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Chaetoderma ***felderi*** — a new giant caudofoveate species from the Gulf of Mexico (Mollusca: Aplacophora)

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ABSTRACT. *Chaetoderma* ***felderi*** is a new species of Caudofoveata from the upper slope of the Gulf of Mexico. This is the first "giant" representative of the taxon whose size (407 mm in length when alive) is more than twice as large as any previously known caudofoveates. The description is based on a specimen found at the depth of 850-610 m during a recent NSF-sponsored dredge-sampling cruise of R/V Pelican in the Gulf of Mexico.

Introduction

Benthic caudofoveates are distributed almost globally except in Antarctic and sub-Antarctic waters and in the Black and Baltic Seas. It is a taxon so far comprised of about 150 described and ready to be described species; nearly one third belong to the family Chaetodermatidae. Despite the small species number, in many localities they are an important part of the deep-sea benthos due to their numerical abundance [Salvini-Plawen, 1975]. Benthic Caudofoveata are usually <50 mm in length, and covered by glistening aragonite sclerites that identify them as belonging to the Aplacophora. The description here of an outstanding giant chaetodermatid species from the upper slope of the Gulf of Mexico gives us a chance to widen our notions about the diversity of Caudofoveata.

Methods and material

Methods for studying caudofoveates and the taxonomic characters used here are given in full in Scheltema and Ivanov [2000, 2004], with some techniques emended here. The characters are based on external appearance, including measurements of the anterium, neck, anterior and posterior trunk, and posterium (Fig. 1A), the ratio of neck to total length and the ratio of anterior and posterior trunk lengths to total length; on the morphology of sclerites from anterior to posterior including the base, blade, longitudinal axis, keels, ridges and grooves and isochromes (lines of equal color when viewed under cross polarized light) (Fig. 2); and on the morphology of isolated radulae (Fig. 1D, E).

Fragments of cuticle within sclerites from 8 points of different body regions (Fig. 1B) were placed in household bleach (hypochlorite) for 3-5 minutes; the fragments were thoroughly washed and then sclerites separated onto a slide, air-dried, and mounted. For scanning electron microscopy (SEM) stubs, the same techniques as for slides were used. Stubs were covered by double-coated carbon conductive tabs and coated with gold.

The radula was dissected and cleared of tissue in bleach and washed thoroughly before mounting in a small drop of glycerine on a slide. It was then covered with a small, round coverslip raised by small bits of broken coverslips. The preparation was then covered by a larger coverslip and Histomount®, sealing in the glycerine.

The holotype as an entire specimen in alcohol, sclerites and radula slides was deposited in the Zoological Museum of Moscow State University (ZMMU).

Specimen was initially frozen aboard ship and subsequently transferred to 10% formalin and finally to 80-90% ethanol; a tissue subsample was fixed in 80-90% ethanol for gene-sequencing studies. After specimen had been fixed, it was dissected longitudinally; the cuticle was damaged and lost on different parts of the body. Total length — 332 mm (407 mm in living condition — D.L. Felder, pers. comm.), greatest diameter on posterior trunk — 10 mm.

Taxonomy

Chaetoderma Lovén, 1845

Lovén, 1845: 116.

Type species *Chaetoderma nitidulum* Lovén, 1845 (monotypy).

Diagnosis. Mollusca belonging to the burrowing aplacophoran taxon with cuticle entire (Caudofoveata or Chaetodermomorpha), most 10-50 mm in length, with distinct body regions of neck, anterior trunk, posterior trunk, and short posterium not tail-

