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ON THE TAXONOMY OF CHAETOPLEURA FULVA (WOOD 1815) (MOLLUSCA: POLYPLACOPHORA)

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The native occurrence of *Chaetopleura fulva* (Wood 1815) (Polyplacophora: Chaetopleuridae) along the coast of eastern South America remained problematical until conclusively proved by Kaas (1954), who cited an extensive bibliography for this species. Although Kaas concluded that the Patagonian *Chiton tehuelchus* Orbigny 1841 was conspecific with Wood's species and noted that *Chiton fulvus* had been placed in various genera, he mentioned nothing about the relationship of *C. fulvus* to *Typhlochiton felipponei* Dall 1921 and *Stereochiton felipponei* Dall 1927. Subsequently, additional authors (Castellanos 1956; Righi 1967, 1970, 1971; Rios 1970) have reported on the polyplacophoran fauna of this region, yet the taxonomic status of Dall's species has remained uncertain. In the following paper I will show that these species are conspecific. In addition, evidence is presented that *Chiton angulatus* Spengler 1797, *Chiton ferrugineus* Spengler 1797, and *Chiton lusitanicus* Tilesius 1802 are also conspecific with *Chaetopleura fulva* (Wood 1815).

Chaetopleura fulva (Wood 1815)

Chiton angulatus Spengler 1797, Skrivt. Nat.-hist.-Selsk., 4: 71 (America; lectotype, herein selected, in ZMK) [*nomen oblitum*]; Mörch 1870, Malak. Blätter, 17: 111.

Chiton ferrugineus Spengler 1797, *Ibid.*, p. 72 (Mediterranean; lectotype, herein selected, in ZMK) [*nomen oblitum*]; Mörch 1870, *Malak. Blätter*, 17: 111.

Chiton lusitanicus Tilesius 1802, *Jahrb. Naturgesch.*, Leipzig, 1: 221, pl. 6, figs. 1-5 (*ad ostium Tagi* [mouth of Tagus River, Portugal]; location of type unknown) [*nomen oblitum*].

Chiton fulvus Wood 1815, *General Conchology*, p. 7, pl. 1, fig. 2 (brought from Portugal, but was probably taken in South America; location of type unknown).

Chiton tehuelchus Orbigny 1841, *Voy. Amér. Mérid.*, 5 (3): 488, pl. 65, figs. 7-13 (la baie de San-Blas, en Patagonie; type in BMNH).

Chaetopleura fulva Rochebrune [sic]. Rochebrune 1891, *Miss. Sci. Cap Horn*, 6 (Zool.): Mollusques, p. 137.

Tonicia tehuelcha Rochebrune [sic]. Rochebrune 1891, *Ibid.*, p. 138.

Tonicia tehuelchus (Orbigny). Pilsbry 1893, *Manual of Conchology*, 14: 105, pl. 40, figs. 13-15; Boudet 1945, *Rev. Chilena Hist. Nat.* for 1944, p. 129.

Chaetopleura fulva (Wood). Pilsbry 1894, *Manual of Conchology*, 14: pl. 44, figs. 62-64; Pilsbry 1894, *Manual of Conchology*, 15: 71; Carcelles & Williamson 1951, *Rev. Inst. Nac. Invest. Cien. Nat. (Zool.)*, 2: 246; Kaas 1954, *Basteria*, 18: 14 [extensive bibliography]; Castellanos 1956, *Rev. Museo Univ. La Plata*, (n.s.) 6: 471, pl. 7, lower left; Leloup 1956, *Lund Univ. Årssk. N. F. Avd.* 2, 52 (15): 29, figs. 9, 11, 12 [girdle elements, aesthetes, shell sculpture].

Chaetopleura tehuelcha (Orbigny). Pilsbry 1894, *Manual of Conchology*, 15: 71; Castellanos 1948, *Notas Museo La Plata*, 13 (Zool.): 194, pl. 3, figs. 1-6; pl. 5, figs. 14, 15; pl. 9, fig. 4; pl. 11, fig. 2 [valves, radula, girdle elements, aesthetes]; Castellanos 1951, *Com. Inst. Nac. Invest. Cien. Nat., Cien. Zool.*, 1(15): 7 [numerous Argentine locality records]; Barattini 1951, *Publ. Cien., Serv. Ocean. Pesca*, no. 6, p. 189; Barattini & Ureta 1960, *La Fauna de las Costas Uruguayas del Este*, p. 91.

