https://doi.org/10.30836/igs.1025-6814.2023.4 .279470
UDC 565.33:579.8 (916)

New data on the systematics of Recent Ostracoda of the genus *Ambostracon* Hazel 1962 (Hemicytheridae, Podocopida) from South Africa

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The study provides a revision of the taxonomic composition (subgenuses, species) of the genus Ambostracon Hazel 1962 and a monographic description of the fossil (Holocene) and Recent marine ostracods of the genus Ambostracon of South and South-Eastern Africa. The material examined comes from geological stations on the shelf, continental slope and deep-water depression (32–3059 m water depth) of three areas (from the southern coast Mossel Bay to the eastern coast south of Durban, the outer part of Maputo Bay and the eastern coast of South Africa) and surface sediment samples from lagoons, estuaries and coastal lakes of the eastern coast of the South East Africa (Wilderness area, 0.2–1000 m water depth) (R/V METEOR M123-2016). The validity of the selection of the subgenus Ambostracon Patagonacythere is discussed. Two species (Ambostracon keeleri, A. flabellicostata) and one new species (Ambostracon frenzeli sp. nov.) were described. The systematic section provides data about synonymy (compiled on the results of a revision of the species volume), holotype (paratypes, syntypes), material, diagnosis, description, dimensions (linear, relative), sexual dimorphism, individual and geographic variability (fixation of the manifestations and the range of the variability of the morphological elements of the shell), comparison, remarks, localities, stratigraphical position, geographical distribution, environmental conditions of the site (for recent species), palaeoecology (for fossil species), zoogeography. SEM-images of external and internal structures of the carapace (macro- and mesosculpture, central muscle scar field, hinge, normal pore canals) are provided.

***Keywords**: Crustacea; Ostracoda; Taxonomy; South Africa.*

Citation: Dykan N.I., Daniel T. 2023. New data in the systematics of Recent Ostracoda of the genus *Ambostracon* Hazel 1962 (Hemicytheridae, Podocopida) from South Africa. *Geologičnij žurnal,* 4 (385): 3–19. https://doi.org/10.30836/igs.1025-6814.2023.4 .279470

Цитування: Дикань Н.І., Даніель Т. Нові дані з систематичного вивчення сучасних остракод роду *Ambostracon* Hazel 1962 (Hemicytheridae, Podocopida) Південної Африки. *Геологічний журнал.* 2023. № 4 (385). С. 3–19. https://doi.org/10.30836/igs.1025-6814.2023.4 .279470

1 Introduction

Recent marine *ostracods of* the genus *Ambostracon* Hazel 1962 (Hemicytheridae, Cytheroidea, Podocopida) are distributed along the continental margins of the northern and southern hemispheres: the near-shore littoral zone of the Pacific coasts of North America, California (McKenzie & Swain, 1967; Swain 1969) and South America, southern Patagonia of Chile (Hartmann, 1962; Rossi de Garcia, 1970; Valicenti, 1977), and in the Indian Ocean (South Africa) (Brady, 1881; Keeler, 1981; Boomer, 1985; Dingle, 1992–1995) Western Africa, the barrier reef of Kenya (Jellinek, 1993). The distribution areas of the fossil representatives of the genus *Ambostracon* partially coincide with the areas of the Recent species. Fossil species of *Ambostracon* are known from Paleogene deposits of South Africa (Valicenti, 1977; Frewin, 1987), from Miocene deposits of South-East Australia (McDonald & Warne, 2022), from Miocene deposits of Argentina (Rossi de Garcia, 1970), from Upper Pliocene deposits of northwest France (Maybury & Whatley, 1986), from Quaternary deposits of South Africa (Dingle, 1992–1995), from Lower Pleistocene deposits of North America, California (Hazel, 1962), from Holocene deposits of South Africa (Conway-Physick, 1995). In total 32 species of the genus *Ambostracon* have been described yet (Kempf, 1986).

The study of ostracods of the genus *Ambostracon* began in 1880 with the description of the female of *Cythere flabellicostata* n. sp. (syn. *Ambostracon (A.) flabellicostatum*; amended by R. Dingle (1992) by the English micropaleontologist George S. Brady from surface sediment of False Bay, South Africa). Brady documented the dimensions of the female shell, a brief comparative description of the male shell and their images. In 1962, Joseph E. Hazel identified the new genus *Ambostracon* n. gen. (type species *Ambostracon costatum* n. sp., Hazel, 1962, p. 822–824, text-figs. la, 2a, 3a-c) from the Lower Pleistocene deposits of California. Diagnosis of the genus *Ambostracon* Hazel 1962 by Hazel (1962): "This genus is characterized by its subquadrate lateral outline, robust ribbed ornamentation and holamphidont hinge, where the RV anterior tooth and socket are located on a "spatulate platform". Based on the results of studying about 50 representatives of the genus *Ambostracon* Hazel 1962 (https://www.marinespecies.org/ostracoda), the diagnosis of the genus has been expanded to include features of the macrosculpture, lock and central muscular field of the shell (Maybury & Whatley, 1986, c. 77): "...prominent costae, well developed intercostate pore conuli and weakly developed reticulation. The posterodorsal costa is curved and terminates below and just behind the eye tubercle. The anterodorsal costa is submarginal and extends from the mid-dorsal area of the valve through the eye tubercle to mid-anterior. The median costa is bifurcate anteriorly and interrupted anteromedianly by an irregularly-shaped tubercle. The ventral costa is gently curved and parallel to the median costa. Anteriorly and caudally there is a narrow, frill-like flang. Marginal pore canals are numerous, simple, straight and entire. Hinge holamphydont. Central muscle scars anteromedian in position, comprising a near vertical row of four adductors with the dorsomedian scars divided and three subcircular frontal scars in a slightly curved row. There are three dorsal scars close to the anterior section of the hinge's median elements and a suboval fulcral point situated above and between the adductor and frontal scar rows".

In the same year, Gerd Hartmann described the new genus *Patagonacythere* n. gen. (type species *Patagonacythere tricostata* n. sp., Hartmann-Schröder & Hartmann, 1962; cited by Frewin, 1987, p. 37) from modern deposits of the Pacific coast of Chile and the coast of southern Patagonia. In 1977, V. Valicenti studied the fossil ostracods of the genera *Ambostracon* and *Patagonacythere* from the Oligocene-Eocene deposits of Patagonia (Argentina) and reclassified the two genera as two subgenera within the genus *Ambostracon*. There are *Ambostracon* (*Ambostracon*) (Hazel, 1962) and *Ambostracon* (*Patagonacythere*) (Hartmann, 1962). Valicenti (1977) defined the macrosculpture of the first order in the anterodorsal part of the shell (the degree of the development of the eye ridge) as a taxonomic sign of subgeneric rank. There is a weakly developed eye ridge in *Ambostracon* (*Ambostracon*) and a well-developed eye ridge of varying length in *Ambostracon* (*Patagonacythere*) (Frewin, 1987).

The results of a systematic study of Recent ostracods of the genus *Ambostracon* of South Africa (Meteor expedition M123, 2016, Institute of Geosciences, Jena, Germany) and analysis of literature sources showed that the ocular ridge has a significant range of variability in the degree of develop-

ment from a weakly to strongly developed ridge, of the size of the ridge (high or low, narrow or wide, short or long), a different position of the ridge on the valve surface (anterodorsal, dorsal), a different relation of the ocular ridge to the eye tubercle (connected with the eye tubercle or not), to the marginal anterior ridge (connects with anterior ridge or not) and the ventral ridge (isolated or not). The geographical variability of these morphological characters has not been recorded. Taxonomic characters of the subgenus in the hierarchical series "species-order" of ostracods of the order Podocopida are the details of the overlap of the valves, the type of meso-sculpture, the width of the duplicature at the anterior end (Dykan, 2006, 2016, 2022). Some of them have a significant range of variability or coincidence of qualitative and quantitative parameters and are diagnostic characters of the subgenus only within the fixed limits of this range and in combination with other subgeneric characters. In addition, the taxonomic weight of the individual characters in the different groups of ostracods partially does not coincides, i.e., there are taxonomic characters of a certain rank in one family which have a different rank in another family. According, each family and its lower taxa (subfamily, genus, subgenus, species) has its own system of taxonomic characters. Therefore, the question of the legitimacy of the selection of subgenera within the genus *Ambostracon* and the determination of morphological characters diagnostic for subgenera of the genus *Ambostracon* requires further systematic study of this group of ostracods.

The purpose of this study is a revision of the taxonomic composition and a monographic description of Recent species of the genus *Ambostracon* Hazel 1962 of South Africa from the collection M123-2016 of the Institute of Geosciences, Micropalaeontology Working Group, Friedrich-Schiller University of Jena, Germany, and a synthesis of the taxonomic literature of this genus.

2 Materials and methods

The material studied was sampled during the scientific research voyage R/V METEOR M123 (2016) at the southern and eastern coast of South Africa. Further taxonomic material originates from sampling campaigns within the RAiN program covering estuarine systems of South Africa. Samples for microfaunistic analysis (ostracods) are from modern deposits on the shelf and continental slope of South and South-Eastern Africa from 25 stations from the eulittoral to 3060 m water depth of three main areas: from the southern coast near Mossel Bay to the eastern coast south of Durban and from the outer part of Maputo Bay and one station off the eastern coast of South Africa (Fig. 1). The additional material for taxonomic comparisons originates from surface sediment samples of lagoons, estuaries and coastal lakes in the Wilderness area in South Africa. Locations of the stations on the shelf were documented using ship acoustic systems along more than 900 nm profile lines. The sediment samples were washed on sieves dividing them into the fractions of 0.1–0.25 mm, 0.25–0.50 mm, 0.50–1.0 mm, 1.0–2.0 mm. The sieve residues were examined under a Stemi-305 ZEISS binocular microscope. The ostracods valves were collected using a fine wet brush and transferred to micropalaeontological collection cells. The morphology of the external and internal structure of a shell was studied by SEM and light microscopy images using a Philips XL30 ESEM and a Digital Microscope Keyence VHX-6000 (Institute of Zoology and Institute of Geosciences, Friedrich-Schiller-University Jena, Germany).

