Ruthenica, 2014, vol. 24, No. 2: 65-73.
Published online November 24, 2014.

http: www.ruthenica.com

New findings of minute chiton of the genus *Leptochiton* (Mollusca, Polyplacophora) in Vietnamese waters

Boris SIRENKO

Zoological Institute, Russian Academy of Sciences, Universitetskaya nab. 1, 199034, St. Petersburg, RUSSIA; marine@zin.ru

ABSTRACT. *Leptochiton muelleri* Sirenko and Schwabe [2011] was known from only 7 specimens found near Sri Lanka. The author in 2010-2014 in Vietnamese waters collected the species from South to North Vietnam. *Leptochiton muelleri* turned out to be a very wide spread Vietnamese species, found from Con Dao Id. (08º39'N) to Van Don (21º02'N). This minute species was found by using a new method of collecting, described by Sirenko [2012]. It is expected that the species will have a wide distribution into the Indo West Pacific Region.

Introduction

Until present, the only species of the genus *Leptochiton* known from Vietnam was *L. vietnamensis* Sirenko [1998]. It was described from deep waters off South Vietnam. Many species of *Leptochiton* inhabit deep waters of the Indo West Pacific from 95 to 7657 m [Leloup, 1981; Kaas, 1982, 1985, 1991; Saito, 1997; Sirenko, 1998, 2001; Sigwart, Sirenko, 2012 and others] but only few species are known from the shoals near coral reefs (*Leptochiton nierstraszi* Leloup, 1981 and *L. muelleri* Sirenko et Schwabe, 2011 in the Indian Ocean, and *L. hiriensis* Schwabe et Lozouet, 2006 from the Polynesian region of the Pacific). The three latter species are very small, their body length from 1.4 to 2.5 mm.

In 2010-2014 several samples with small leptochitonids were collected in different regions of south and north Vietnam. They are conspecific with recently described *Leptochiton muelleri* from the Indian Ocean. Vietnamese specimens have small differences from the type from Sri Lanka, as described below.

Material and methods

Chitons studied here were collected in five expeditions of the Russian-Vietnamese Tropical Center in 2010-2014 by the author. The new collection method described in Sirenko [2012] was used. Valves, armature of girdle, and radula of studied specimens were boiled for 10-15 minutes in 7% KOH solution to remove organic material for scanning electron microscope (SEM). Portions of radula and girdle were embedded in Canada balm for examination under a light microscope. Several intact dry specimens were used for SEM examination. All materials are in the Zoological Institute of Russian Academy of Sciences in St. Petersburg.

Abbreviations: BL – body length. ZISP – Zoological Institute of Russian Academy of Sciences, St. Petersburg, Russia.

Systematics

Class Polyplacophora Gray, 1821
Subclass Loricata Shumacher, 1817
Order Lepidopleurida Thiele, 1909
Suborder Lepidopleurina Thiele, 1909
Family Leptochitonidae Dall, 1889

Genus *Leptochiton* Gray, 1847

Type species: *Chiton cinereus* (*sensu*) Montagu, 1803 (*non* Linnaeus, 1767) = *Leptochiton asellus* (Gmelin, 1791) *fide* Lovén [1846: 159], subsequent designation by Gray [1847: 168].

Genus distribution: Worldwide. Lower Carboniferous-Recent [Sirenko, 2013].

Leptochiton muelleri
Sirenko et Schwabe, 2011
(Figs. 1-8)

Type material. – Holotype (ZISP 2170).

Type locality. – Sri Lanka, Unawatuna (6°N, 80°14'E).

Material examined. – A total of 32 specimens from four locations.

Vietnam, Con Son Arch. Bay Canh Id., 8°40'N, 106°41'E, SCUBA, 17 m, old corals on sand, 3 spms, 11. 04. 2010, leg. B. Sirenko; Hon Ba Id., 8°40.403'N, 106°33.518'E, SCUBA, 12-13 m, on old shells, 9 spms, 13. 04. 2011, leg. B. Sirenko; Bay Canh Id., 8°39.659'N, 106°41.550'E, SCUBA, 15-17 m, old shells and corals, 3 spms, 15. 04. 2011, leg. B. Sirenko; Con Dao Id., 8°39.653'N, 106°41.557'E, SCUBA, 12-15 m, on old shells, 1 spm, 17. 04. 2011, leg. B. Sirenko; 8°44.341'N, 106°37.312'E, SCUBA, 5-12 m, old corals on sand, 2 spms, 19. 04. 2011, leg. B. Sirenko.