Typhlochiton felipponei Dall 1921, Nautilus, 35: 4 (southern Brasil; holotype USNM 333091); Lange de Morretes 1949, Arq. Museu Paranaense, 7: 6; Barattini 1951, *Ibid.*, p. 190; Barattini & Ureta 1960, *Ibid.*, p. 91.

Stereochiton felipponei Dall 1927, Proc. U. S. Natl. Mus., 70(2668): 11 (Mar del Plata, Argentina; holotype USNM 333469); Barattini 1951, *Ibid.*, p. 189; Castellanos 1956, *Ibid.*, p. 472; Barattini & Ureta 1960, *Ibid.*, p. 89, pl. 17, top 2 figs. (fig. caption says "*Chiton felipponei*"; holotype of *Stereochiton felipponei* Dall 1927 figured).

Chaetopleura fulva, var. *tehuelcha* (Orbigny). Kaas 1954, Basteria, 18: 17; Leloup 1956, Lund Univ. Årssk. N. F. Avd. 2, 52(15): 33.

Typhlochiton feliponei [sic] Dall. Castellanos 1956, *Ibid.*, p. 477.

Chaetopleura (Chaetopleura) fulva tehuelcha (Orbigny). Righi 1967, Pap. Avul. Zool., S. Paulo, 20: 91, figs. 21-31 [radula, girdle elements]; Righi 1970, Ann. Inst. Océan., 47: 107, figs. 1, 2; Righi 1971, Pap. Avul. Zool., S. Paulo, 24: 134.

Description: Animal of moderate size, reaching a length of 50 mm, a width of 29 mm. Angle of valves about 100°, somewhat greater in young specimens. Anterior valve convex; post-mucral region of posterior valve straight to slightly convex. Mucro rather sharp. Jugal region sculpturally undifferentiated from the central areas; both regions with longitudinal, occasionally branching, beaded lirae, about 15 per side. Lateral triangle and end valves slightly raised, smooth, except for 3-5 faint, irregularly bifurcating, smooth (rarely beaded) radial lirae. Marginally, each lira of central and lateral areas ends as a notch; the nodules are actually the callused remains of previous notches.

Shell color variable. Central regions typically chestnut brown with darker jugal region; beaded lirae white. Lateral triangles and end valves lighter; radiating lirae white. Chestnut brown regions sometimes purplish brown; entire shell occasionally nearly white. Girdle naked, yellowish

brown, sparsely covered with small hairs. Interior of shell white.

Insertion plates: Apophyses broad, moderately extended. Jugal sinus trapezoidal; jugal teeth absent, or present, but indistinct. A single insertion slit; insertion teeth ventrally smooth, dorsally grooved; eaves not spongy.

Hypostracum: Central depression of intermediate valves with numerous scattered slits oriented perpendicular to the longitudinal axis. Callus moderately developed. Functional slit-ray present; slits elongate on callus, circular and irregularly scattered along slit-ray in the posterior depression. Secondary slit-ray present. Mucral callus slightly concave. Anterior valve with 11-14 deeply and unevenly grooved teeth; posterior valve with 12-14 teeth.

Radula: Similar to *Chaetopleura peruviana*, the type of the genus *Chaetopleura*. Denticle cap large, completely black; bicuspidate, lateral cusp slightly larger. When dried, the radular teeth shrivel; only the denticle caps retain their natural form.

Discussion: Upon examination of the unfigured type specimens of Spengler's (1797) *C. angulatus* and *C. ferrugineus*, I noted that both species, which have remained unrecognized by most workers since their description, are clearly conspecific with the well known *Chaetopleura fulva* (Wood 1815). Such a conclusion was not entirely unexpected, for both names were included as questionable synonyms of *Chaetopleura fulva* by Pilsbry (1894) and Kaas (1954). Hanley's (1856) remark that *C. ferrugineus* had priority over *C. fulvus* has passed a century of time unnoticed. Mörch (1870) also stated that *C. ferrugineus* was *C. fulvus* and noted that *C. angulatus* was only a light gray variety of the former.