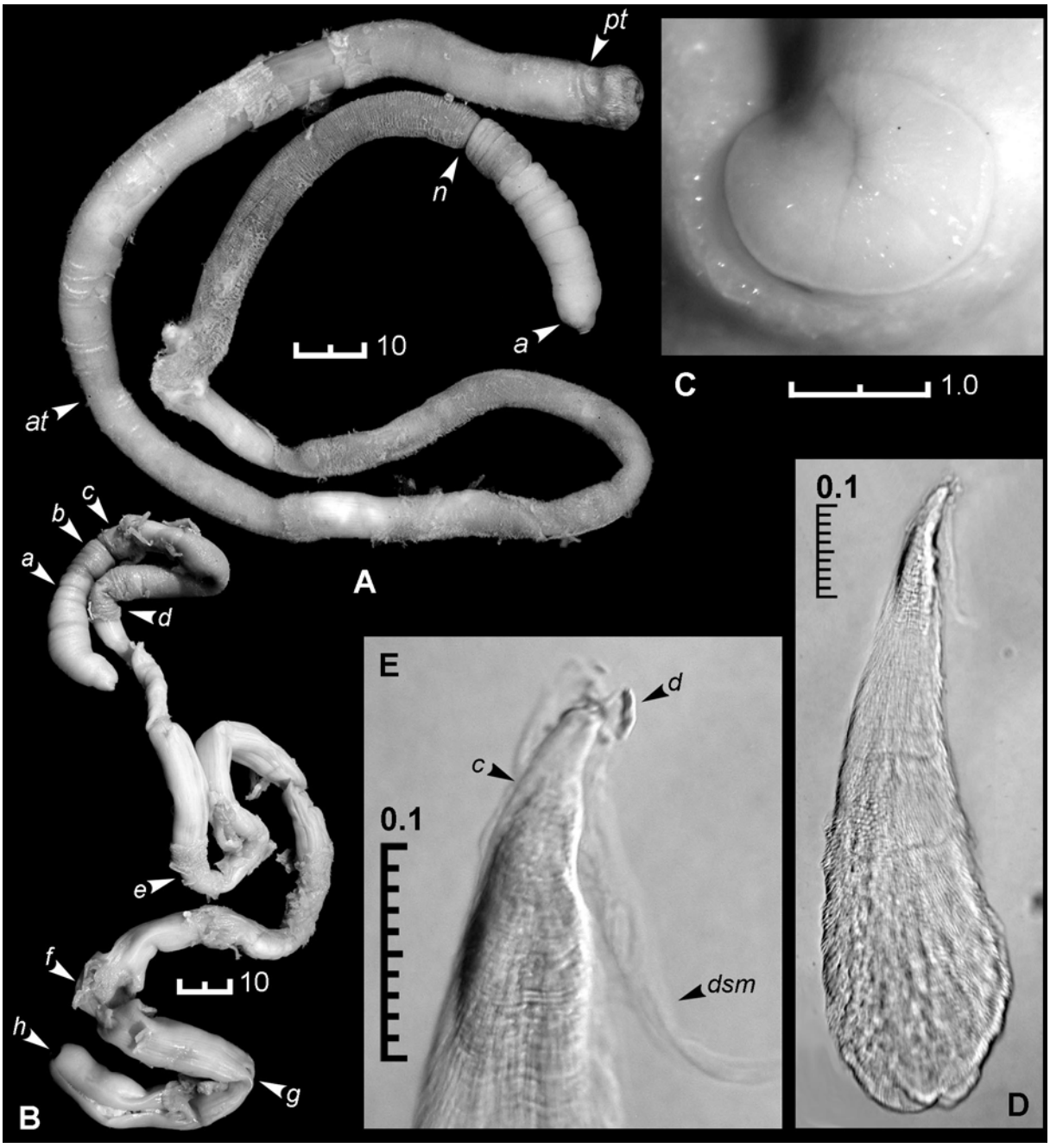

FIG. 1. Holotype of *Chaetoderma* ***felderi*** sp. nov. A — entire specimen which had been frozen and defrosted before fixation. Arrows indicate the borders of body regions: *a* — anterium; *n* — neck; *at* — anterior trunk; *pt* — posterior trunk. B — specimen after fixation in alcohol: *a-h* — points for sclerite preparation. C — oral shield. D, E — radula: *c* — cone; *d* — denticle; *dsm* — dome-shaped membrane. Scales in mm.