The description of ostracods was based on the principles and rules of the systematic study of fossil ostracods determined by the first author and tested on her own actual material (Dykan, 2006, 2016, 2020, 2021, 2022), which is important for a comprehensive characterization of the species and their revision. We give a detailed description of the morphological elements of the external and internal structure of the shell, use a unified terminology for the description of morphological elements, determine the numerical parameters for morphological elements with numerical characteristics, formalize the qualitative morphological characters, and determine the range of variability of the morphological elements. The description of ostracods is made in accordance with the International Code of Zoological Nomenclature (1999). The material investigated, including the types, is stored in the collection of the Micropalaeontology working group of the Institute of Geosciences, University of Jena, Germany, but will be transferred to the collection of the Iziko South African Museum in Cape Town in the near future.

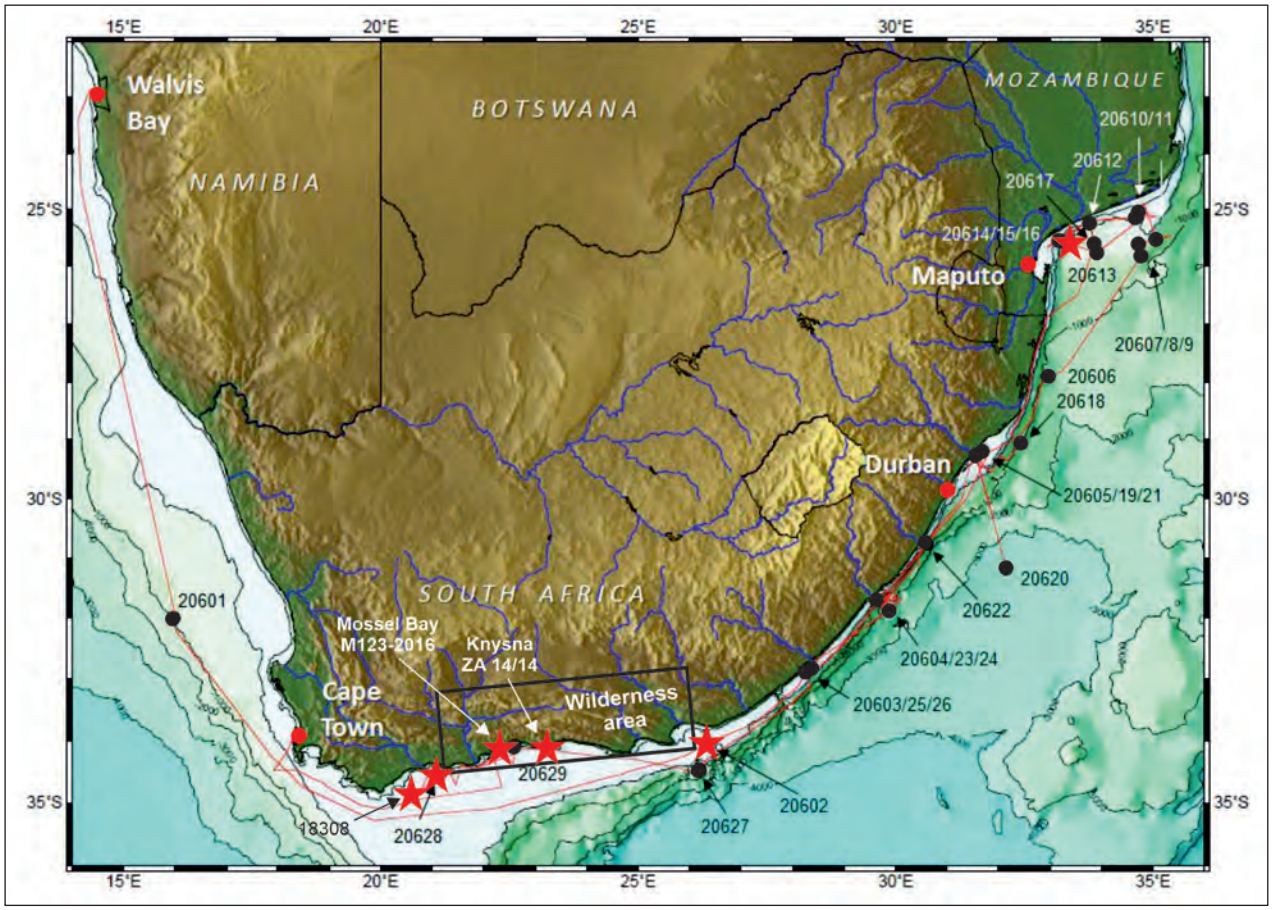

Fig. 1. Research area and the location of the sampling sites (R/V METEOR M123, 2016) (from Zabel 2017, modified). The red asterisks mark the locations of *Ambostracon* species

3 Abbreviations

H, height; **L**, length; **L/H**, degree ratio of elongation; **C**, carapace; **V**, valve; **RV**, right valve; **LV**, left valve; ♀, female; ♂, male; **A**, adult; **J/early or last stages**, juvenile stage of development; **SEM/DM ZZZ–0**, collection number of a specimen from collection M123-2016; **PSU** – Practical Salinity Units,1 PSU corresponds to 1 ‰ (part per thousand) and 1 g/l (gram per litre); MWG – Micropalaeontology working group of the Institute of Geosciences, Jena, Germany.

4 Results

Systematic paleontology

Phylum	Arthropoda von Siebold 1848
Subphylum	Crustacea Brünnich 1772
Class	Ostracoda Latreille 1802
Subclass	Podocopa G.O. Sars 1866
Order	Podocopida G.O. Sars 1866
Suborder	Cytherocopina Baird 1850
Superfamily	Cytheroidea Baird 1850
Family	Hemicytheridae Puri 1953

Genus ***Ambostracon* Hazel 1962**

***Ambostracon flabellicostatum* (Brady 1880)**

Fig. 2, photo 1, 2, 3, 4, 5, 5*a*

Cythere flabellicostata n. sp.: Brady, 1881: 88–89, pl. XIII, figs. 6 a-h.

Ambostracon sp.: Keeler, 1981: 113–118, pl. 6, figs. 9–10, 13–14 (cited by Dingle, 1992).

Ambostracon sp.: Boomer, 1985: 45–46, pl. 4, figs. 62 (cited by Dingle, 1992).

Ambostracon (Patagonacythere) sp. A 468: Frewin, 1987: 40, pl. 13A, Fig. 2.9 (B).

Ambostracon (Ambostracon) flabellicostata: Dingle, 1992: 43, 46, Fig. 28 A, B, C, D; 29 C, F; Dingle, 1994, Fig. 3 L; Conway-Physick, 1995: 30–31, Fig. 4.24, pl. 6 E, F, G, H; pl. 7 A, B.

Holotype. *Cythere flabellicostata* (Brady, 1881, p. 88–89, pl. XIII, figs. 6a–d, female, LV, external, x 60, L = 1–50th of an inch (5 mm); pl. XIII, fig. 6 e-h, male, LV, external, x 60, South Western Africa, Simon Bay, Challenger Station 140, 18.3–36.6 m depth water, Recent. The exact location of the holotype is unknown.

Type series (coll. M123-2016). SEM 20628-1 MA-1, station GeoB20628-1, A, ♀, LV; SEM OF-B-P34/3, station GeoB 20615-1, A, ♀, RV; DM OF-H-P11-002, station GeoB20602-1, A, ♀, RV; SEM ZA14/14-1, sample ZA14/14, A, ♂, LV; SEM ZA14/14-2, sample ZA14/14, A, ♂, LV.

Material. 3 valves of females (adult), 2 valves of males (adult).

Diagnosis by G.S. Brady (1881, p. 88–89): "...anterior extremity broad and obliquely rounded, posterior truncated, produced below the middle and slightly emarginated above; dorsal margin gibbous in front thence sloping with a slight convexity backwards, and ending a sharp angle; the sides are gently curved, converging gradually towards the front and more suddenly behind. The surface of the valves is marked throughout with large, irregularly-shape, angular cavities, separated from each other by sharply-cut ridge, which on the hinder half assume a radiating or fan-lake arrangement. The shell of the male presents the assume elongated, compressed and angular form".

Diagnosis by present authors: valve small, maximum convexity in median part. Surface with rugged sculpture, cellular-ribbed; ridges high and broadly rounded; cells small to large with wide muri. Loop-shaped ridge well expressed, elongated, high, narrow, with longitudinal ridge and large cells inside. Ocular ridge well expressed, long, high, broadly rounded, runs through large smooth eye tubercle, connects with ventral ridge. Ventral ridge long, high, sinuous, broadly rounded, runs from the top of the caudal process to anterior third. Marginal, high, broadly rounded ridge runs along the perimeter of the shell except for the posteroventral part. Marginal large tooth in posteroventral part. Hinge holamphydont, left-bared; terminal teeth are not bifid, high, tuberous; the median part is represented by a smooth bar.