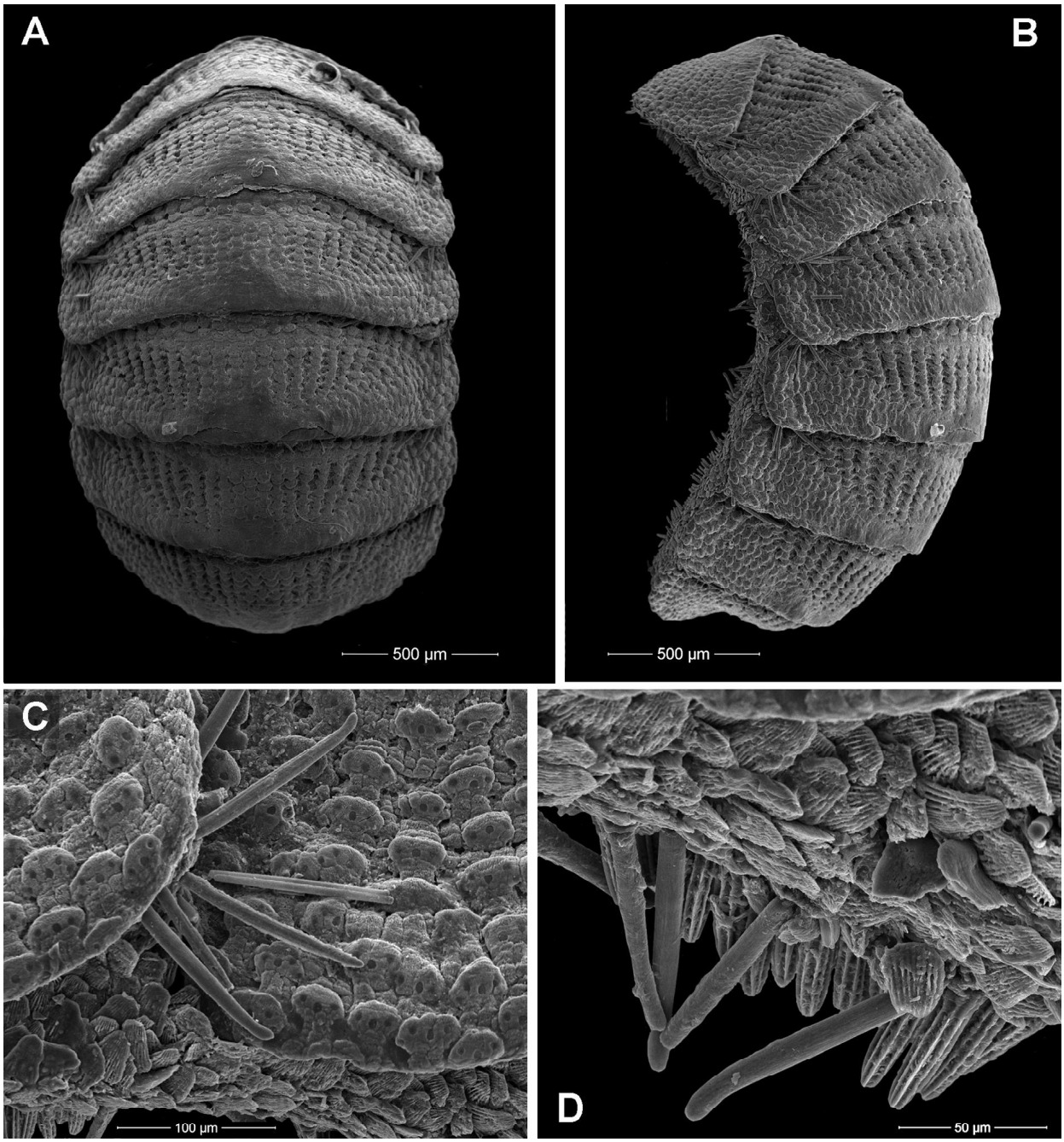

FIG. 1. *Leptochiton muelleri*, Cat Ba Id., north Vietnam, BL – 2.5 mm: A, whole animal, dorsal view; B, whole animal, lateral view; C, sutural needles; D, dorsal scales and marginal needles and scales.

РИС. 1. *Leptochiton muelleri*, о. Катба, северный Вьетнам, длина тела – 2.5 мм: A, вид животного с дорсальной стороны; B, вид животного с боковой стороны; C, межсегментные иглы; D, дорсальные чешуйки и маргинальные иглы и чешуйки.

Nha Trang Bay. Tre Id., 12°10'N, 109°19'E, SCUBA, 13-20 m, stones on sand, 1 spm, 23. 05. 2011, leg. B. Sirenko.

Gulf of Tonkin. Cat Ba Id., 20°44' 49.7"N, 107°04'9.8"E, SCUBA, 5-6 m, old shells on sand, 3 spms, 01. 05. 2012, leg. B. Sirenko; 20°47.379'N, 106°06.216'E, SCUBA, 2-4 m, bivalve shells on sand, 5 spms, 03. 05. 2012, leg. B. Sirenko; 20°46.310'N, 107°07.700'E, SCUBA, 3-4 m, bivalve shells on sand, 1 spm, 04. 05. 2012, leg. B. Sirenko; 20°45.957'N, 107°07.722'E, SCUBA, 3-4 m, old shells, 1 spm, 06.05.2012, leg. B. Sirenko; 20°45.962'N, 107°07.621'E, SCUBA, 10-22 m, bivalve on sand, 1 spm, 06. 05. 2012, leg. B. Sirenko.

Van Don. 21°02'09"N, 107°33'35.4"E, SCUBA, 6-7 m, stones, 1 spm, 03. 04. 2014, leg. B. Sirenko; 20°50'47.5"N, 107°19'19.7"E, SCUBA, 17-20 m, shells and stones on sand, 1 spm, 07.04.2014, leg. B. Sirenko.

Description. – Animal minute, body length of largest specimen 2.9 mm; elongate-oval. Valves moderately elevated (dorsal elevation 0.43 in valve V), rounded, not beaked. Color of tegmentum white.

Head valve semicircular, larger than tail valve. Intermediate valve rectangular, lateral margins nota-