РИС. 1. *Chaetoderma* ***felderi*** sp. nov. голотип. A — тело моллюска после заморозки (стрелками отмечены задние границы отделов тела: *a* — антериум; *n* — шея; *at* — передняя часть туловища; *pt* — задняя часть туловища); B — экземпляр после фиксации в спирте (*a-h* — точки, в которых брались склериты для препаратов); C — головной щиток; D, E — радула (*c* — радулярная мембрана; *d* — зуб; *dsm* — мембрана одонтофора). Масштабные линейки в мм.

like; oral shield entire. Radula small with paired denticles lying outside a dome-shaped cuticular membrane covering buccal mass and with paired lateral projections extending from distal end of radula cone to within dome-shaped membrane opposite base of denticles.

Chaetoderma ***felderi*** sp. nov.

(Figs. 1-3)

Type locality. Upper continental slope of the Gulf of Mexico, between 28°06.52’N, 89°36.99’E

and 28°07.21'N, 89°46.57'E, 850-610 m (NSF-III-074 benthic skimmer, R/V Pelican, 08.07.2006).

Holotype. ZMMU Le1-196.

Distribution. Known only from the type locality.

Diagnosis. With characters of the genus, very long; trunk sclerites thick, elongate, in scope of isosceles triangle; cuticle thin, weak; radula small for body size; oral shield pierced by mouth opening.

[**Диагноз.** С признаками рода, тело очень длинное, почти цилиндрическое; туловищные склериты толстые, удлиненные, равнобедренно-треугольные; радула очень маленькая по сравнению с диаметром тела; головной щиток пронзен ротовым отверстием].

Description. Appearance (Figs. 1A, B). Long, almost cylindrical; neck long (about 0.1 of total length) thicker than anterior trunk at constriction; first three-quarters of neck light-rosy with thin cuticle, without sclerites, posterior quarter of neck rough, light-brown; anterior trunk long (0.65 of total length), almost twice length of posterior trunk (anterior/posterior trunk index — 2.2), almost equal in diameter for the whole length, very rough, grey-green, with sediment between sclerites; posterior trunk short (0.29 of total length), slightly thicker than anterior trunk, greatest diameter at posterior third, light-rosy with silky shine; posterium short (0.02 of total length), rounded, bulblike, with yellow secretions on sclerites around mantle cavity opening; dorsoterminal sense organ indistinct; oral shield small in comparison with diameter of body, entire, slightly wider than high, pierced by mouth opening up centre. Body measurements before fixation (Fig. 1A): length 365 mm, anterium 2 x 4 mm, neck 34 x 8 mm, anterior trunk 235 x 7 mm, posterior trunk 106 x 9 mm, posterium 8 x 9 mm; oral shield 2 x 1.7 mm.