Description. Shell of the female subrectangular, small (L = 0,56–0.59 mm, coll. M123-2016; LV, L = 0.51 mm) (Frewin, 1987), moderately elongate (L/H = 1.87–1.97). Maximum height in anterior third. Maximum convexity in the median part of the shell. Wide flat flange posteroventrally. Dorsal margin inclined to posterior end (LV). Cardinal angles indistinct, rounded (RV). Ventral margin widely concaves in anterior third. Anterior end higher than posterior, rounded. Posterior end significantly concaves in the upper part and posterodorsally. Caudal process located at the lower of the longitudinal axis, rounded in the posteroventral part, well-expressed on the right valve. Surface with rugged sculpture, cellular-ribbed; large and distinctively reticulated in the central part of the valve but less distinctively in the marginal parts. The small to average cells are round, oval, and irregular in shape with wide flattened muri in anterior part and with high, rounded muri in posterior part. Ridges well developed, high, broadly rounded. Loop-shaped ridge well-expressed, high, elongated, narrow, located subdiagonally in the posterodorsal, posteromedian and anterior-median parts (RV), with well-expressed longitudinal ridge and large fossae inside. A short ridge extends from the apex of the loop-shaped ridge to the posterior cardinal angle. Ocular ridge long, high, broadly rounded, runs through the large, smooth eye tubercle to the anteroventral part where it bends almost at a right angle; connects with ventral ridge. Ventral ridge long, high, broadly rounded, sinuous; runs from the top of the caudal process in posterior part to anterior third. Marginal, high, broadly rounded ridge runs along the perimeter of the valve except for the posteroventral part; most developed at the anterior end. One marginal large tooth in posteroventral part. Hinge holamphydont, left-bared; terminal teeth are not bifid, high, tuberous; the median part is represented by a smooth bar. Central muscle scar field in the anteromedian part, well expressed outside (RV). Muscle scars bilinear: two large scars (upper scar elongated, lower scar rounded) in the right row and three vertical round scars in the left one.

Dimensions. SEM 20628-1 MA-1, A, ♀, LV, L = 0,59 mm, H = 0.33 mm, L/H = 1,79; SEM OF-B-P34/3, A, ♀, RV, L = 0.54 mm, H = 0.30 mm, L/H = 1.8; DM OF-H-P11, A, ♀, RV, L = 0.54 mm, H = 0.29 mm, L/H = 1.86; SEM ZA14/14-1, A, ♂, LV, L = 0.58 mm, H = 0.30 mm, L/H = 1.93; SEM ZA14/14-2, A, ♂, LV, L = 0.59 mm, H = 0.30 mm, L/H = 1.97.

Sexual dimorphism. Sexual dimorphism expressed. Manifested in size of the valve: female smaller than male ("female L = 1–50th of an inch (5 mm), male presents the assume elongated", Brady, 1880, p. 88, fig. 6 a, e; female, LV, L = 0.51 mm,

Frewin, 1987; female, RV, L = 0.56–0.59 mm, male, LV, L = 0.58–0.59 mm, MWG, coll. M123-2016); in shape of the valve ("...the shell of the female quadrangular, dorsal margin gibbous in front thence sloping with a slight convexity backwards, the shell of the male elongated, compressed and angular form", LV, Brady, 1881; Conway-Physick, 1995; subquadrate with straight dorsal margin in female, LV, Frewin, 1987; subrectangular with dorsal margin straight in female, RV, MWG, coll. M123-2016); in degree of elongation: male more than female (female from short-cut to moderately elongated: LV, L/H = 1.71–1.84; RV, L/H = 1.79–2.0; male elongated: LV, L/H = 1.93–2,06; RV, L/H = 2.24, Brady, 1880; Frewin, 1987; Dingle, 1992; Conway-Physick, 1995; MWG, coll. M123-2016).

Variability. Manifested slightly in size of the shell (L = 0.51–0.56 mm, Frewin, 1987; MWG, coll. M123-2016); in degree of elongation of female from short-cut (L/H = 1.04, Frewin, 1987) to moderately elongated (L/H = 1.71–1.87, Brady, 1880; Dingle, 1992; Conway-Physick, 1995; MWG, coll. M123-2016); in shape of female (subrectangular, Dingle, 1992; Conway-Physick, 1995; MWG, coll. M123-2016; subquadrate, Brady, 1880; Frewin, 1987; Dingle, 1992; Conway-Physick, 1995); in degree of development of the ocular ridge (one well expressed high, connects with eye tubercle, Brady, 1880; Frewin, 1987; Dingle, 1992; MWG, coll. M123-2016; one weakly expressed, Dingle, 1992; Conway-Physick, 1995); in degree of development of ventral ridge (well expressed, Brady, 1880; Dingle, 1992; Conway-Physick, 1995; MWG, coll. M123-2016; dominates among sculptural elements, Frewin, 1987).

Comparison. *Ambostracon flabellicostatum* (Brady, 1880) differs from *Ambostracon* (*A.*) *keeleri* (Dingle, 1992, p 46–50, Fig. 34D–F, 35A–B, Quaternary, South West Africa; MWG, coll. M123-2016, Fig. 2, 6–8; Recent, South West Africa) by smaller size of the valves; rugged sculpture, better developed high, broadly rounded ridges and wide muri between cells; better developed loop-shaped ridge, its shape (high, elongated) and presence of internal longitudinal ridge inside; well expressed high ocular ridge and more developed and shorter ventral ridge; well-developed marginal ridge along the perimeter of the valve; sizes and smaller number of marginal teeth posteroventrally. It differs from *Ambostracon frenzeli* sp. nov (MWG, coll. M123-2016, Figs. 3, 1–4; Figs. 4, 1–5; Recent, South West Africa) by location of maximum convexity in the median part of the valve, rugged sculpture, well-developed ocular ridge, morphology of the ventral ridge, sizes and smaller number of marginal teeth posteroventrally.

Localities. Recent: Indian Ocean, continental shelf of the eastern coast of South Africa, southwest of Durban, station GeoB 20602, lat. 34° 2.241'S, long. 26°20.301'E, surface sediment (0–5 cm; here and on – depth of sampling), 117 m water depth, sandy mud substrate; continental shelf off the eastern coast of South Africa, Maputo Bay, station GeoB 20615, lat. 25°33.073' S, long. 33°12.181' E, surface sediment (0–5 cm), 200 m water depth, brown organic mud with low proportion of detritus and high proportion of organic material substrate; continental shelf off the southern coast of South Africa, Mossel Bay, station GeoB-20628, lat. 34°33.880' S, long. 21°05.670' E, Early Holocene, sediment depth 261.5 cm, 71 m water depth (inner shelf); Wilderness area of the eastern coast of South Africa (Knysna estuary, Thesen Island, sample ZA 14/14, lat. 34°03.666', long. 23°02.727', surface sediment (0–3 cm), 3 m water depth, muddy sand substrate, Fig. 1.

Stratigraphical position. Lower Palaeocene-Upper Eocene: continental shelf of South Africa, Agulhas Bank (Frewin, 1987). Miocene: Argentina (Rossi de Garcia, 1970; cited by Dingle, 1992). Quaternary: South-West Africa (Dingle, 1992). Holocene: continental shelf of South Africa (Conway-Physick, 1995), South-West Africa (Boomer, 1985). Recent: continental shelf of South Africa (Brady, 1880; Keeler, 1981), South-West Africa (Boomer, 1985; Dingle, 1992) and South-East Africa (Keeler, 1981), continental shelf of the eastern, southern and western coast of South Africa, estuaries and lagoons of the eastern coast (Wilderness area) (MWG, coll. M123-2016).

Geographical distribution. Recent. South-West Africa: continental shelf (Boomer 1985), Simon Bay (Brady, 1881), continental shelf between Kunene River and Cape Agulhas, lat. 20–34°S, long. 13–25' E (Dingle, 1992). South Africa: continental shelf from Cape Agulhas to Port Elizabeth, lat. 33–37°S, long. 19–27°E (Conway-Physick, 1995); continental shelf of the southern coast, Mossel Bay, lat. 34°33.880' S, long. 21°05.670' E (MWG, coll. M123-2016). South-East Africa: continental shelf southwest of Durban, lat. 34°2.241'S, long. 26°20.301'E; estuaries and lagoons of the southern

coast (Wilderness area) (MWG, coll. M123-2016); continental shelf up to the south Cape Agulhas and Reunion Island east of Madagascar (Keeler 1981). Fossil populations of the species *A. flabellicostatum*: Lower Palaeocene-Upper Eocene, East Agulhas Bank shelf, South Africa (Frewin, 1987); Quaternary, zone between latitude 20.43°S and the eastern Agulhas Bank (Dingle, 1992).

Habitat conditions. In the collection M123-2016, the species *A. flabellicostatum* is represented by single valves of adults and may have an allochthonous type of burial. Marine species. *A. flabellicostatum* is abundant and widespread over the entire broad Agulhas Bank including the coral reefs, lat. 34.77°S (Conway-Physick, 1995); on the south-western shelf off Cape Peninsula to Saldanha Bay, lat. 33.16°S (Dingle, 1992); in estuaries of the eastern coast (Knysna estuary, MWG, coll. M123-2016). It exists at depths of 15–200 m (Brady, 1880; Dingle, 1992; Conway-Physick, 1995; MWG, coll. M123-2016), with a water temperature of +12,26 to +18,8°C and salinity of 35 PSU, but has a wider range of tolerance to temperature, salinity and dissolved oxygen (Conway-Physick, 1995; MWG, coll. M123-2016). *A. flabellicostatum* was found on the Agulhas Bank in water depths of 30–200 m, in water temperature of +12,26°C and marine water of 35 PSU (Conway-Physick, 1995); on the south-western shelf in water depths of 15–131 m (Dingle, 1992) and on the eastern shelf in a water depth of 117 m (MWG, coll. M123-2016); in shallow habitats of the southern coast (Mossel Bay) in 71 m water depth; in Simon Bay in a water depth of 18,3–36,6 m (Brady, 1881); in Knysna estuary in a water depth of 3 m, at water temperature of +18,8°C, in saline water of 34,1 PSU and at pH of 8,22, on muddy sandy substrate (MWG, coll. M123-2016).