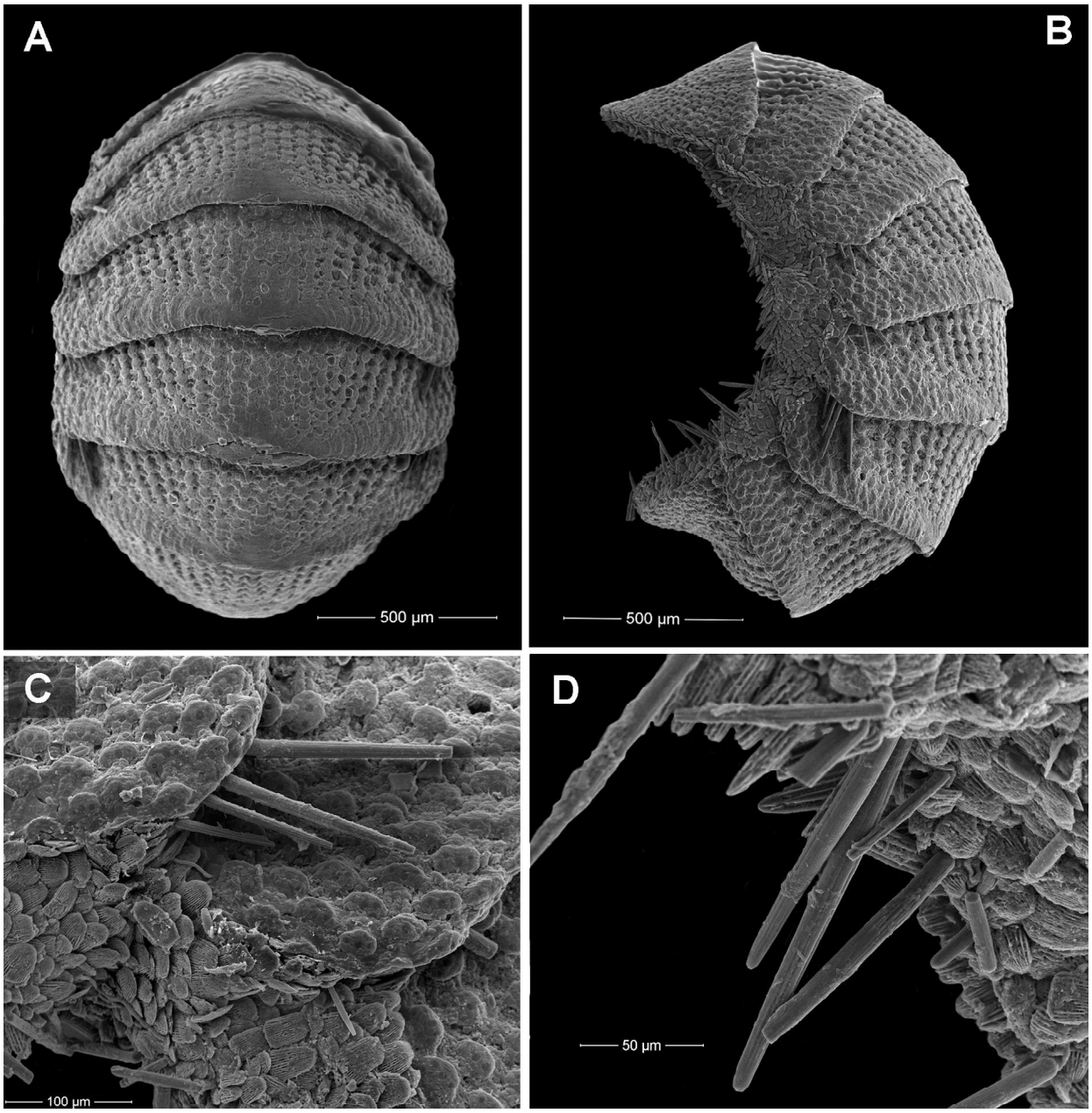

FIG. 2. *Leptochiton muelleri*, Con Dao Id., south Vietnam, BL – 2.2 mm: A, whole animal, dorsal view, B, whole animal, lateral view; C, sutural needles and dorsal scales; D, marginal needles and scales.

РИС. 2. *Leptochiton muelleri*, о. Кондао, южный Вьетнам, длина тела 2.2 мм: A, вид животного с дорсальной стороны; B, вид животного с боковой стороны; C, межсегментные иглы и дорсальные чешуйки; D, маргинальные иглы и чешуйки.

bly rounded, anterior and posterior margins nearly straight, lateral area weakly raised. Tail valve high, mucro anterior, short antemucronal slope convex, long postmucronal slope concave.

Tegmentum sculptured with oval weakly raised granules, arranged in longitudinal chains on central areas of intermediate valves and antemucronal area of tail valve, in vague radial rows on valve I and postmucronal area of tail valve and quincuncially on lateral areas of intermediate valves. There are 22 chains in central area and about 40 vague radial rows in head valve. Each granule with one mega-laesthete and four micraesthetes in front. Aesthete pores about the same size.

Articulamentum weakly developed, apophyses broadly rounded.

Girdle very narrow, dorsally densely covered with small, bluntly pointed, strongly ribbed (10-12 ribs) scales (28 x 20 µm). Intersegmental area with long smooth or rare weakly striated needles (140-200 x 8 µm) and elongate, ribbed (9 ribs) scales (42 x 15 µm). Margin armed with two different kinds of elements: 1) long needles (100-170 x 6 µm) similar to the intersegmental ones and 2) numerous