Two syntypes of *C. angulatus* were found in the Zoological Museum, Copenhagen. One is less curled and light yellowish gray (pl. 34, figs. 2, 3); the other is strongly curled and more typically colored. The former, which better fits Spengler's description, is here selected as the lectotype of *Chiton angulatus* Spengler 1797 (pl. 34, figs. 4, 5). In the Copenhagen Museum are also two syntypes of *C. ferrugi-*

neus. The larger, rust-colored specimen, which perfectly matches the description in Spengler, is here selected as the lectotype (pl. 35, figs. 3, 4). Both Spengler names predate that of *Chiton fulvus* Wood 1815. To preserve stability of nomenclature, *Chiton angulatus* Spengler 1797 and *Chiton ferrugineus* Spengler 1797 are herein considered *nomina oblita* under Article 23b of the International Code of Zoological Nomenclature. *Chiton lusitanicus* Tilesius 1802 is also synonymous and it too is herein declared a *nomen oblitum*.

It is amusing that Dall (1921, 1927) applied the same specific name to two species from South America that subsequently have proved to be conspecific. Although originally placed in different genera belonging to separate families, there is no doubt that *Typhlochiton felipponei* Dall 1921 (pl. 35, fig. 5) from southern Brasil and *Stereochiton felipponei* Dall 1927 (pl. 35, figs. 1, 2) from Argentina must be placed in synonymy with *Chaetopleura fulva* (Wood 1815). Dall neither figured nor compared these species with other Polyplacophora and this has helped to keep the names in obscurity. Castellanos (1956) first suggested that *Stereochiton felipponei* was conspecific with *Chaetopleura fulva*. Lange de Morretes (1949) listed *Typhlochiton felipponei* from Brazil, but did not record the presence of *Chaetopleura fulva*. Righi (1967, 1970, 1971) made no reference to either of Dall's species. It should be mentioned that the holotype of *Stereochiton felipponei* was figured by Barattini & Ureta (1960) as "*Chiton felipponei*." Since both of Dall's species were included in their report, neither in the genus *Chiton*, the figure has been useless for determining the identity of *S. felipponei*. Barattini & Ureta did not mention that the photographs are of the unique type, but the whiteness of the shell and irregular black markings on the shell have allowed me to state with certainty that Dall's type is figured.

When describing *Typhlochiton felipponei*, Dall must have been confused as to the placement of this species. It had grooved insertion teeth, thought to be a characteristic of the restricted family Chitonidae, yet other characters, such

as the lack of jugal teeth, the non-spongy eaves, and the fact that the long gill rows did not extend to the head or tail, led him to believe that a new group of the family Chitonidae had been discovered.

The few South American workers who have cited *Typhlochiton felipponei* have continued to list it in the Chitonidae. In the Treatise on Invertebrate Paleontology, the best and most recent classification of the Polyplacophora, A. G. Smith (1960) placed *Typhlochiton* in synonymy with *Chiton*. The type species of *Typhlochiton*, by original designation, is *Typhlochiton felipponei* Dall [= *Chaetopleura fulva* (Wood)]. Therefore, until further work is done on this group, *Typhlochiton* must be removed from the Chitonidae and placed in the Chaetopleuridae as a junior synonym of *Chaetopleura Shuttleworth* 1853.

Six years after introducing the genus *Typhlochiton*, Dall again unknowingly became involved with *Chaetopleura fulva* by describing *Stereochiton felipponei* [= *C. fulva*] from Argentina. This was still another indication that this common South American species was an enigma to Dall. The genus *Stereochiton* had been proposed previously by Dall himself (1882, ex Carpenter MS) for *Callochiton castaneus* (Wood 1815), which today typifies a distinct group of Polyplacophora, the Callochitonidae.

There are numerous reasons why *Chaetopleura fulva* cannot be placed in the Chitonidae. The most conclusive evidence is afforded by the radula, which is nearly identical to that of *Chaetopleura peruviana* (Lamarck), the type of the genus *Chaetopleura*. This type of radula has a bicuspidate denticle cap, not a unicuspidate one, and the central tooth is broad, not thin as in the Chitonidae. Also, the radular teeth in the Chitonidae appear to be much more substantial and are little affected by drying; in *Chaetopleura*, as in *C. fulva*, most of the teeth shrivel when the radular ribbon is dried.