Palaeoecology. In the Quaternary *A. flabellicostatum* existed in the narrow coastal zone of the southern-western shelf of the Cape Peninsula between latitude 20.43°S and the eastern coast of Cape Agulhas; upper depth threshold ranged from 31–40 m (Luderitz, south-western Cape) to 142–158 m (Walvis Bay, Orange Banks), lower depth threshold was 184–223 m; maximum abundance of *A. flabellicostatum* was at depths of 40 m and 130–200 m (southern Namaqualand, south-western Cape, Walvis Bay), its minimum number was at a depth of 70–90 m (south-western Cape) (Dingle, 1992).

Zoogeography. Indo-Pacific species (Dykan, 2020).

Ambostracon keeleri (Dingle 1992)

Fig. 2, photo. 6–8

Ambostracon sp.: Keeler, 1981: 115–120, pl. 6, figs. 11–12, 15–19 (cited for Dingle, 1992); Boomer, 1985: 45–46, pl. 4, figs. 67–69 (cited by Dingle, 1992).

Ambostracon (*Ambostracon*) *keeleri* sp. nov.: Dingle, 1992: 46–50, figs. 29 A, D, G, 34 D, E, F, 35 A–B; Dingle, 1994, Fig. 4, C; Dingle, 1995, pl. 1, fig. 9; Conway-Physick, 1995: 31, Fig. 4.25, pl. 7, figs. C, D.

Ambostracon (*Patagonacythere*) sp. 3556: Dingle, 1993: 98, Fig. 54 C, D.

Holotype. *Ambostracon* (*Ambostracon*) *keeleri* (Dingle, 1992, p. 46–50), fig. 34 D, LV, external, x 100, L = 0.70 mm, H = 0.38 mm, L/H = 1.84; continental shelf of south-western Africa between the Kunene River and Cape Peninsula, lat. 34°09' S, long. 18°22' E; SAM-PQ-MF-0551, TBD 6823, collection no. SEM 2529; 120 m water depth, sandy substrate, Recent. South African Museum (Cape Town, South Africa).

Type series (coll. M123-2016). DM OF-H-P13, station GeoB 20602-1, A, ♀, LV; DM OF-H-P12, station GeoB 20602-1, A, ♂, RV; DM OF-H-P7, station GeoB 20602-1, A, J/last stages, ♀, LV; DM OF-H-P8, station GeoB 20602-1, A, J/last stages, ♀, RV.

Material. 1 valve of female (adult), 1 valve of male (adult), 2 valves of females (juveniles).

Diagnosis by Dingle (1992, p. 47): "...species with a strong ocular ridge that runs anterior to the eye tubercle, and is not continuous with the ventrolateral ridge. Ridges radiate centrally from the subcentral tubercle".

Diagnosis by present authors: valve middle size, maximum convexity in median part. Surface with fine sculpture, cellular-ribbed; ridges high and low, narrow and wide; cells average to large with thin muri. Loop-shaped ridge weakly expressed, low, short, with fuzzy cells inside. Ocular ridge weakly expressed, low, narrow, short, connects with spheric, large, smooth eye tubercle. Anterior ridge runs behind the eye tubercle and connects with the ventral ridge. Ventral ridge wide, rounded, runs from the top of the caudal process to the anterior ridge. Numerous very small teeth are located along the anterior end, three to four teeth developed posteroventrally. Hinge holamphydont, left-bared; terminal teeth are not bifid, high, tuberous; median part is represented by a smooth bar.

Description. Shell subrectangular, medium size (L = 0.66–0.69 mm), moderately elongate (L/H = 1.74–1.97). Maximum height in anterior third. Maximum convexity in median part of the shell. Dorsal margin straight and inclined to posterior end. Posterior cardinal angle well-expressed, rounded (RV). Ventral margin widely concaves in anterior third. Anterior end higher than posterior, rounded. The posterior end is nearly vertical beveled and concave posterodorsally. Caudal process located at the level of the longitudinal axis, well-expressed on the right valve, rounded posteroventrally. Surface with fine sculpture, cellular-ribbed. Cells average to large in size, of various shapes (round, three-pentagonal angular, irregular), with low thin muri. Ridges wide in posteromedian part, thin in posterior part; low, flat and narrowly rounded; diverge radially from the subcentral tubercle in the median part. Loop-shaped ridge located in the posterodorsal, middle-dorsal and median-dorsal parts; weakly expressed, low, short, with fuzzy cells inside. Ocular ridge located in the anterodorsal part of the valve and connects with eye tubercle; weakly expressed, low, narrow, short. Anterior ridge runs behind the eye tubercle and does not cross it, connects with the ventral ridge. Ventral ridge wide, rounded, runs from the top of the caudal process to the anterior ridge. Eye tubercle is of spheric shape, large and smooth. In juveniles an eye tubercle connects with the subcentral tubercle by a short-curved ridge (Dingle, 1922, p. 48). Numerous very small teeth are located along the anterior end, three to four teeth developed posteroventrally. Duplicature width, at the anterior end 2.5 times wider than at the posterior end. Zone of the marginal pore canals is wide at the anterior end. Marginal pore canals are numerous (about 50, MWG, coll. M123-2016; near 30, Dingle 1992), simple, single-tier, unevenly located, single and grouped in two, long and short, straight narrow and ampoule-shaped in the anterior end. Hinge holamphydont, left-bared. Terminal teeth are not bifid, high, tuberous; the median part is represented by a smooth bar. Anterior terminal elements of the right valve are represented by a high, smooth tooth and a deep narrow pit; the posterior terminal element is represented by a low tooth weakly crenulated in two parts; the median part is represented by a narrow groove. Anterior terminal elements of the left valve are represented by a large deep pit and a small tuberous tooth on the inside; the posterior element is represented by a large deep pit; the median part is represented by a smooth bar (Dingle, 1992, p. 48, 52, Fig. 35 A; B). The central muscle scar field has the shape of a smooth weakly concave tubercle in the anteromedian part on the outside of the valve, muscle scars could not be observed. Dingle (1992, p. 48, Fig. 29 D, E, F) remarked too that «muscle scars could not be clearly seen, despite the large number of specimens available», and mentions "...a total of six scars» of the adductor group located bilinear and noted that adductor scars of the species *Ambostracon (A.) keeleri* «...appear to be simpler than those in *A. flabellicostata* and *A. levetzovi*". Anterior ridge is well-expressed, short, curved in larvae of last stages.

Dimensions. DM OF-H-P13, A, ♀, LV, L = 0.66 mm, H = 0,38 mm, L/H = 1.74; DM OF-H-P12, A, ♂, RV, L = 0.69 mm, H = 0.35 mm, L/H = 1.97; OF-H-P7, J/last stages, ♀, LV, L = 0.57 mm, H = 0.32 mm, L/H = 1.78; OF-H-P8, J/last stages, ♀, RV, L = 0.58 mm, H = 0.32 mm, L/H = 1.81.

Sexual dimorphism. Weakly expressed. Manifested in size of the valve (females, L = 0.66–0.70 mm, MWG, coll. M123-2016; L = 0.77–0.80 mm, Dingle, 1993; slightly larger than males, L = 0.68–0.69 mm, Dingle, 1992), in degree of elongation (males, L/H = 1.97–2.06, longer than females, L/H = 1.74–2.0), in degree of expression of the caudal process (in males well expressed, in females weakly expressed).

Remarks. In the description of the species *Ambostracon* (*A.*) *keeleri* sp. nov. Dingle (1992, p. 48) noted that "...males more elongate than females, but he did not indicate the sex of the specimens on the palaeontological tables. Figs. 34 D, 35 B (L = 0.70 mm, L/H = 1.84; L = 0.69 mm, L/H = 1.84, Dingle, 1992), fig. 4 C (Dingle, 1994), pl. 1, fig. 9 (Dingle, 1995) show left valve of females; on figs. 34 E, 35 A (L = 0.8 mm, L/H = 1.94–2.06, Dingle, 1992) show a right valve of a male. Conway-Physick (1995) shows the left and right valves of females on pl. 7, fig. C, D (L/H = 1.77–1.81).

Variability. Manifested slightly in size of the valve (L = 0.66–0.69 mm, MWG, coll. M123-2016; L = 0.68–0.73 mm, Dingle, 1992), in degree of elongation of the valve (L/H = 1.74–1.97, MWG, coll. M123-2016; L/H = 1.82–2.06, Dingle 1992; L/H = 1.84–1.86, Conway-Physick 1995); in degree of expression of the ocular ridge (very weakly expressed, MWG, coll. M123-2016; from strong to weakly expressed, more strongly developed on the right valve, Dingle, 1992, pl. 34 D, E); in degree of

expression (clear, weakly expressed) and slightly in size (length and width) of loop-shaped ridge; in internal surface sculpture (cellular or absent); in morphology of anterior ridge which is well-expressed in females of last stages larvae.

Geographical variability. According to Conway-Physick (1995), populations of *A. keeleri* in the biotopes of the Agulhas Bank have a more strongly developed anterior ridge than representatives of this species on the west coast of South Africa.