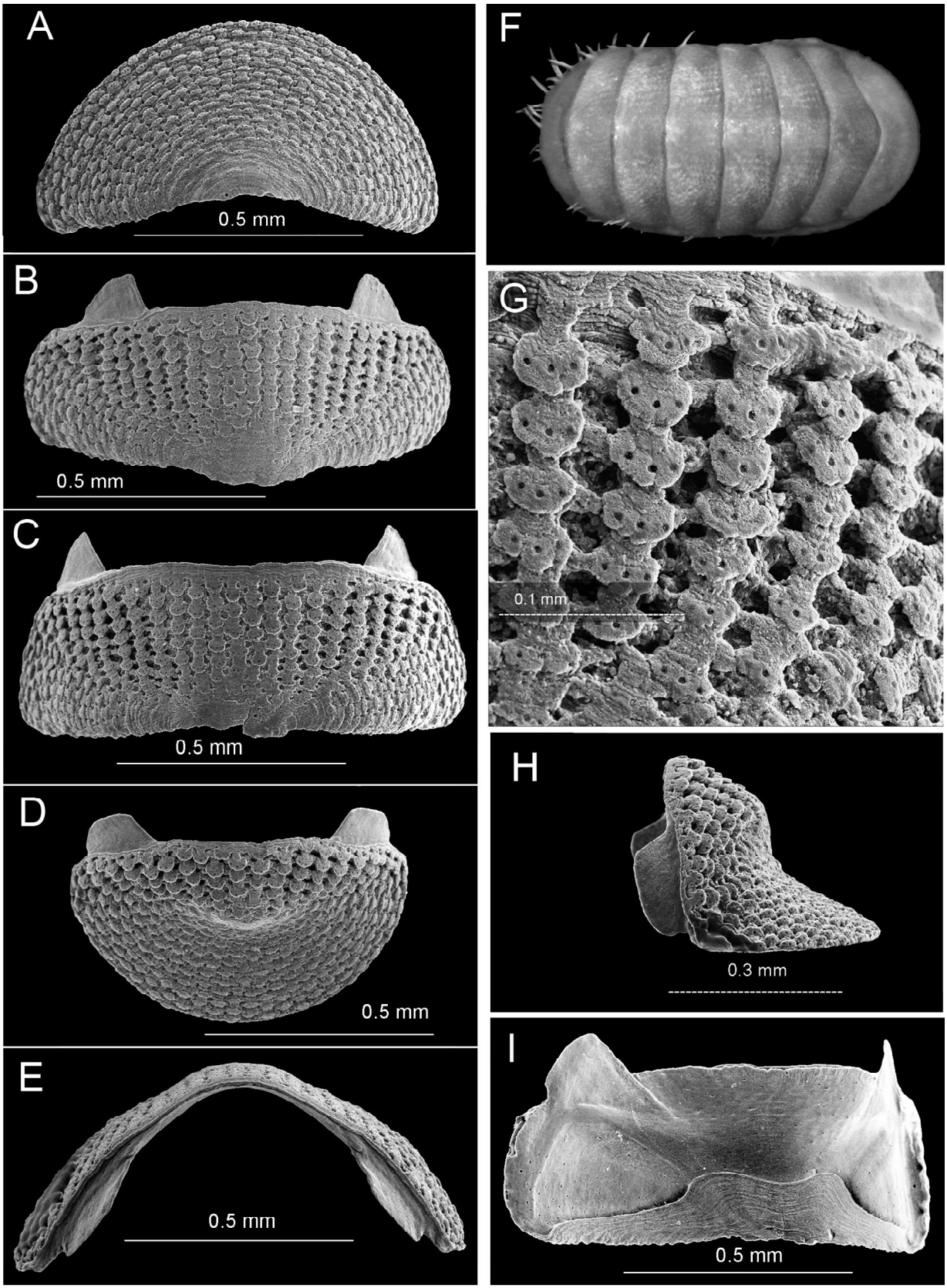

FIG. 3. *Leptochiton muelleri*, Con Dao Id., south Vietnam, BL – 2.1 mm: A, head valve, dorsal view; B, valve II, dorsal view; C, valve V, dorsal view; D, tail valve, dorsal view; E, valve V, frontal view; F, whole animal, dorsal view; G, valve V, tegmentum sculpture in central area; H, tail valve, lateral view; I, valve IV, ventral view.

РИС. 3. *Leptochiton muelleri*, о. Кондао, южный Вьетнам, длина тела 2.1 мм: A, головной щиток, вид сверху; B, второй щиток, вид сверху; C, пятый щиток, вид сверху; D, хвостовой щиток, вид сверху; E, пятый щиток, вид спереди; F, вид животного с дорсальной стороны; G, пятый щиток, скульптура тегментума на центральном поле; H, хвостовой щиток, вид сбоку; I, четвёртый щиток, вид снизу.

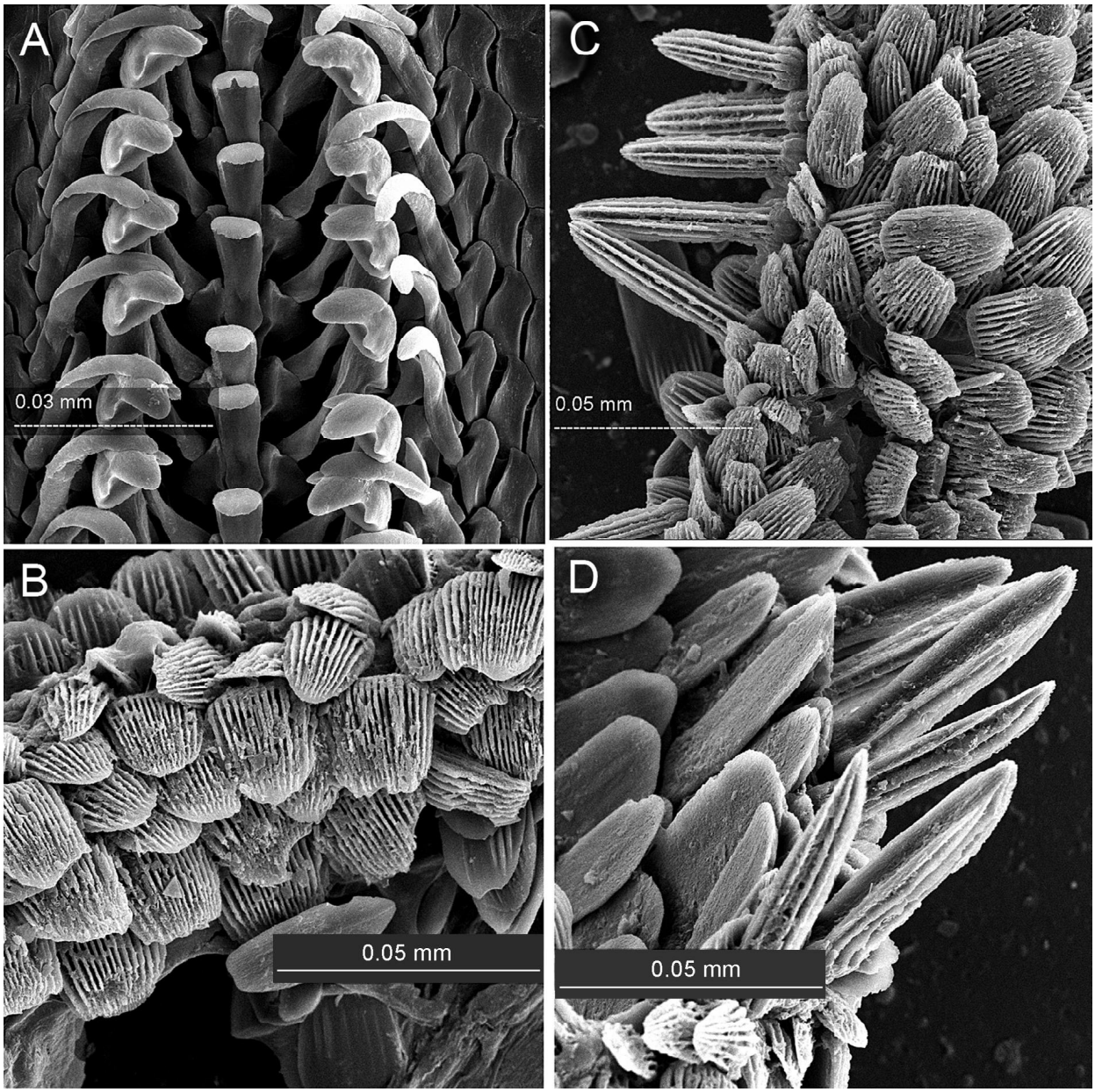

FIG. 4. *Leptochiton muelleri*, Con Dao Id., south Vietnam, BL – 2.1 mm: A, radula; B, dorsal scales; C, dorsal and marginal scales; D, ventral and marginal scales.