Another character which excludes *C. fulva* from the Chitonidae is the peculiar, beaded central area of the shell, which is typical of most chaetopleurids. Such sculpture is not exhibited by chitonids. Study of the functional mor-

phology of these beads may reveal important evidence of the evolutionary development of the Chaetopleuridae. By examining the growing edges of the valves, one can see that each bead begins as a notch in the tegmentum. The dorsal edges of the notch become progressively calcified and eventually form a bead-like structure. While the central area of a number of Chaetopleuridae is distinctly beaded, the beads in some species coalesce, forming slightly irregular longitudinal lirae. The relationship between these beads and the aesthete system is unknown.

Kaas (1954) considered Orbigny's *tehuelcha* as a variety of *Chaetopleura fulva*. He (Kaas 1954: 16) stated that an Argentine form can be differentiated from typical *C. fulva* by "more prominent radials on the end valves and lateral areas and the more crowded, beaded threads on the centrals." Righi (1967, 1970, 1971) failed to note any differences between the Brazilian and Argentine populations and, following Kaas, placed all western Atlantic specimens in the subspecies *C. fulva tehuelcha*. Such conclusions are not justifiable, for the differences noted by Kaas are slight and fall within the expected variation for this species. One lot in the collection of the Museum of Comparative Zoology from Golfo San Matias, Argentina, agrees with Kaas' Argentine form, but other specimens from off Punta Bermeja, a nearby locality, are of the typical form. Therefore, I conclude that the name *tehuelcha* should not be used.

Distribution: The occurrence of *Chaetopleura fulva* along the coasts of Spain and Portugal is well known (see pl. 33), a fact which influenced most early workers to state that the South American records for this species were questionable. It should be noted, however, that Spengler (1797) described his species from both sides of the Atlantic. For some unknown reason, Wood (1815) stated that he felt his new species probably had come from South America. He later listed (Wood 1825) the locality of *C. fulvus* as South America. In spite of such comments, by the middle of the nineteenth century, it was commonly believed that *C. fulvus* was not an inhabitant of South American shores. An old label in the Museum of Comparative Zoology

reads: "Rio Janeiro/Imported from Portugal". In Hanley's (1856) revision of Wood's *Index Testaceologicus*, the locality of *C. fulvus* was changed to Gilbraltar. Mörch (1870), who recognized the identity of *C. angulatus* Spengler, stated that Spengler's locality "America" was incorrect.

Kaas (1954) gave an extensive bibliography (mostly references to *C. fulva* and *C. tehuelcha*) and discussed the problems concerning the South American records. I concur with Kaas that South America was probably the original locality of *Chaetopleura fulva* (see pl. 33). Its restricted European distribution, limited to countries that had frequent communication with Brazil and Argentina, lead one to this conclusion. Some malacologists might be quick to point out that chitons, living as they do on hard substrate, might have been transported along with ballast, although this has never been recorded in the literature. A more likely explanation might be translocation via a ship's anchor cable. Rochebrune (1891) obtained his specimens from an anchor chain and noted that this species had the ability to climb the chain rapidly to a great height. It is overlooked that Orbigny (1841) also had obtained his specimens from the chain of an anchor.

CONCLUSIONS

- 1.) *Chiton angulatus* Spengler 1797, *C. ferrugineus* Spengler 1797, *C. lusitanicus* Tilesius 1802, *C. fulvus* Wood 1815, *C. tehuelchus* Orbigny 1841, *Typhlochiton felipponei* Dall 1921, and *Stereochiton felipponei* Dall 1927 are conspecific.
- 2.) *C. angulatus* Spengler 1797, *C. ferrugineus* Spengler 1797, and *C. lusitanicus* Tilesius 1802 are herein declared *nomina oblita* under Article 23b of the International Code of Zoological Nomenclature, allowing continued use for this species of the well known name *Chaetopleura fulva*.
- 3.) Specimens of *Chaetopleura fulva* examined from the western Atlantic prove to be identical to those from the eastern Atlantic. Therefore the use in any manner of

the name *C. tehuelcha* for the western Atlantic populations is considered impracticable.

- 4.) The genus *Typhlochiton* Dall 1921 is removed from the Chitonidae and placed in the Chaetopleuridae as a junior synonym of *Chaetopleura* Shuttleworth 1853.