Comparison. *Ambostracon keeleri* Dingle 1992 (p. 46–50, 34 D–F, 35 A–B, Quaternary, South West Africa) differs from *A. frenzeli* sp. nov. by larger size of the shell, less convexity of the shell in their median part, smoothly rounded caudal process, size of loop-shaped ridge (wider and shorter), location of the anterior ridge relative to the eye tubercle (behind the eye tubercle), weakly developed (short, low) ocular ridge; structure of the hinge (hinge holamphydont with terminal high and not bifid teeth and smooth bars in the median part in *A. keeleri*; hinge paramphidont with crenulated terminal teeth and fine-crenulated groove in the median part in *A.frenzeli* sp. nov.). *A. keeleri* Dingle 1992 differs from *A. flabellicostata* (Brady 1880) (Dingle, 1992, p. 43, 46, Figs. 28 A–D, 29 C, F, Quaternary, South Africa; MWG, coll. M123-2016, Figs. 2, 1–5, Recent, South Africa) by larger size of the shell, thin-celled sculpture (cells with thin muri); weakly developed loop-shaped ridge and its shape (low, short); weakly developed short (reaches eye tubercle) ocular ridge and its isolation from anterior ridge; location of the anterior ridge behind eye tubercle; absence of peripheral ridge along the edge of the valves; numerous marginal teeth on the anterior end and posteroventrally.

Localities. Recent: Indian Ocean, continental shelf of the east coast of South Africa, southwest of Durban, sample GeoB 20602-1, lat. 34°2.241', long. 26°20.301', surface sediment (0–5 cm), 117 m water depth, sandy mud substrate.

Stratigraphical position. Quaternary: continental shelf of south-western Africa (Dingle, 1992, 1994). Holocene: continental shelf of South Africa (Conway-Physick, 1995) and South-West Africa (Boomer, 1985). Recent: continental shelf of South Africa (Keeler, 1981), South-West Africa (Boomer, 1985; Dingle, 1992) and South-East Africa (Keeler, 1981); continental shelf of the eastern, southern and western coast of South Africa (MWG, coll. M123-2016).

Geographical distribution. Ambostracon keeleri Dingle 1992 is rare, it occurs only on the South African shelf of the Atlantic and Indian Oceans. South-West Africa, continental shelf (Boomer, 1985), continental shelf between Kunene River and Cape Agulhas, lat. 34°09' S, long. 18°22' E (Dingle 1992, 1994). South Africa, the nearshore zone of the south-western Cape Peninsula between St Helena Bay, lat. 32.68°S and Cape Agulhas, lat. 34.77°S (Dingle, 1992); the continental shelf from Cape Agulhas to Port Elizabeth, lat. 33–37°S, long. 19–27°E (Conway-Physick, 1995). South-East Africa: continental shelf southwest of Durban, lat. 34°2.241'S, long. 26°20.301'E (MWG, coll. M123-2016), continental shelf between Cape Agulhas and Reunion Island east of Madagascar (Keeler, 1981).

Habitat conditions. Marine species. *Ambostracon keeleri* is widespread on the continental shelf of the south-western coasts of South Africa from Cape Peninsula to north-west (Dingle, 1992, 1994; Conway-Physick, 1995). Psammophile (85.2 % of individuals were found on sandy substrate; Conway-Physick, 1995). The distribution of this species is limited by nearshore sites of the south-western part of the Cape between St Helena Bay (32.68°S, 18 m water depth) and Cape Agulhas (34.77°S, 73 m water depth); it is widespread in Hout Bay on Cape Peninsula from 15 m to 140 m water depths. It exists in the broad shallow shelf of the Agulhas Bank at depths of 15–200 m and has a high population density at depths of 95–140 m (maximum in mid-shelf zone, near 120 m), in average water temperature of +11.6 to +12.7 C and a salinity of 35 PSU (Dingle, 1992). The distribution of the species *A. keeleri* on the continental shelf of South-West Africa from Cape Peninsula to the North is limited by the low water temperature of the Benguela current (Dingle, 1992; Conway-Physick, 1995).

Palaeoecology. In the Quaternary *A. keeleri* was widespread in the narrow coastal zone of the southern to western shelf of Cape Peninsula between latitude 20.43°S and the eastern coast of Cape Agulhas with the Walvis Shelf populations being relatively sparse. A narrow zone of high population density was found on the Walvis shelf (from latitude 20.43°S to 23.43°S) and from the south-western Cape Peninsula to Luderitz (on the mid-shelf with water depths of about 120 m). Upper depth threshold ranged from 15 m (south-western Cape) and 31 m (Luderitz) to 158 m

(Orange Banks) and 160 m (Walvis Bay). Lower depth threshold ranged from 200 m (Walvis Shelf) to 252-303 m (all the southern areas). Maximum abundance of *A. keeleri* was found at water depths of 90-160 m in the south-western Cape Peninsula (Dingle, 1992).

Zoogeography. Indo-Pacific species (Dykan, 2020).

Ambostracon frenzeli sp. nov.

Fig. 3, photo 1, 2, 3, 3a, 3c, 3d, 3k, 4, 4a, 4b;
Fig. 4, photo 1, 2, 2a, 2b, 3, 3a, 3b, 4, 5

Etymology. Named after Peter Frenzel (Jena), in recognition of his contribution to the study of ostracods.

Holotype. *Ambostracon frenzeli* sp. nov. (Fig. 3, 1 – adult, female, RV, external, × 210, SEM DN-4, station GeoB 20615, L = 0.48 mm, H = 0.28 mm, L/H = 1.71; Fig. 3, 2 – adult, male, LV, external, SEM OF-E-014, station Geo B20615, L = 0.53 mm, H = 0.28 mm, L/H = 1.89. South Africa, Maputo Bay, lat. 25°33.073'S, long. 33°12.181'E, 200 m water depth, int. 0-5 cm, mud substrate, Recent. Collection M123-2016, Institute of Geosciences (University of Jena, Germany). LSID urn: lsid: zoobank.org: pub: F5A34CEF-E3F9-472B-A7F6-66974A362ADE

Paratypes (coll. M123-2016)**.** DM DN-8, station GeoB 18308-1, A, ♀, RV; DM DN-6, sample GeoB 18308, ♀, LV; SEM OF-B-P35, station GeoB 20615, A, ♀, RV; SEM OF-E-014, station GeoB 20615-1, A, ♂, LV; SEM OF-E-007, station GeoB 20615-1, A, ♂, RV; DM OF-E-P7, station GeoB20615-1, A, ♂, RV; SEM OF-B-P34/1, station GeoB 20615-1, A, ♂, RV; DM DN-7, station GeoB 18308-1, A, ♂, LV; ZA14/14-3, sample ZA14/14, juv., ♀, LV; SEM ZA14/14-4, sample ZA14/14, juv., ♀, RV; DM DN-3, station GeoB 20615, J/last stages, ♀, LV.

Material. 4 valves of females (adult), 7 valves of males (adult), 3 valves of juveniles.

Diagnosis: Shell is small, maximum convexity in the medianventral and posteromedian parts. Valves finely sculptured, cellular-ribbed; ridges high and narrow; cells average to large with fuzzy muri. Loop-shaped ridge well expressed, elongated, high, with longitudinal ridge inside. Ocular ridge well expressed, long, low, narrow, runs through smooth, flattened, average size eye tubercle, isolated from ventral ridge. There are two ventral ridges in the ventral part of the valve. High narrow ridges run along the anterior end and anteroventral part of the valve. Numerous very small teeth are located along anterior end. One to two marginal teeth developed posteroventrally. Surface pore canals well expressed. Hinge paramphidont, terminal teeth are crenulated, low, long; median part is represented by fine-crenulated groove (RV).

Description. Shell subtrapezoid (female) and subrectangular (male), small (L = 0,48-0,58 mm), moderately elongate (L/H = 1.70–2.04), moderately wide (L/W = 2.43). Maximum height in anterior third. Maximum convexity in median-ventral and posteromedian parts. Wide flat flange in posteroventral position. Dorsal margin straight and inclined to posterior end. Anterior cardinal angle weakly distinct or indistinct, posterior cardinal angle well expressed, rounded. Ventral margin widely concaves in anterior third. Contact well-expressed and high tuberous knob-stop is in middle-ventral part. Anterior end higher than posterior, rounded. Posterior end significantly concave posterodorsally. Well-expressed caudal process located at the level of the longitudinal axis, has the form of a straight bevelled ledge with a rounded or sharp top. Valve surface finely sculptured, cellular-ribbed. Cells are of various shapes (round, three-pentagonal angular, irregular), average to large (size of the cells increases from the center to the margins of the valve), muri thin, low, weakly expressed. Ridges high, narrowly rounded, diverge radially from the muscular field in the central part of the valve. Loop-shaped ridge located in the posterodorsal, posteromedian and median-dorsal parts (RV); it is well expressed, high, elongated, diagonally located in the posterodorsal, posteromedian and anterior-median parts of the left valve, with well-expressed longitudinal ridge and reticulated surface inside. A well-defined short ridge extends from the apex of the loop-shaped ridge to the posterior cardinal angle. Ocular ridge weakly expressed, low, narrow, short; connects with eye tubercle on the left valve and isolated from ventral ridge on LV, connects with it on LV. There are two ventral ridges. A high, narrow, lamellar ridge runs from top of the caudal process to middle part of the valve; a low, narrow, short ridge runs from middle part of the valve to ante-

