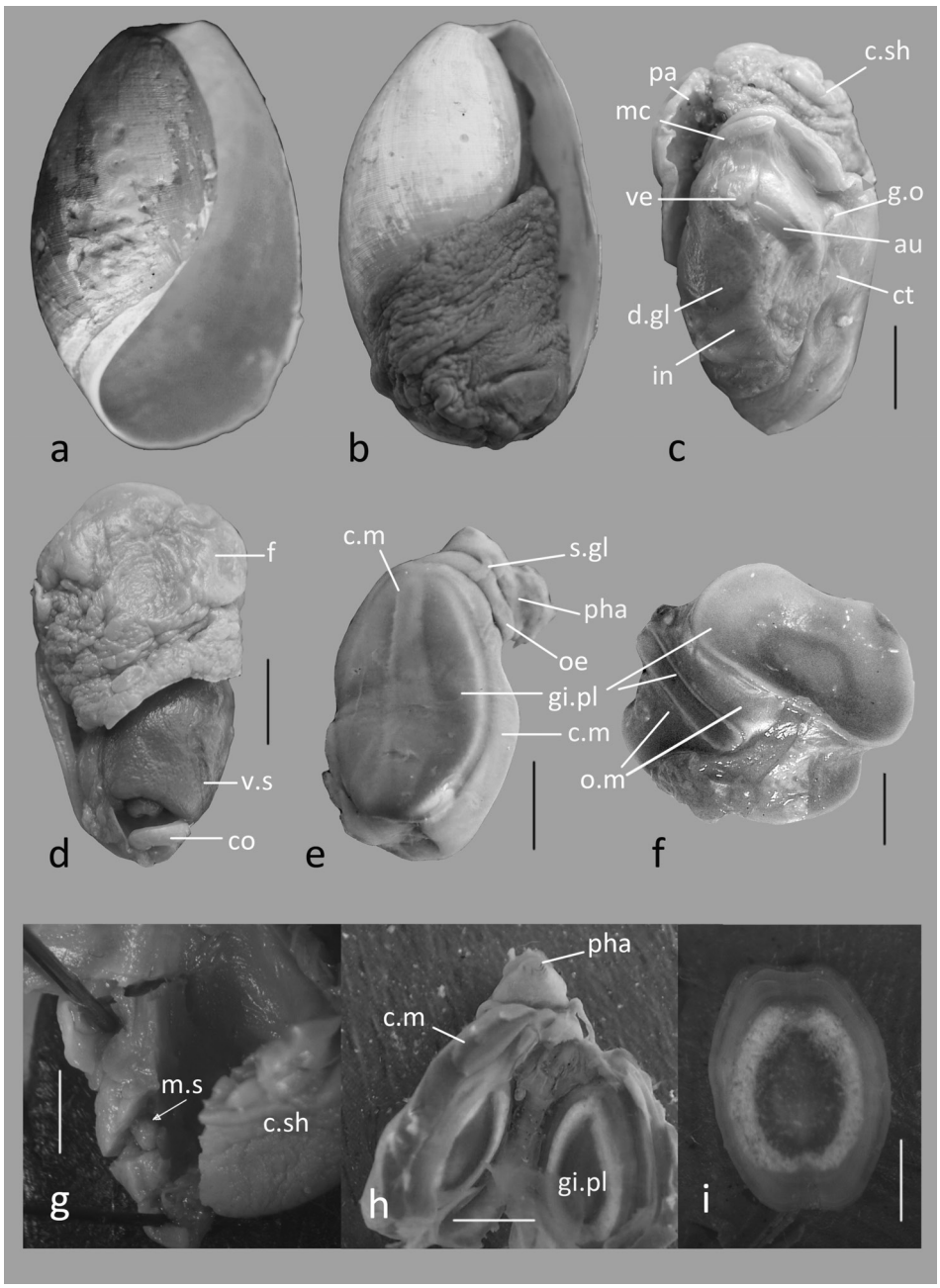

Fig. 1. *Eoscaphander fragilis* (**a**–**i**) and *Scaphander punctostriatus* (**f**). Shell, ventral view, height 33 mm (**a**); specimen, ventral view, height 25 mm (**b**); soft body, dorsal view (**c**), ventral view (**d**); part of digestive system, dorsal view (**e**); dissected anterior part of body (digestive system extracted) for demonstration of copulative apparatus (indicated by the arrow) in body wall (**g**); dissected gizzard (**h**); gizzard plate (**i**); gizzard (**f**); *au* – auricle, *c.m* – circular muscle fibers, *co* – pallial coecum, *c.sh* – cephalic shield, *ct* – ctenidium, *d.gl* – digestive gland, *f* – foot, *gi.pl* – gizzard plates, *g.o* – genital opening, *in* – intestine, *mc* – mantle commissure, *m.s* – copulative apparatus, *oe* –oesophagus, *o.m* – oblique muscle fibers, *pa* – parapodia, *pha* – pharynx, *s.gl* – salivary gland, *ve* – ventricle, *v.s* – visceral sac. Scale bars: 5 mm (c, d), 4 mm (g, h), 3 mm (e, f), 2 mm (i).