Sclerites (Figs. 2, 3; dimensions given as length x greatest width x thickness unless otherwise noted): All sclerites long, thick, isosceles trianglular except neck and posterium, slightly curved towards body (Fig. 2*), with distinct central keel and distinct middle groove (Fig. 3A-C), a pair of lateral ridges near edges of base, waist indistinct, base short, blade very long, sometimes slightly curved or S-shaped (Fig. 3E, H) up to 1500 x 60 x 18 μm. Cuticle of anterium and most part of neck without sclerites. Neck sclerites uniform, lead-shaped, sharply pointed, straight or slightly curved, waist indistinct, blade 3-5 times longer than base, isochromes symmetrical, thickest in middle of base, from 40 x 10 x 4 to 200 x 20 x 12 μm (Fig. 2A, B). After neck constriction anterior trunk sclerites by 1.5 longer than neck ones (Fig. 2C), elongated, isosceles trianglular, sharply pointed, with distinct central keel, and pair of lateral short ridges near edges of base, waist indistinct, base short (not more than 1/5 of total length), isochromes symmetrical, thickest in middle of blade, up to 330 x 30 x 9 μm. In the middle of trunk sclerites from "wide" isosceles trianglular, sharply pointed, with distinct central keel (with or without midline groove), pair of lateral long ridges near edges, and some additional short ridges in between keel and lateral ridges (from 2 to 5) (Fig. 3A), without waist, thickest in the middle of central keel, up to 250 x 70 x 7 μm (Fig. 2D, E), to narrow isosceles trianglular, sharply pointed, with distinct central keel, without lateral ridges, with distinct waist, base very short (less than 1/5 of total length), thickest on central keel near waist, up to 700 x 40 x 15 μm (Fig 2E, 3G, H). Posterior trunk sclerites same like from anterior trunk ones, but narrower with indistinct central keel, from 450 x 70 x 12 m to 1500 x 60 x 18 μm (Figs. 2F, G). Two types of posterior sclerites: elongated knife blade shaped with asymmetrical keel near one of edge of sclerite, thickest near base, 250 x 30 x 7 μm, and elongated needle like sclerites, straight, slightly curved or S-shaped, thickest near base, 300 x 20 x 18 μm.

Radula very small compared to body diameter, translucent, with unpaired small denticles (25 x 7 μm) lying outside of very thin translucent dome-shaped cuticular membrane (160 μm in length), radula cone slightly curved, elongated drop-shaped, translucent, slightly yellowish in upper quarter (690 x 200 μm).

Remarks. This species is unique in its size compared to other *Chaetoderma* species. The longest previously known species is *Chaetoderma productum* Wirén, 1892, which is 150 mm in length and less than 3 mm in greatest diameter [Wirén, 1892]; *Chaetoderma* ***felderi*** more than twice as long and three times larger in greatest diameter. The shape of the sclerites — isosceles triangle — is likewise unique. However, the radula, oral shield, and body regions unambiguously place *C.* ***felderi*** in the genus *Chaetoderma.*

Etymology. The species is named in honour of Dr. Darryl L. Felder, University of Louisiana, Lafayette.