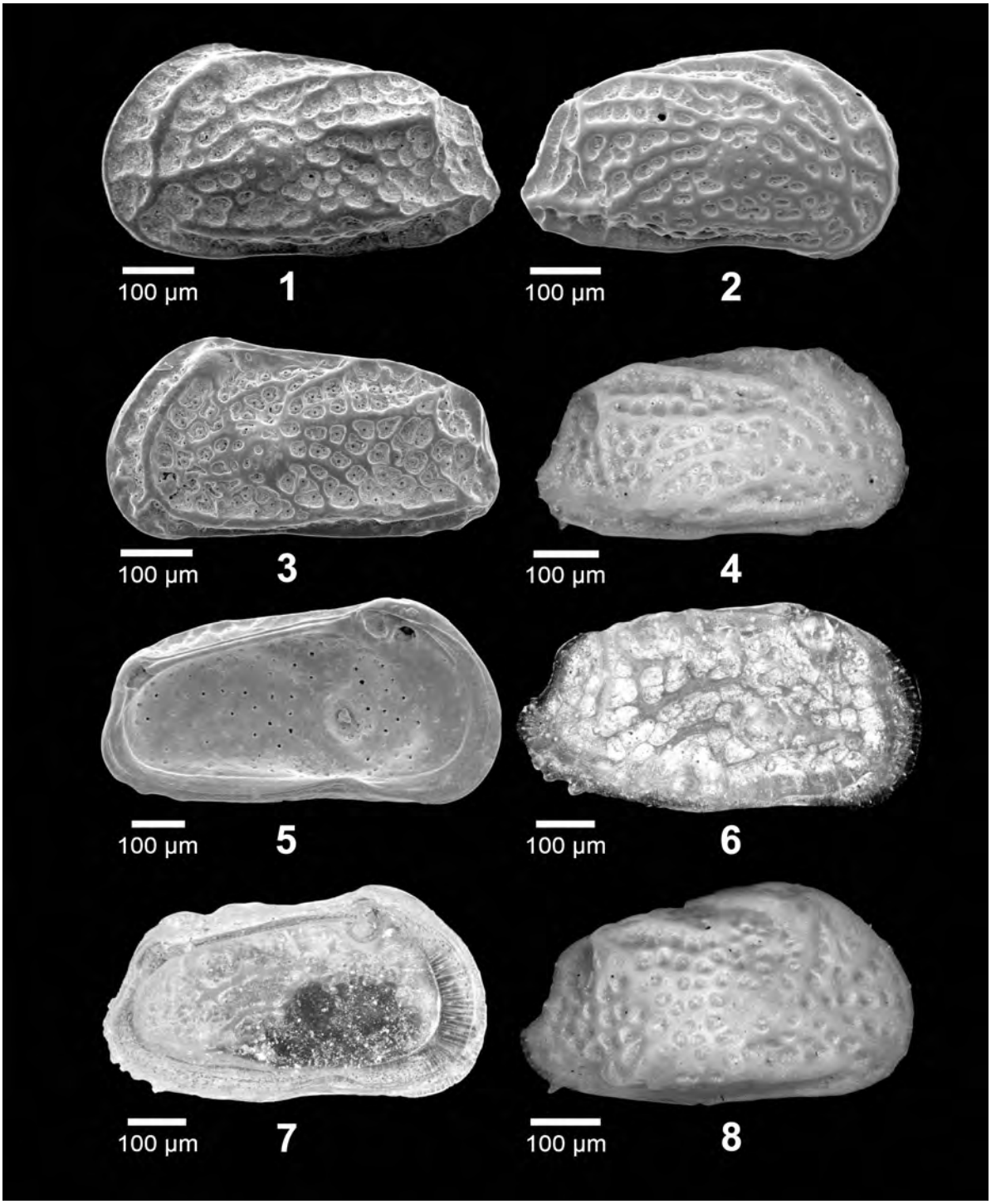

Fig. 2. ***Ambostracon flabellicostata*** **(Brady, 1880)**: *1* – SEM 20628-1 MA-1 (paratype), A, ♀, LV, external, South Africa, Mossel Bay, station GeoB20628, 71 m water depth, surface sediment 261.5 cm, Recent. *2* – SEM OF-B-P34/3 (paratype), A, ♀, RV, external, South Africa, Maputo Bay, station GeoB 20615, 200 m water depth, surface sediment (0–5 cm), Recent. *3* – SEM ZA14/14-1 (paratype), A, ♂, LV, external, South Africa, Knysna estuary (Thesen Island), sample ZA14/14, 3 m water depth, surface sediment (0–3 cm), Recent. *4* – DM OF-H-P11-002 (paratype), A, ♀, RV, external, South Africa (southwest of Durban), station GeoB20602, 117 m water depth, surface sediment (0–5 cm), Recent. *5* – SEM ZA14/14-2 (paratype), A, ♂, LV, internal, South Africa, Knysna estuary (Thesen Island), sample ZA14/14, 3 m water depth, surface sediment (0–3 cm), Recent. *5a* – hinge. ***Ambostracon keeleri*** **(Dingle, 1992):** *6* – DM OF-H-P12 (paratype), A, ♂, RV, external, South Africa (the southwest of Durban), sample GeoB 20602, 117 m water depth, surface sediment (0–5 cm), Recent. *7* – DM OF-H-P13 (paratype), A, ♀, LV, internal, South Africa (the southwest of Durban), sample GeoB 20602, 117 m water depth, surface sediment (0–5 cm), Recent. *8* – DM OF-H-P8 (paratype), J/last stages, ♀, RV, external, South Africa (southwest of Durban), station GeoB 20602, 117 m water depth, surface sediment (0–5 cm), Recent

rior third of the valve. A high, narrow and rounded ridge runs along the periphery of the anterior end. Eye tubercle is of average size, smooth, flattened. Numerous very small teeth are located along the anterior end. One to two marginal teeth developed in the posteroventral part. Duplicature narrow at the anterior and posterior ends. Normal pore canals unevenly located, opened, have the form of a convex high tubercle with a raised rounded osculum without a rim (larvae of the last stages). Hinge paramphidont, left-bared. Anterior terminal element of the right valve is represented by a low, long tooth, notched into ten parts (denticle's size decrease inwards); posterior terminal element is represented by a higher and shorter tooth, crenulated into six to seven parts; median part is represented by a narrow fine-crenulated groove. Central muscle scar field is well expressed on the inside of the carapace, located in the anteromedian part of the right valve and in the median one in the left valve. The type of adductor muscle scars is bilinear (three scars in each row), upper scar is rounded, lower scars are elongated. Two frontal rounded scars are in front and above the adductor muscles**.**

In larvae the maximum convexity is located in mid-dorsal part of the valve, caudal process is below the longitudinal axis, anterior and ventral ridges are well expressed, posterodorsal loop-shaped ridge is low, cells located concentrically with respect to the muscular field.

Dimensions. SEM DN-4 (holotype), A, ♀, RV, L = 0.48 mm, H = 0.28 mm, L/H = 1.71; SEM OF-E-014 (holotype), A, ♂, LV, L = 0.53 mm, H = 0.28 mm, L/H = 1.89; SEM DM DN-6 (paratype), A, ♀, LV, L = 0.50 mm, H = 0.26 mm, L/H = 1.92; DM DN-8 (paratype), A, ♀, RV, L = 0.51 mm, H = 0.30 mm, L/H = 1.70; SEM OF-E-006 (paratype), A, ♂, LV, L = 0.58 mm, H = 0.30 mm, L/H = 1.93; SEM OF-E-007 (paratype), A, ♂, RV, L = 0.56 mm, H = 0.29 mm, L/H = 1.93; SEM DN-7 (paratype), A, ♂, LV, L = 0.51 mm, H = 0.25 mm, L/H = 2.04; DM OF-E-P7 (paratype), A, ♂, RV, L = 0.56 mm, H = 0.28 mm, L/H = 1.93; SEM OF-B-P34/1 (paratype), A, ♂, RV, L = 0.58 mm, H = 0.30 mm, L/H = 1.93; DM DN-3, J/last stages, ♀, LV, L = 0.45 mm, H = 0.25 mm, L/H = 1.8; SEM DN-1, J/early stages, ♀, LV, L = 0.35 mm, H = 0.21 mm, L/H = 1.65; SEM DN-2, J/early stages, ♀, RV, L = 0.35 mm, H = 0.21 mm, L/H = 1.65.

Sexual dimorphism. Strongly expressed. Manifested in shape of the shell (irregularly subtrapezoid in female; irregularly subrectangular in male), in size of the shell (male, L = 0.51–0.58 mm, larger than female, L = 0.48–0.53 mm), in degree of elongation of the shell (male, L/H = 1.93–2.04, more than female, L/H = 1.89–1.92), in degree of concavity of the ventral margin (in male less than in female), in development of reticulation sculpture (the cells are larger and the muri of the cells are low and wide in female; the cells are less expressed, small or of an average size, the muri are low or smooth in males), in development of the ridges (anterior and ventral ridges are more expressed, high and wide, without a net of ridges in the central part of the shell in female; the diagonal and longitudinal, short and long, narrow ridges in the median part of the shell, a short high ridge in the middle of the loop-shaped ridge in male), in degree of expression of the posterodorsal loop-shaped ridge (strongly expressed in female, less expressed in male), in the number of marginal teeth in the posteroventral part (three to four teeth in females, one tooth in males), in degree of expression of the muscular field (clear from the outside and inside, rounded, large, convex, smooth in females; slightly expressed, fuzzy in male).