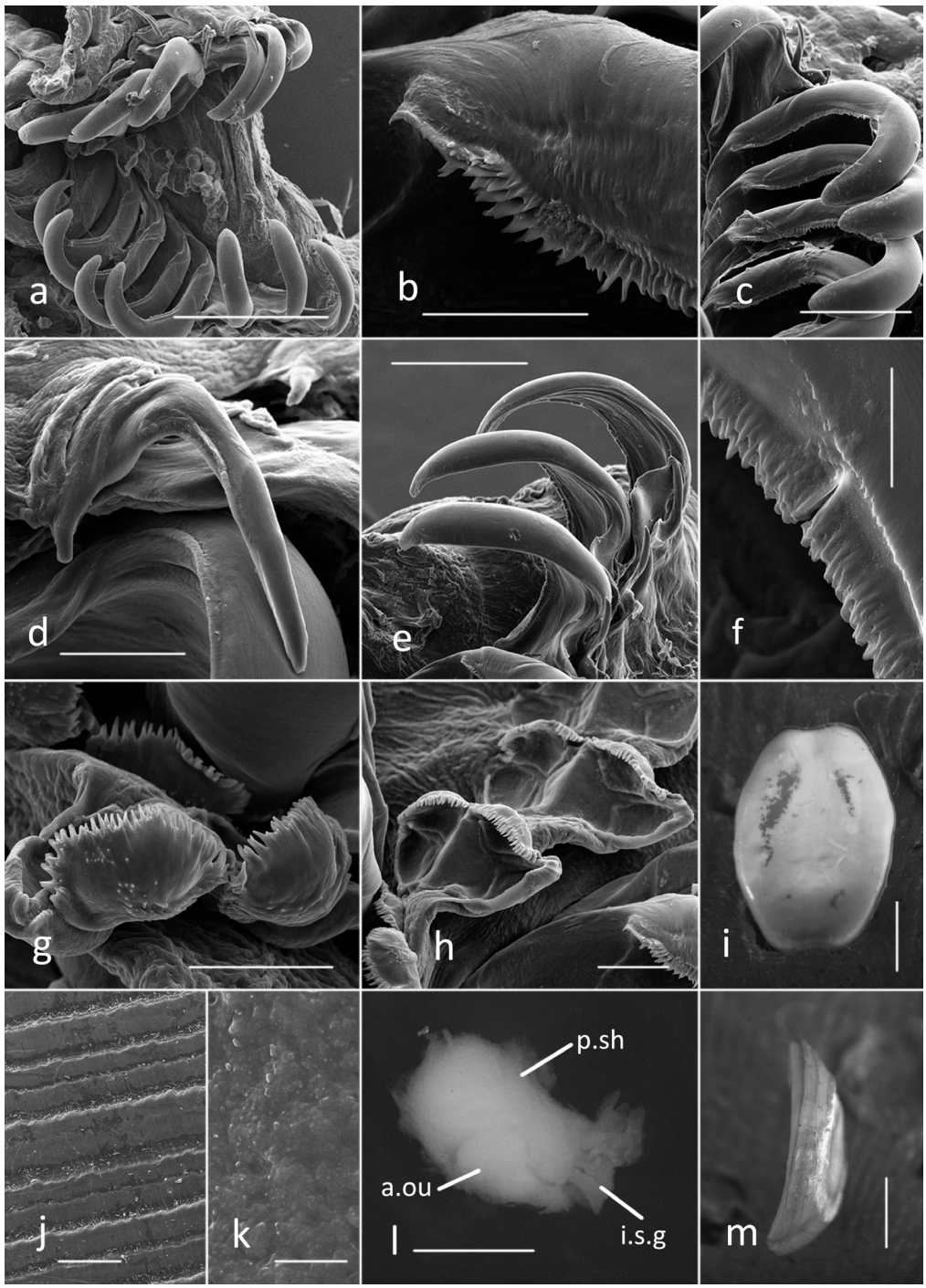

Fig. 2. *Eoscaphander fragilis*. Radula **(a–h)**, internal lateral teeth **(b, c, f)**, denticles of internal lateral teeth **(b, f)**, outer lateral tooth **(d)**, rachidian teeth **(g, h)**; gizzard plates, outer surface **(i, k)** abd lateral view **(m)**; shell spiral sculpture **(j)**; copulative apparatus **(l)**; *a.ou* – additional outgrowth, *i.s.g* – internal seminal groove, *p.sh* – penial sheath. Scale bars: 10 μm (k), 20 μm (f), 40 μm (b), 50 μm (d, g, h), 200 μm (c, j, e), 500 μm (a), 1 mm (l), 2 mm (i, m).

spiral sculpture developed and composed of deep frequent spiral grooves (about 6 per 1 mm), wide grooves alternated with narrow one (Fig. 2j).

Anatomy. Headshield of preserved specimens wide, contracted, folded; lateral posterior corners extended. Food with small parapodia, eyes not visible. Ctenidium and others structures of pallial cavity well developed and visible through thin mantle (Fig. 1c). Pallial coecum well developed (Fig. 1d) and not fixed to visceral sac.

Radula 16×2:1:1:1:2, bilobate rachidals well developed and equipped with several rows of numerous sharp denticles (Figs 2g–h); lateral teeth very large, brown, flexible and equipped with densely located numerous short denticles arranged in several lines (Fig. 2b); marginals very small and visible under a microscope only.