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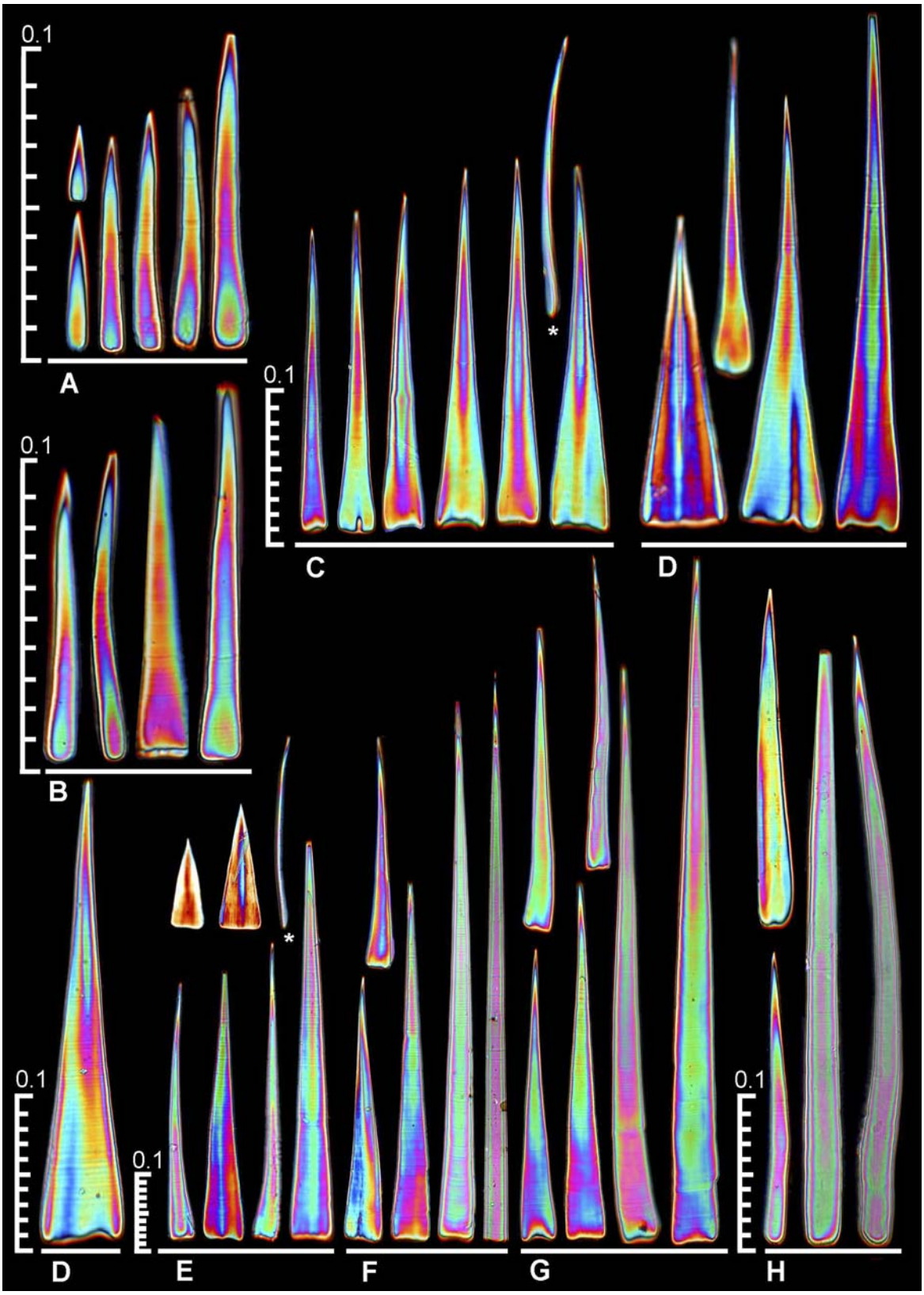

FIG. 2. Sclerites of *Chaetoderma* ***felderi*** sp. nov. in cross polarized light from eight points on body as indicated on Fig. 1B by corresponded lower-case letters: A, B — neck; C-E — anterior trunk; F, G — posterior trunk; H — posterium; * — lateral view. Scales in mm.

РИС. 2. *Chaetoderma* ***felderi*** sp. nov. — склериты в перекрестно-поляризованном свете из восьми точек на теле (A, B — шея; C-E — передняя часть туловища; F, G — задняя часть туловища; H — постериум; обозначения соответствуют строчным буквам на Рис. 1B; * — вид сбоку). Масштабные линейки в мм.