Variability. Manifested in size of the shell (L = 0.48–0.58 mm), in expression of the anterior cardinal angle (unexpressed to weakly expressed; rounded, rectangular shape); in degree of inclination of dorsal margin to posterior end in male (from strongly to slightly); in size (narrow or wide, short or long, low or high top) and sculpture (well expressed longitudinal ridge, one or two small transverse ridges, only cells inside) of loop-shaped ridge; in the size, shape and number of marginal teeth in the posteroventral part (one large tooth with a wide base and a rounded tip at the border of the posterior and middle ventral parts; three to four low rounded teeth in the posteroventral part; three teeth on top of the caudal process of which the middle tooth is large); in male in degree of development of the caudal process (weak or well expressed) and degree expressed of the ridges on LV (from strongly expressed to rare weakly expressed); in female in more developed ridges and cells on the right valve.

Remarks. The type of the hinge (general features of the structure of the middle and marginal parts of the hinge) is a diagnostic generic character of marine ostracods. The details of the hinge structure (more stable middle part and variable terminal elements) are taxonomic characters of the species (e.g., shape and size of teeth in *Leptocythere*, Dykan, 2006). The hinge of the genus *Ambostracon* Hazel 1962 (*Ambostracon europea* Maybury & Whatley, 1986, p. 77–80, figs. 1a-b; Upper Pliocene, NW France; *A. costaforva* Whatley & Maybury 1986, there only p. 81–84, figs. 1, 3, 4a–b; *A. delicata* Whatley & Maybury 1986, there only p. 85-88, figs. 2a–b, 3a–b; *A.* (*A.*) *keeleri*, Dingle, 1992, fig. 35A-B, Quaternary, South Africa) is amphidont of the holamphidont subtype: terminal anterior smooth high tuberous tooth, posterior smooth or weakly crenulated tuberous tooth and smooth bars in the median part. The hinge of the of species *A.* (*A.*) *frenzeli* sp. nov. is of the paramphidontic subtype with crenulated median part and terminal elements (long, low, anterior and posterior teeth).

Comparison. *Ambostracon frenzeli* sp. nov. (MWG, coll. M123-2016, Recent, South Africa) differs from *A.europea* Maybury & Whatley 1986 (Maybury & Whatley, 1986, p. 77–80, pl. 13, 78, figs. 1a,b, 3a,b; pl. 13, 80, figs. 1a,b, 3a,b, 4a,b; Upper Pliocene, NW France) by location of the loop-shaped ridge on the surface of the valve, clear reticulation of surface, absence of diagonal ridges in the anteroventral part and frill-like flange anteriorly and caudally, structure of the anterior marginal element of the hinge (long, low and crenulated teeth). *A. frenzeli* sp. nov. differs from *A. keeleri* Dingle 1992 by smaller size of the shell (*A. frenzeli* sp. nov.: L = 0,48–0.58 mm, MWG, coll. M123-2016, Recent, South Africa; *A. keeleri*: L = 0.66–0.73 mm, Dingle 1992, Quaternary, South West Africa); well expressed caudal process on LV; strongly convex valve in posterior and posteromedian part; well expressed high, diagonally located loop-shaped ridge and sculpture (ridges, cells) inside; well expressed long ocular ridge which runs through eye tubercle; well expressed ventral ridge passing along limit of maximum convexity of the shell; the structure of the hinge (paramphidont with crenulated terminal teeth and fine-crenulated groove in the median part in *A. frenzeli*; holamphidont with anteriorily not bifid, high, tuberous teeth and a smooth bar in the median part in *A. keeleri*). *A. frenzeli* sp. nov. differs from *A. flabellicostata* (Brady 1880) by location of maximum convexity of the valve in the median-ventral and posteromedian parts; finely sculpted surface (narrow ridges with weakly expressed muri between them); smaller width of ocular ridge, narrow high peripheral ridge along anterior end, morphology of ventral ridges, greater number and size of marginal teeth.

Locality. Recent: Indian Ocean, continental shelf of the eastern coast of South Africa, southwest of Durban, station GeoB 20602, lat. 34°2.241’ S, long. 26°20.301’ E, surface sediment (0–5 cm), 117 m water depth, on sandy mud substrate; 200 m water depth, on organic mud substrate; continental shelf off the eastern coast of South Africa, Maputo Bay, station GeoB 20615, lat. 25°33.073’ S, long. 33°12.181’ E, surface sediment (0–5 cm), 200 m water depth, substrate: brown organic mud with low proportion of detritus and high proportion of organic material; continental shelf off the southern coast of South Africa, Mossel Bay, station GeoB 18308, lat. 34°22’23,34” S, long. 21°55’44,8212” E; surface sediment (0–2 cm), 39.8 m water depth, muddy substrate; estuaries and lagoons of the eastern coast (Wilderness area, Knysna estuary).

Stratigraphical position. Recent: continental shelf of East and South Africa, estuaries and lagoons of the eastern coast of South Africa (Wilderness area, Knysna estuary) (coll. M123-2016).

Geographical distribution. South-East Africa: continental shelf of Maputo Bay (lat. 25°33.073’ S, long. 33°12.181’ E) to southwest of Durban (lat. 34°2.241’ S, long. 26°20.301’ E), estuaries and lagoons of the eastern coast (Wilderness area). South Africa: continental shelf of the southern coast, Mossel Bay, lat. 34°22’23,34” S, long. 21°55’44,8212” E (MWG, coll. M123-2016).

Habitat conditions. Marine species. *Ambostracon frenzeli* sp. nov. has a regional distribution on the continental shelf of the east of South Africa including estuaries and lagoons. It exists in habitats of the continental shelf of the eastern coast from Maputo Bay to southwest of Durban on sandy and organic mud in 117–200 m water depth; in shallow habitats of the southern coast (Mossel Bay) in 39.8 m water depth, on muddy substrate; in Knysna estuary it exists on muddy sand substrate in a water depth of 3 m at a water temperature of +18.8°C, in saline water of 34.1 PSU and pH of 8.22. Pelophilic, populations are small (MWG, coll. M123-2016).

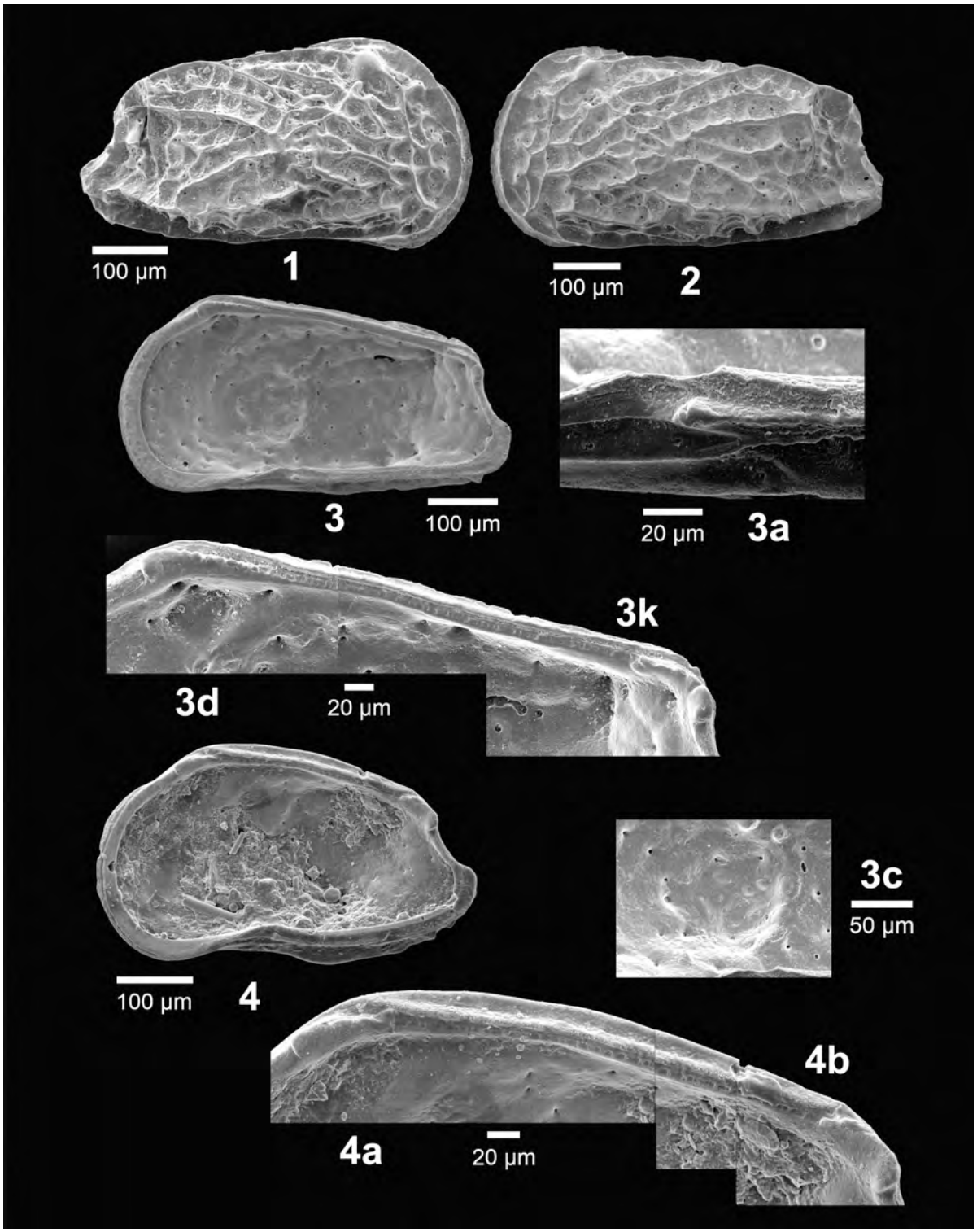

Fig. 3. SEM photographs of the valves of *Ambostracon frenzeli* sp.nov.: *1* – SEM DN-4 (holotype), A, ♀, RV, external, South Africa, Maputo Bay, station GeoB 20615, 200 m water depth, surface sediment (0–5 cm), Recent. ***2*** – SEM OF-E-014 (holotype), A, ♂, LV, external, South Africa, Maputo Bay, station GeoB 20615, 200 m water depth, surface sediment (0–5 cm), Recent. ***3*** – SEM OF-E-007 (paratype), A, ♂, RV, internal, South Africa, Maputo Bay, station GeoB 20615, 200 m water depth, surface sediment (0–5 cm), Recent. ***3a*** – contact tuberous knob-stop; ***3c*** – central muscle scar field; ***3d*** – anterior terminal element of hinge; ***3k*** – posterior terminal element of hinge. ***4*** – SEM DN-8 (paratype), A, ♀, RV, internal. South Africa, Mossel Bay, sample GeoB 18308, 39.8 m water depth, surface sediment (0–2 cm), Recent; ***4a*** – anterior terminal element of hinge; ***4b*** – posterior terminal element of hinge