Gizzard well developed, flat, with two gizzard plates (Figs 1e, h). Gizzard plates large, brown, square-oval, convex and slightly asymmetrical in outline, with small impressions at their ends, both of equal size and form, up to 9.0 mm height and 5.5 mm width. Gizzard plates of the largest specimen more oval and elongated. Central shabby part of gizzard plates separated from smooth periphery with narrow light zone (Fig. 1i). Gizzard with envelope of circular muscles which strongly thickened between plates. Envelope divided into four parts with four tendons of connective tissue (Fig. 4d). Tendons covered periphery of wider parts of gizzard; thin segments of circular muscles looking as longitudinal strips (Fig. 1e).

Copulative apparatus very small (2 mm in length), oval and not protruded from body wall to head cavity (Fig. 1g). It includes: 1) short sac-form atrium with incurrent seminal groove and muscle folds; 2) small additional outgrowth (seminal vesicle?) at lateral side of the atrium (Fig. 2l).

Bionomics. The gizzard of the specimen from the Tsugaru Strait was filled with tissue and three-branched spicules of sponges.

Distribution. The species is distributed from the Pacific coast of the northern part of Honshu to the southern Kuril Islands. Molluscs were collected at a depth of 100–1056 m, in muddy sand (Habe, 1964; Hori, 2000, Hasegawa, 2009; and the original data).

Comparison. The species is easily distinguished from other *Scaphander*-like molluscs from the northwestern Pacific by its large size, the shell closest to the same of *S. lignarius* and the non-punctured spiral sculpture.

Genus ***Pseudocylichna*** **gen. nov.**

Type species: *Cylichna magna* Lemche, 1956; recent.