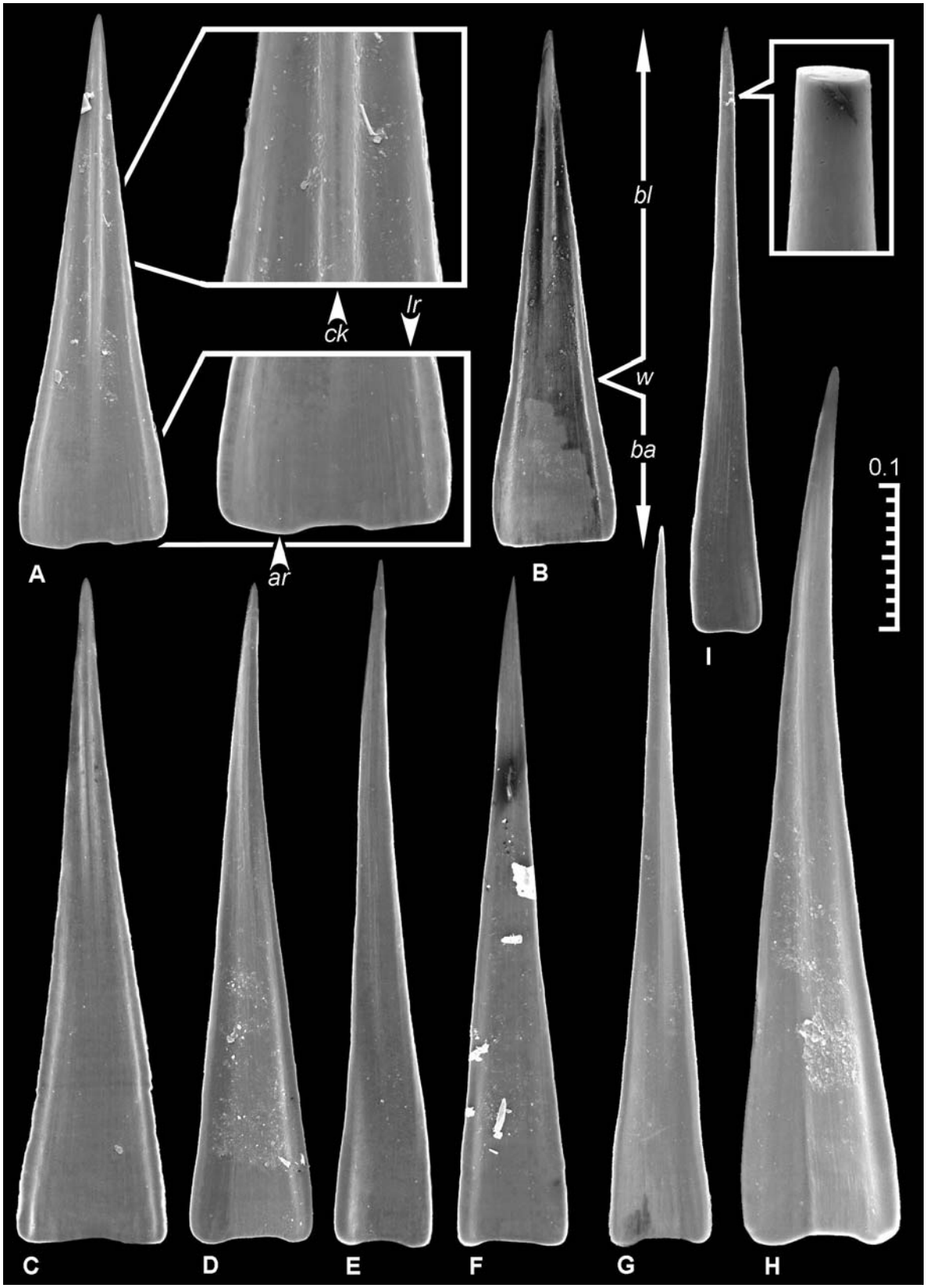

FIG. 3. Scanning electron microscopy images of trunk sclerites of *Chaetoderma* ***felderi*** sp. nov.: *ar* — additional lateral ridge; *ba* — base; *bl* – blade; *ck* — central keel; *lr* — lateral ridge; *w* — waist. Scale in mm.

РИС. 3. *Chaetoderma* ***felderi*** sp. nov. — склериты в электронном сканирующем микроскопе (*ar* — дополнительные латеральные ребра; *ba* — основание; *bl* — лезвие; *ck* — центральный киль; *lr* — латеральное ребро; *w* — пережим). Масштабная линейка в мм.

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Chaetoderma ***felderi*** — новый гигантский вид каудофовеат из Мексиканского залива (Mollusca: Aplacophora)

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РЕЗЮМЕ. *Chaetoderma* ***felderi*** — новый вид каудофовеат из верхней батиали Мексиканского залива. Первый "гигантский" представитель этого подкласса, чей размер (407 мм длины в прижизненном состоянии) более чем в два раза превосходит все ранее известные размерные характеристики этих моллюсков. Описание вида основывается на единственном экземпляре, обнаруженном на глубине 850-610 м в ходе работ научно-исследовательского судна "Пеликан" в Мексиканском заливе.