РИС. 4. *Leptochiton muelleri*, о. Кондао, южный Вьетнам, длина тела 2.1 мм: A, радула; B, дорсальные чешуйки; C, дорсальные и маргинальные чешуйки; D, вентральные и маргинальные чешуйки.

dorsally strongly ribbed (5 ribs) scales with sharply pointed distal end (40-50 x 9 µm). Ventrally girdle covered with elongated, distally obtusely pointed blunt scales, with 4-5 short ribs near their tip, arranged near the margin and shorter smooth scales (23 x 12 µm) in middle of girdle.

Radula of studied specimen (BL 2.9 mm) 0.8 mm long with 31 transverse rows of very small teeth, central teeth elongate, first lateral teeth short, major lateral teeth with tridentate cusp, central denticle largest.

There are 5 short gills in studied specimens arranged from valve VII to anus.

Remarks. – Vietnamese specimens of *Leptochiton muelleri* have several differences from the type specimens from Sri Lanka: 1. sutural and marginal needles smooth or rarely weakly striated in Vietnamese specimens (smooth in type specimens; 2. granules arranged in vague radial rows on head valve and postmucronal area on tail valve in Vietnamese specimens (quincuncially in type specimens); 3. sculpture of tegmentum more clearly defined in Vietnamese specimens than in the type specimens.

Habitat. – The present material shows a species preference for shallow water (4-17 m) where the

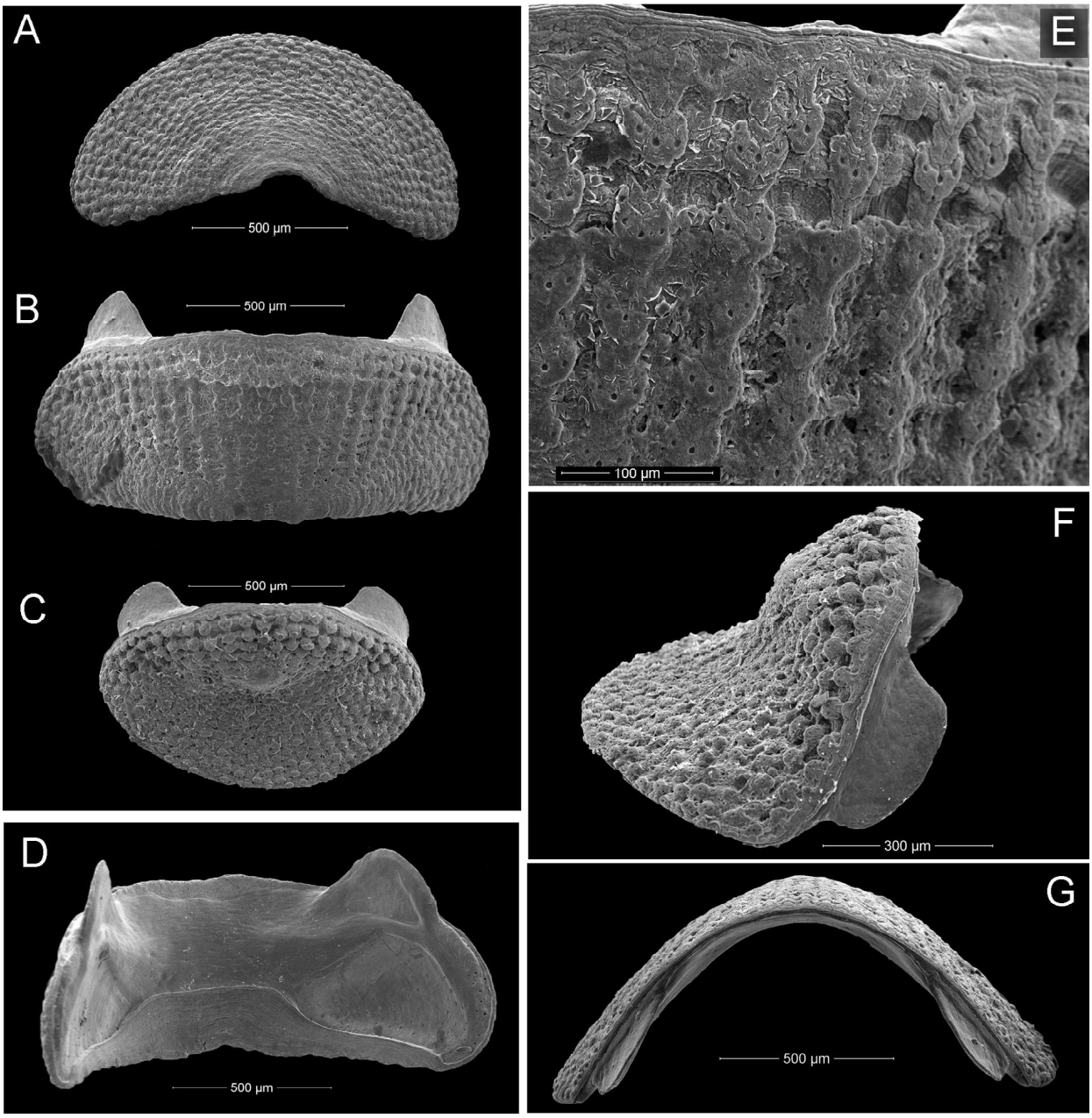

FIG. 5. *Leptochiton muelleri*, Cat Ba Id., north Vietnam, BL – 2.9 mm: A, head valve, dorsal view; B, valve V, dorsal view; C, tail valve, dorsal view; D, valve IV, ventral view; E, valve V, tegmentum sculpture in central area; F, tail valve, lateral view; G, valve V, frontal view.