Diagnosis. Shell cylindrical with sunken spire, apical umbilical closed; radula 2:1:1:1:2; rachidals bilobate with denticulate cutting edge, denticles arranged in one line; laterals equipped with rare uneven denticles dispersed in one line. Gizzard with two large, constricted to one end, elongated gizzard plates of equal shape and size; gizzard wall without thickening of circular muscles between plates; internal lining of gizzard forms large folds in gizzard cavity. Copulative apparatus with simple short tubular prostate and seminal vesicle slightly protruded from body wall into head cavity.

Etymology. The name *Pseudocylichna* is composed of prefix pseudo- deriving from Ancient Greek ψευδής (pseudḗs, "false, lying"), and the name of the genus *Cylichna*.

Comparison. *Pseudocylichna* **gen.nov.** differs from all cephalaspids (excluding individuals of *Eoscaphander*) in the number of the gizzard plates and differs from *Eoscaphander* in the morphology of the radula, gizzard and copulative apparatus.

Pseudocylichna magna (Lemche, 1941), **comb. nov.**
(Figs 3, 4c)

Cylichna magna Lemche, 1941: 15–17; 1948: 43–49, 79; 1956: 240–250, pl. 1, figs 7, 8, 13, 17, pl. 3, figs 33–37, pl. 4, figs 43, 49, pl. 5, figs 54, 59, pl. 6, figs 64, 72, 73, pl. 7, figs 78, 79, 88, 89, pl. 8, figs 101, pl. 9, figs 103, 112, 113, pl.