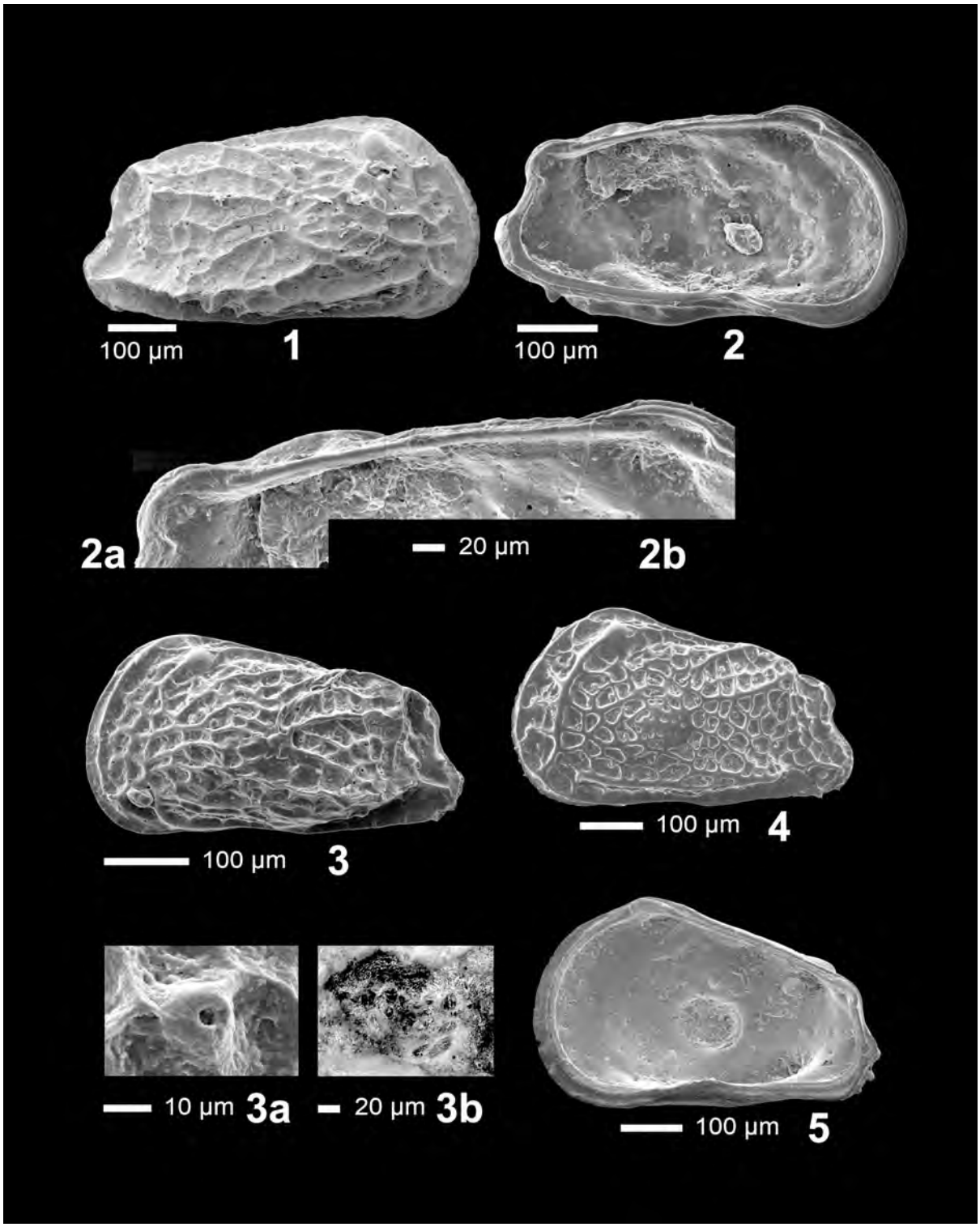

Fig. 4. *Ambostracon frenzeli* sp. nov.: *1* – SEM OF-B-P34/1 (paratype), A, ♂, RV, external, South Africa, Maputo Bay, station GeoB 20615, 200 m water depth, surface sample (0–5 cm), Recent. *2* – SEM DN-7 (paratype), A, ♂, LV, internal, South Africa, Mossel Bay, station GeoB 18308, 39.8 m water depth, surface sample (0–2 cm), Recent; *2a* – posterior terminal element of hinge; *2b* – anterior terminal element of hinge. *3* – SEM DN-3 (paratype), J/last stages, LV, external, South Africa, Maruto Bay, station GeoB 20615, 200 m water depth, surface sample (0–5 cm); *3a* – normal pore canal; *3b* – adductor and frontal scars, sample DM OF-E-P7. *4* – SEM ZA14/14-3 (paratype), J/early stages, ♀, LV, external, South Africa, Knysna estuary (Thesen Island), sample ZA14/14, 3 m water depth, surface sediment (0–3 cm), Recent. *5* – SEM ZA14/14-4 (paratype), J/early stages, ♀, RV, internal, RV, internal, South Africa, Knysna estuary (Thesen Island), sample ZA14/14, 3 m water depth, surface sediment (0–3 cm), Recent

5 Conclusions

For the first time, a complete monographic description of the ostracods of the genus *Ambostracon* Hazel 1962 (*Ambostracon keeleri, A. flabellicostata, A. frenzeli* sp. nov) of the South Africa has been compiled. New data on morphology, adaptive variability and sexual dimorphism were obtained, and data on ecology, stratigraphic position and geographical distribution of these species were clarified. The taxonomic revision of the subgenera of the genus *Ambostracon* was carried out. The results of the systematic study of the South African ostracods are the informational and analytical basis for paleogeographic reconstructions of the marine and coastal ecosystems of the Indo-Atlantic coast of the South Africa.

6 Acknowledgements

The authors would like to thank Prof. Dr. Peter Frenzel (University Jena, Institute of Geosciences) for providing the South African ostracod collection for systematic study and comprehensive assistance during directing work with the collection material. Lukas Gander is thanked for processing and picking the fresh sediment samples on board of RV Meteor, selected images and the comprehensive documentation of samples in his Master thesis. Stefanie and Sascha Fürstenberg (University of Jena) collected and documented the material in the Knysna estuary, South Africa.

7 Authors contributions

Natalia Dykan conducted a study of ostracod valves (morphology, size measurements, statistical analysis, species identification, SEM photography of valves), made a taxonomic revision and monographic description of ostracods, compiled palaeontological tables and a map of actual material. Thomas Daniel processed samples of material from South Africa as part of the project in 2018, made light microscope images of the ostracods, provided help with the compilation of the palaeontological tables and the map of actual material.

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Received 17.05.2023
Received in revised form 05.10.2023
Accepted 26.11.2023

Нові дані з систематичного вивчення сучасних остракод роду *Ambostracon* Hazel 1962 (Hemicytheridae, Podocopida) Південної Африки

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Стаття присвячена ревізії таксономічного складу (підродів, видів) роду *Ambostracon* Hazel 1962 (Hartmann, 1962) і монографічному опису викопних (голоценових) і сучасних морських остракод роду *Ambostracon* Hazel 1962 Південної і Південно-Східної Африки. Фактичний матеріал відібрано з геологічних станцій на шельфі, континентальному схилі та глибоководній западині (гл. 32–3059 м) у трьох районах (від південного узбережжя затоки Моссел до східного узбережжя на південь від Дурбану; зовнішня частина затоки Мапуту; східне узбережжя Південної Африки) і донних відкладів з лагун, естуаріїв і прибережних озер східного узбережжя Південно-Східної Африки (Wilderness, гл. 0,2–1000 м) (R/V METEOR M123-2016). Обговорюється валідність виділення підроду *Ambostracon (Patagonacythere)* (Hartmann, 1962). Описано два види *(Ambostracon keeleri, A. flabellicostata)* та один новий вид (*Ambostracon frenzeli* sp. nov.). Систематична частина включає синоніміку (складена за результатами ревізії виду), голотип (паратипи, типова серія), матеріал, діагноз, опис, розміри (лінійні, відносні), статевий диморфізм, індивідуальну та географічну мінливість, порівняння, зауваження, місцезнаходження, стратиграфічне положення, географічне поширення, екологію (для сучасних видів), палеоекологію (для викопних видів), зоогеографію. SEM-зображення зовнішньої та внутрішньої будови черепашки (макро- та мезоскульптури, центрального м'язевого поля, замка, поверхневих порових каналів).

***Ключові слова**: Crustacea; Ostracoda; Taxonomy; Південна Африка.*