РИС. 5. *Leptochiton muelleri*, о. Катба, северный Вьетнам, длина тела – 2.9 мм: A, головной щиток, вид сверху; B, пятый щиток, вид сверху; C, хвостовой щиток, вид сверху; D, пятый щиток, вид снизу; E, пятый щиток, скульптура тегментума на центральном поле; F, хвостовой щиток, вид сбоку; G, пятый щиток, вид спереди.

species is found on living and dead shells and dead corals laying on fine sand.

Acknowledgments

I would like to thank Floyd Sandford (Coe College Cedar Rapids, IA, USA) for his linguistic polishing, Alexey Miroljubov (ZISP) for his technical assistance with SEM procedures**,** Galina A. Kuznetsova (ZISP) for her help in preparation of figures and the Russian-Vietnamese Tropical center for help in collecting of materials. This research was supported by the Russian-Vietnamese Tropical Center.

References

Dall W.H. 1889. Report on the results of dredgings, under the supervision of Alexander Agassiz, in the Gulf of Mexico (1877-78) and in the Caribbean Sea (1879-80), by the U.S. coast survey steamer "Blake", Lieutenant-Commander C.D. Sigsbee, U.S.N., and Commander J.R. Bartlett, U.S.N., commanding, 29, Report on the Mollusca. 2 Gastropoda and Scaphopoda. *Bulletin of the Museum of Comparative Zoology,* 18: 1–492.

Gmelin J.F. 1791. *C. von Linnaeus' Systema Naturae,*

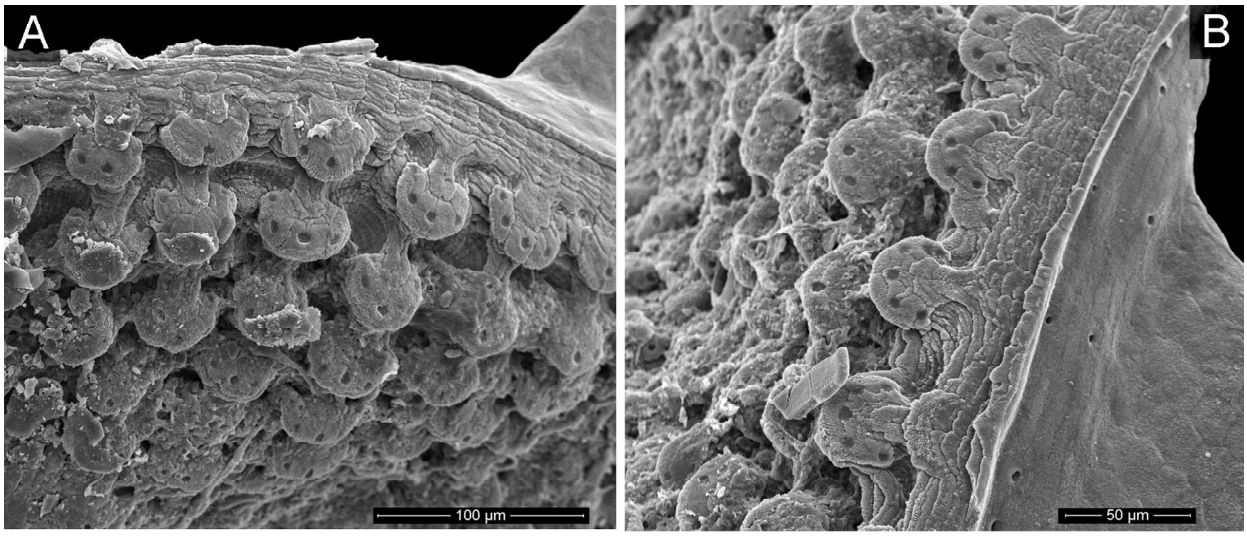

FIG. 6. *Leptochiton muelleri*, Cat Ba Id., north Vietnam, BL – 2.9 mm: A, valve V, granules on central area; B, valve V, eaves and granules with aesthete pores.

РИС. 6. *Leptochiton muelleri*, о. Катба, северный Вьетнам, длина тела – 2.9 мм: A, пятый щиток, гранулы на центральном поле; B, пятый щиток, карнизы и гранулы с порами эстетов.