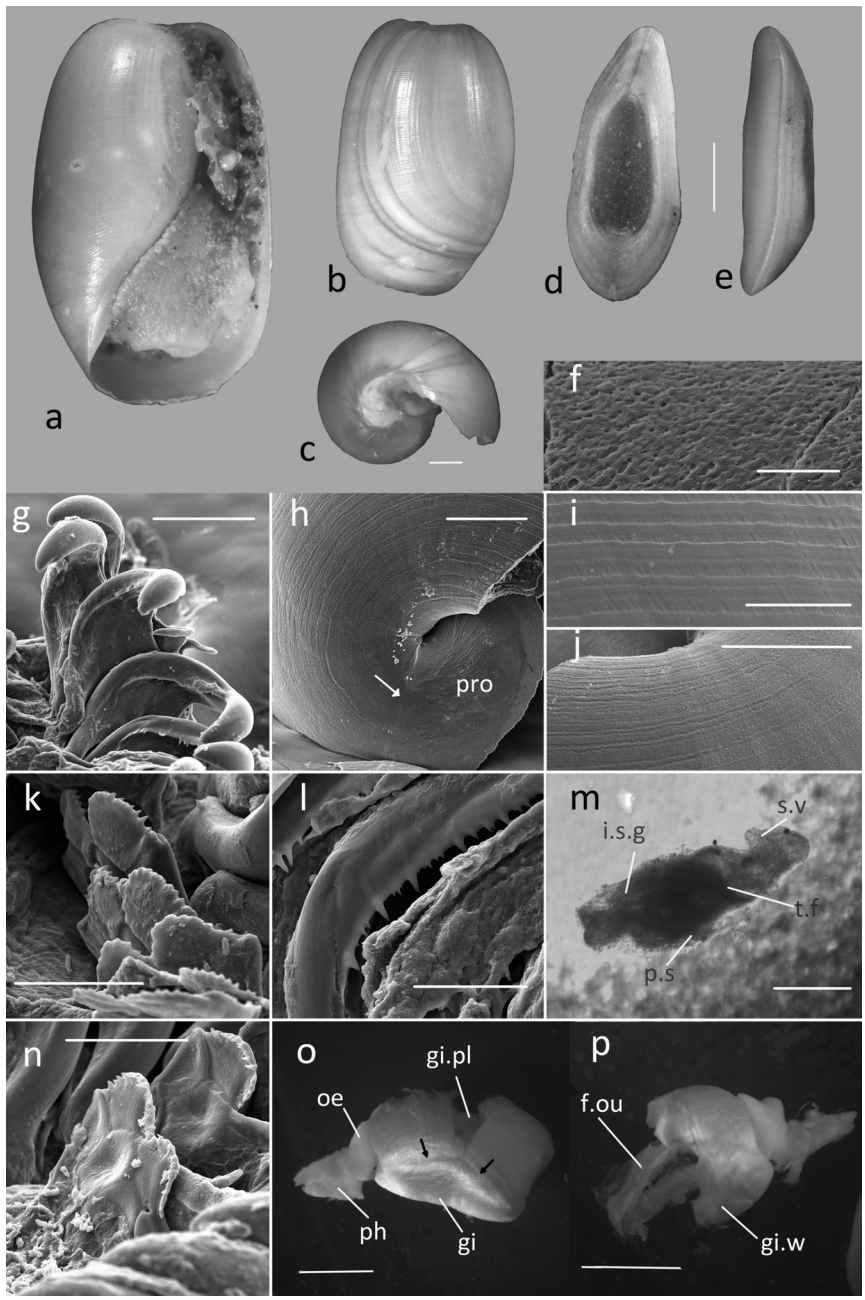

Fig. 3. *Pseudocylichna magna*. Specimen, ventral view, height 9.5 mm **(a)**, dorsal view, height 7.5 mm **(b)**, and apical view **(c)**; gizzard plate, inner view **(d)**, lateral view **(e)**, and outer surface, enlarged, SEM **(f)**; radula, rachidian tooth, dorsal surface **(k)**, ventral surface **(n)**, and denticles of internal lateral tooth **(l)**; shell sculpture of protoconch **(h)**, of first definitive whorl **(h, j)**, of body whorl **(i)**; part of digestive system **(o,p)**; border of protoconch and definitive whorl **(h)** signed with the white arrow; *f.ou* – folded outgrowth of the gizzard wall, *gi* – gizzard, *gi.pl* – gizzard plates, *gi.w* – gizzard wall, *i.s.g* – internal seminal groove, *oe* –oesophagus, *pha* – pharynx, *pro* – protoconch, *p.s* – penial sac, *s.v* – seminal vesicle, *t.f* – transverse muscular fold. Scale bars: 40 μm (l), 50 μm (f, k, n), 100 μm (g, j, h), 400 μm (i), 0.5 mm (m), 1 mm (c, d, e), 2 mm (o, p).