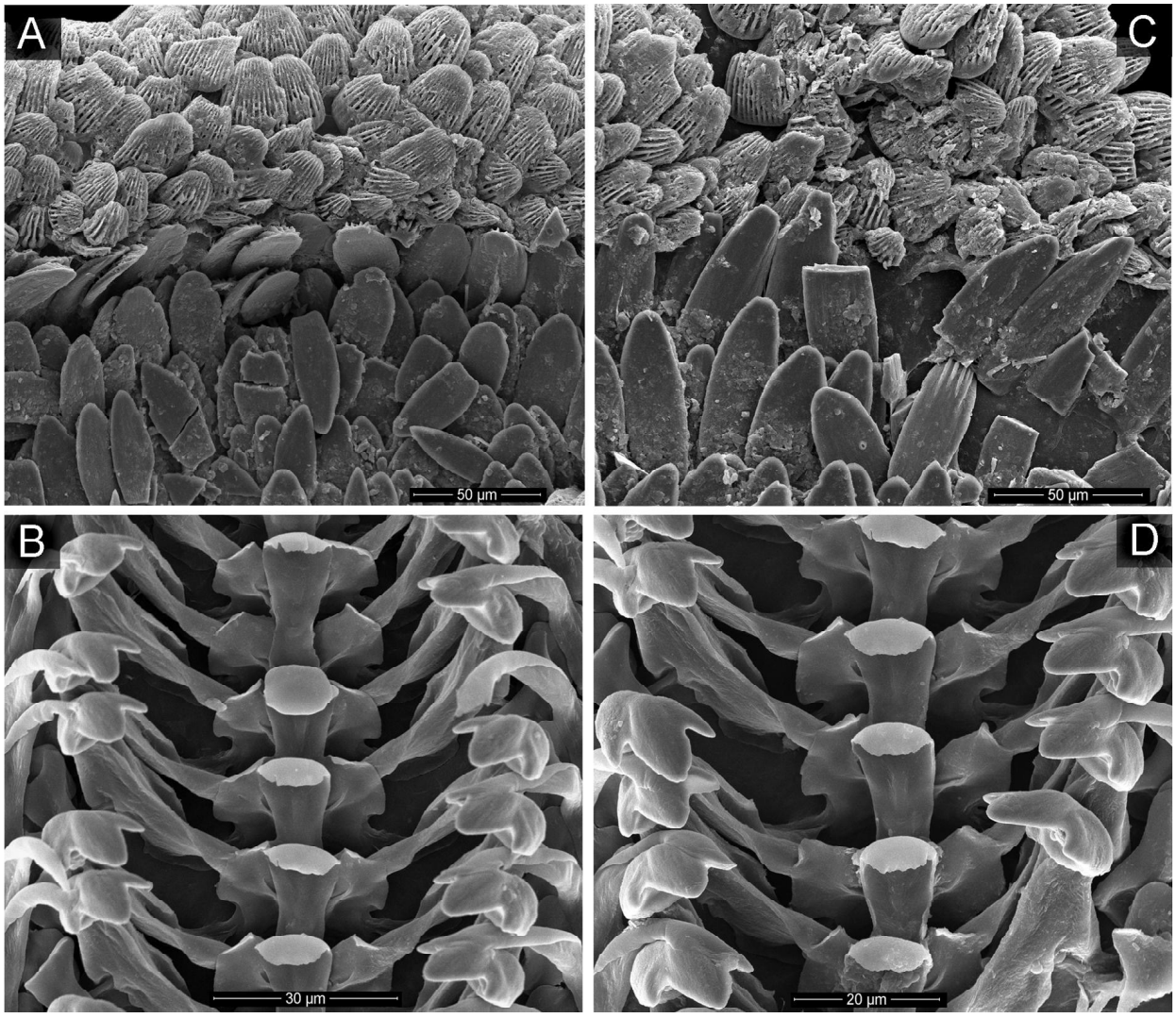

FIG. 7. *Leptochiton muelleri*, Cat Ba Id., north Vietnam, BL – 2.9 mm: A, C, dorsal, marginal and ventral scales; B,D, central portion of radula.

РИС. 7. *Leptochiton muelleri*, о. Катба, северный Вьетнам, длина тела – 2.9 мм: A, C, дорсальные, маргинальные и вентральные чешуйки, B,D, центральная часть радулы.

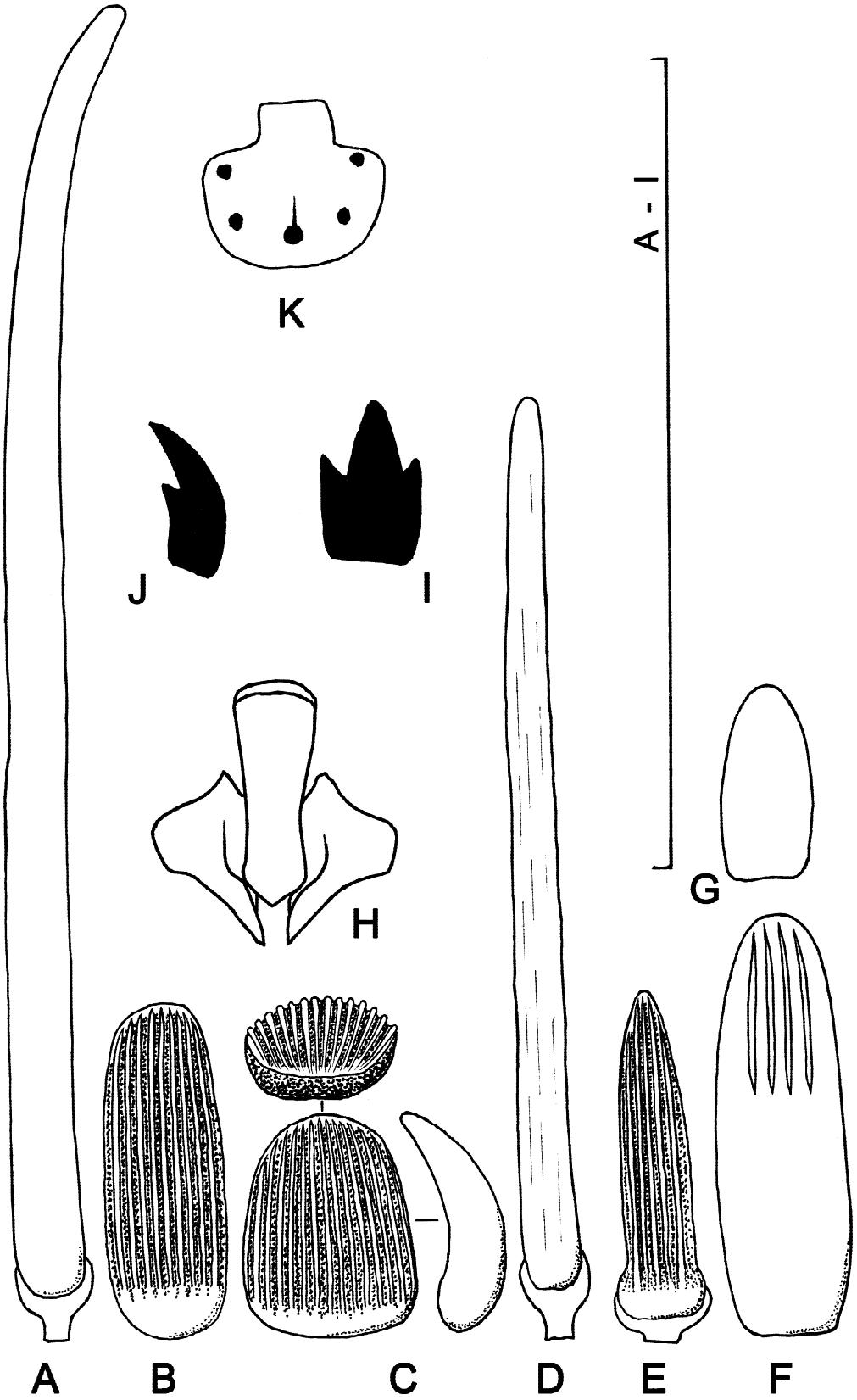

FIG. 8. *Leptochiton muelleri*, Cat Ba Id., north Vietnam, BL – 2.9 mm: A, sutural needle; B, sutural scale; C, dorsal scales; D, marginal needle; E, marginal scale; F, ventral scale near margin; G, ventral scale in middle part; H, central and first lateral teeth of radula; I, J, head of major lateral tooth of radula; K, aesthete group. Scale bar: 100 μm.

РИС. 8. *Leptochiton muelleri*, о. Катба, северный Вьетнам, длина тела – 2.9 мм: A, межсегментная игла; B, межсегментная чешуйка; C, дорсальные чешуйки; D, маргинальная игла; E, маргинальная чешуйка; F, вентральная чешуйка у края; G, вентральная чешуйка в средней части; H, центральный и первый боковой зубы радулы; I, J, наконечник крючковой пластинки радулы; K, эстетная группа. Масштабная линейка 100 мкм.

ed. 13. tome 1, pars 6, *Vermes Testacea, Genus 300, Chiton:* 3202-3207. Holmiae.
Gray J.E. 1821. A natural arrangement of Mollusca according to their internal structure. *London Medical Repository,* 15: 221–239.
Gray J.E. 1847. A list of the genera of recent Mollusca, their synonymy and types. *Proceedings of the Zoological Society London,* 15: 129-206.
Kaas P. 1982. *Leptochiton* species (Polyplacophora: Leptochitonidae) of the Musorstom 1 (1976) and 2 (1980) – Philippines-Expeditions. *Basteria*, 46: 87-92.
Kaas P. 1985. Chitons (Mollusca: Polyplacophora) procured by the French Benthédi-Expédition, 1977, and the MD 32- Réunion Expédition, 1982, in the southwestern Indian Ocean. *Zoologische Mededelingen,* 59 (26): 321-340.
Kaas P. 1991. Mollusca Polyplacophora: Deep-water chitons from New Caledonia. In: A. Crosnier & P. Bouchet (eds), Résultats des Compagnes MUSORSTOM, vol. 7. *Mémoires du Muséum national d'Histoire naturelle*, série A, 150: 9-27.
Leloup E. 1981. Résultats des Compagnes Musorstom I – Philippines (18-28 Mars 1976), 15. Mollusques: Polyplacophores. *Mémoires Orstom*, 91: 317-323.
Lovén S. L. 1846. Index molluscorum litora Scandinaviae Occidentalia habitantium. *Öfverssigt af Kongliga Svenska Vetenskaps-Akademiens Förhandlinger,* 3: 134-160.
Montagu G. 1803. *Testacea Britannica or Natural History of British shells, marine, land and fresh water, including the most minute, systematically arranged and embellished with figures,* 1: 1-291; 2: 292-606, pls 1-16 (London).
Saito H. 1997. Deep-sea chiton fauna of Suruga Bay (Mollusca: Polyplacophora) with description of six new species. *National Science Museum Monographs*, 12: 31-58.
Schwabe E., Lozouet P. 2006. Chitons (Mollusca, Polyplacophora) from Rapa, the southern island of Polynesia. *Zoosystema*, 28(3): 617–633.
Shumacher C.F. 1817. Essai d'un nouvean système de habitations des vers testacés Scultz, Copenhagen. 288 p.
Sigwart J. D., Sirenko B. I. 2012. Deep-sea chitons from sunken wood in the West Pacific (Mollusca: Polyplacophora: Lepidopleurida): taxonomy, distribution, and seven new species. *Zootaxa,* 3195: 1-38.
Sirenko B. I. 1998. One more deep water chiton *Leptochiton vietnamensis* sp. n. (Mollusca, Polyplacophora) living and feeding on sunken wood from the South China Sea. *Ruthenica,* 8: 1-5.
Sirenko B. I. 2001. Deep-sea chitons (Mollusca, Polyplacophora) from sunken wood off New Caledonia and Vanuatu. *Mémoires du Muséum national d'Histoire naturelle,* 185, 39-71.
Sirenko B. I. 2012. Chitons (Mollusca, Polyplacophora) of Nhatrang Bay, South Vietnam. In: Britayev T.A., Pavlov D.S. (Eds.) *Benthic fauna of the Bay of Nhatrang Southern Vietnam*. Vol. 2. Moscow KMK: 56-122.
Sirenko B. I. 2013. Four new species and one new genus of Jurassic chitons (Mollusca: Polyplacophora: Lepidopleurida) from the Middle Russian Sea. *Proceedings of the Zoological Institute RAS,* 317 (1): 30-44.
Sirenko B.I., Schwabe E. 2011. Description of a minute chiton (Mollusca, Polyplacophora) from Sri Lanka. *Ruthenica,* 21(2): 113–121.
Thiele J. 1909. Revision des Systems der Chitonen, Part I. *Zoologica Stuttgart*, 22: 1-70.

●

Новые находки мелкого хитона рода *Leptochiton* (Mollusca, Polyplacophora) во Вьетнамских водах

Борис СИРЕНКО

Зоологический институт РАН, Университетская наб. 1, 199034, С. Петербург, Россия; marine@zin.ru

РЕЗЮМЕ. *Leptochiton muelleri* Sirenko et Schwabe, 2011 был известен только по 7 экземплярам, собранным у берегов Шри Ланка. Благодаря сборам автора в 2010-2014 годах, вид был найден во Вьетнамских водах от севера до юга Вьетнама. *Leptochiton muelleri* оказался очень широко распространенным вьетнамским видом. Он обитает от архипелага Кон Сон (08°39'N) на юге, до Ван Донг (21°02'N) на севере. Этот мелкий вид был найден с использованием нового метода сбора описанного Sirenko [2012]. Предполагается, что вид имеет широкий ареал в Индо-Вестпацифической подобласти.