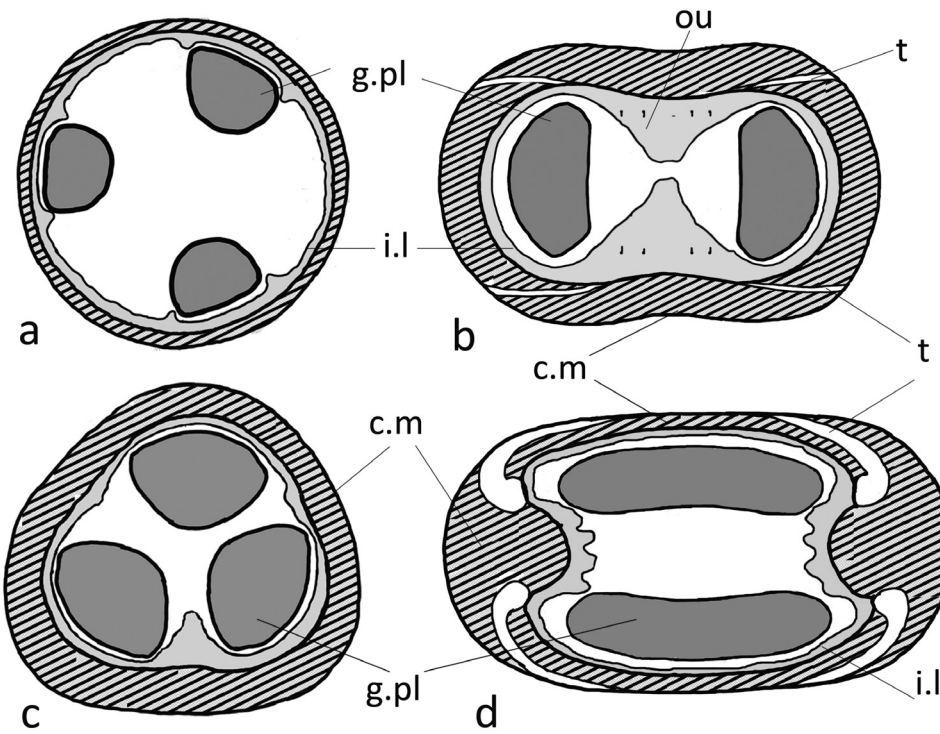

Fig. 4. Schemes of transverse sections through the gizzards of *Cylichna alba* (**a**), *Cylichnoides occultus* (**b**), *Pseudocylichna magna* (**c**), *Eoscaphandr fragilis* (**d**); *c.m* – circular muscle, gizzard plates, *i.l* – internal lining of the gizzard, *ou* – outgrowth of the gizzard wall, *t* – tendon of connective tissue.

15, fig 158, pl. 16, fig 162; Platts, 1985: 152; Schiøtte, 1989: 8, 17.

Eoscaphander magna: Chaban, 1999a: 41.

Type locality: East Greenland, Solitærbugten, Elleø, 60–65 m.

Syntype, ZMUC-GAS-611, Solitærbugten, Elleø, 60–65 m, sten, ler [stones, clay], skraber [dredge], 02 July1932, G. Thorson, East Greenland expedition, station. 284 (Schiøtte, pers. comm.), not examined.

Material examined. **Greenland Sea**: 19 Aug. 1956, icebreaker "Ob'", station 9, 78°04.40′N, 8°34.00′W, 210 m depth, clay, mud, Gorbunov trawl, coll. V.M. Koltun, 1 specimen; 27 Aug. 1956, icebreaker "Ob'", station 29, 78°57.00′N, 9°51.00′W, 243 m depth, sand, gravel, mud, coll. V.M. Koltun, 1 specimen; 28 Aug. 1956, icebreaker "Ob'", station 31, 79°28.20′N, 7°22.50′W, 230 m depth, sand, mud, coll. V.M. Koltun, 4 specimens; 28 Aug. 1956, icebreaker "Ob'", station 33.80° 31.00′N, 6°59.00′W, 250 m, stones, sand, mud, coll. V.M. Koltun, 11 specimens, 1 shell.

Description. Shell white, almost rectangular, from 5 to 15 mm in height, with sunken spire, covered with thin white periostracum (Fig. 3a–c). Growth lines well visible, spiral sculpture consists with dense spiral striations. Apex ovate truncated with small indentation without umbilicus. Aperture expanded at bottom, as long as shell, without callus on parietal wall; columella almost straight without fold; inner lip with narrow reflection (in columellar part); umbilicus absent.

Anatomy. Headshield of preserved specimen short and wide, its posterior end without extinctions; foot short and wide with small parapodia. Very large gizzard well visible dorsally, occupying almost half of body length and protrudes above dorsal surface of body. Small ctenidium lies antero-laterally.

Radula 2:1:1:1:2; rachidals bilobate with denticulate cutting edge, denticles in one line; laterals equipped with rare uneven denticles dispersed in one line; marginals small without denticulation.

Gizzard slightly flattened, with envelope of circular muscles divided into four segments by four narrow tendons. Internal lining of gizzard with large folds in gizzard cavity (Fig. 3p). These outgrowths fuse completely in anterior and posterior parts of gizzard and form pockets for two gizzard plates. Gizzard plates elongated (length – 4 mm; width – 1.5 mm), slightly constricted to one end, light brown on middle of inner side (surface protruding into gizzard cavity) and almost white in periphery; outer surface covered with connective tissue matrix (Fig. 3f).

Copulative apparatus (Fig. 3m) very small (1.3 mm for specimen 9.5 mm in length) and consists of small prostate which opens into posterior end of elongated penial atrium including internal seminal groove which lies between strong muscular folds. Prostate ends with seminal vesicle. Boundary between prostate and penial sac marked by constriction and transverse muscular fold (Fig. 3m).

Bionomics. The specimens of *Pseudocylichna magna* were collected by V.M. Koltun in the Greenland Sea at a depth of 210–250 m on sand and stones with mud. Lemche (1941) noted this species at a depth of 6–300 m (empty shell at a depth 405 m). Eggs and subadult specimens were collected from North Greenland and shortly described by Schiøtte (1989).

Distribution. East and West Greenland, North Island, Spitsbergen, Norwegian Sea, Beaufort Sea and Greenland Sea (Lemche, 1941; Schiøtte, 1989; 2005; Bouchet, 2015b; this study).

Remark. Detailed description and pictures of the species (as *Cylichna magna*) were given by Lemche (1956) and also it was pictured by Claude Nozères (WoRMS, 2012).

DISCUSSION

The presence of only two gizzard plates separates *E. fragilis* and *P. magna* from the all other cephalaspids (with three plates or without plates), meanwhile these species belong to the different genera mainly due to different internal lining of their gizzards. The internal lining of *P. magna* has two large folds in the gizzard cavity, which forms folded sheet between the gizzard plates and pockets for them. The internal lining of *E. fragilis* is devoid of similar folds, but its gizzard has thickenings of the muscles localized between the plates. These characters differ *Eoscaphander* from *Pseudocylichna* **gen. nov.,** and both of these genera from *Cylichna* (Fig. 4a) and *Cylichnoides* (Fig. 4b).

Lemche (1956) noted that the pallial coecum of *Pseudocylichna magna* (Lemche, 1956, as *Cylichna magna*) is much longer than in all other *Cylichna* species, and it is fixed to the visceral sac at the whole length. The pallial cecum of *Eoscaphander fragilis* is well developed also but it is not fixed to the visceral sac (Fig. 1d). *Eoscaphander fragilis* feeds on sponges (the original data) while *Pseudocylichna magna* eats foraminifera (Lemche, 1956).

Eoscaphander fragilis and *Pseudocylichna magna* can be placed into joint family due to similarity of their radula (bilobate rachidal teeth, formula 2:1:1:1:2), gizzard plates and composition of their gizzard wall which is divided into four parts by four tendons. The both species were placed previously in the family Cylichnidae (Chaban, 1999a, b). This position reflected the point of view on the two gizzard plates of the both species as a result of reduction of one of the three plates which can be seen in the families Scaphandridae, Philinidae and Acteocinidae. However most of the known species of Cylichnidae have three equal gizzard plates without tendency to reduction. According to recent data (Oskars et al, 2015), Cylichnidae is considered to be a paraphyletic family. It includes *Toledonia* Dall, 1902

(subfamily Toledoniinae, without the gizzard plates) on the one hand, and *Truncacteocina* Kuroda et Habe, 1955 on the other hand. The latter genus is a junior synonym of *Tornatina* A.Adams, 1850 having partly reduced third gizzard plate (Chaban & Martynov, 2001) and more likely belonging to the family Acteocinidae.

Most likely that the two gizzard plates of *Eoscaphander fragilis* and *Pseudocylichna magna* is a result of the reduction of two of the four plates. Among the shelled opisthobrances four gizzard plates were known for the family Runcinidae only. This family is characterized also by the undivided notum and the lack of the mantle cavity (Burn & Thompson, 1998). Taxonomic position of Runcinidae as a family in the order Cephalaspidea or as a separated order was debated for long time (Odhner, 1968; Burn & Thompson, 1998; Dayrat & Tillier, 2002). Recently the order Runcinacea was reinstated based on the result of molecular phylogenetic studies as an order with uncertain phylogenetic relationships (Malaquias et al., 2009). It is important to note the similarity of the gizzard wall composition of cephalaspids *Eoscaphander fragilis* and *Pseudocylichna magna* with the same of the runcinid mollusc *Metaruncina setoensis* (Baba, 1954) (Baba, 1967: Pl. 3, Fig. 6). The gizzard wall of the latter species was drawn by Baba (1967) as a cover of the circular muscle quartering by the four septa. Despite the fact either the two-gizzard plates is a primary state of the character or is a result of the reduction of two of the four plates, we combined both *Eoscaphander fragilis* and *Pseudocylichna magna* into the family Eoscaphandridae **fam. nov**. The new family is considered in the order Cephalaspidea due to the external morphology of *Eoscaphander fragilis* and *Pseudocylichna magna* and their laterally directed mantle cavity with the pallial coecum. Further molecular studying is needed to clarify the taxonomic position and the monophyly of the new family and its possible relationships with runcinid molluscs.

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