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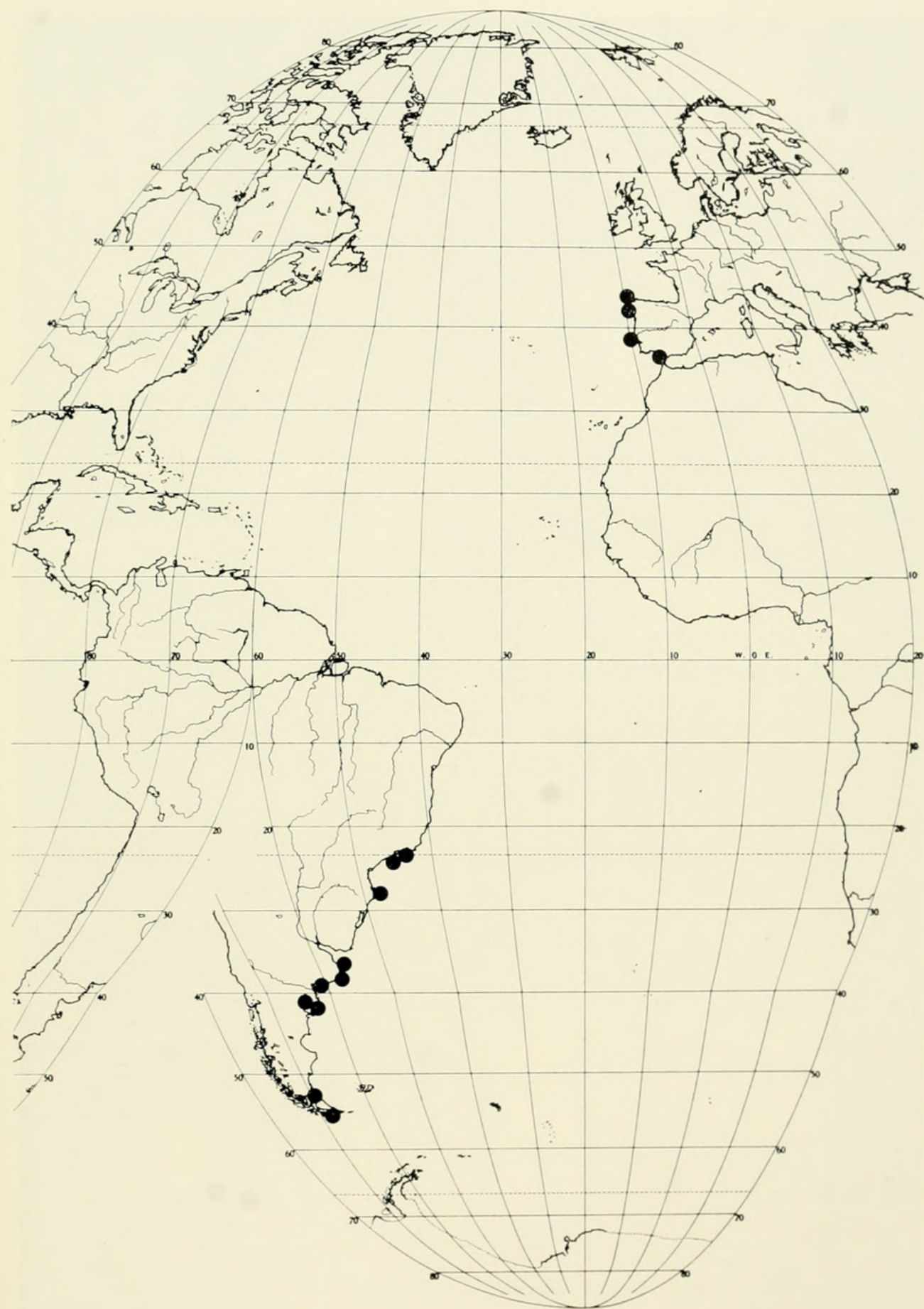


Plate 33

Distribution of *Chaetopleura fulva* (Wood). The selected localities are taken from Castellanos (1951), Nobre (1938-1940), Righi (1967), Rochebrune (1891), and specimens in the Museum of Comparative Zoology.

Plate 34

Fig. 1. *Chaetopleura fulva* (Wood). Vigo, Spain. MCZ 277784 (2×).

Figs. 2, 3. *Chiton angulatus* Spengler. America. Paralectotype, from the Zoological Museum, Copenhagen (2 ×).

Figs. 4, 5. *Chiton angulatus* Spengler. America. Lectotype, from the Zoological Museum, Copenhagen (2 ×).

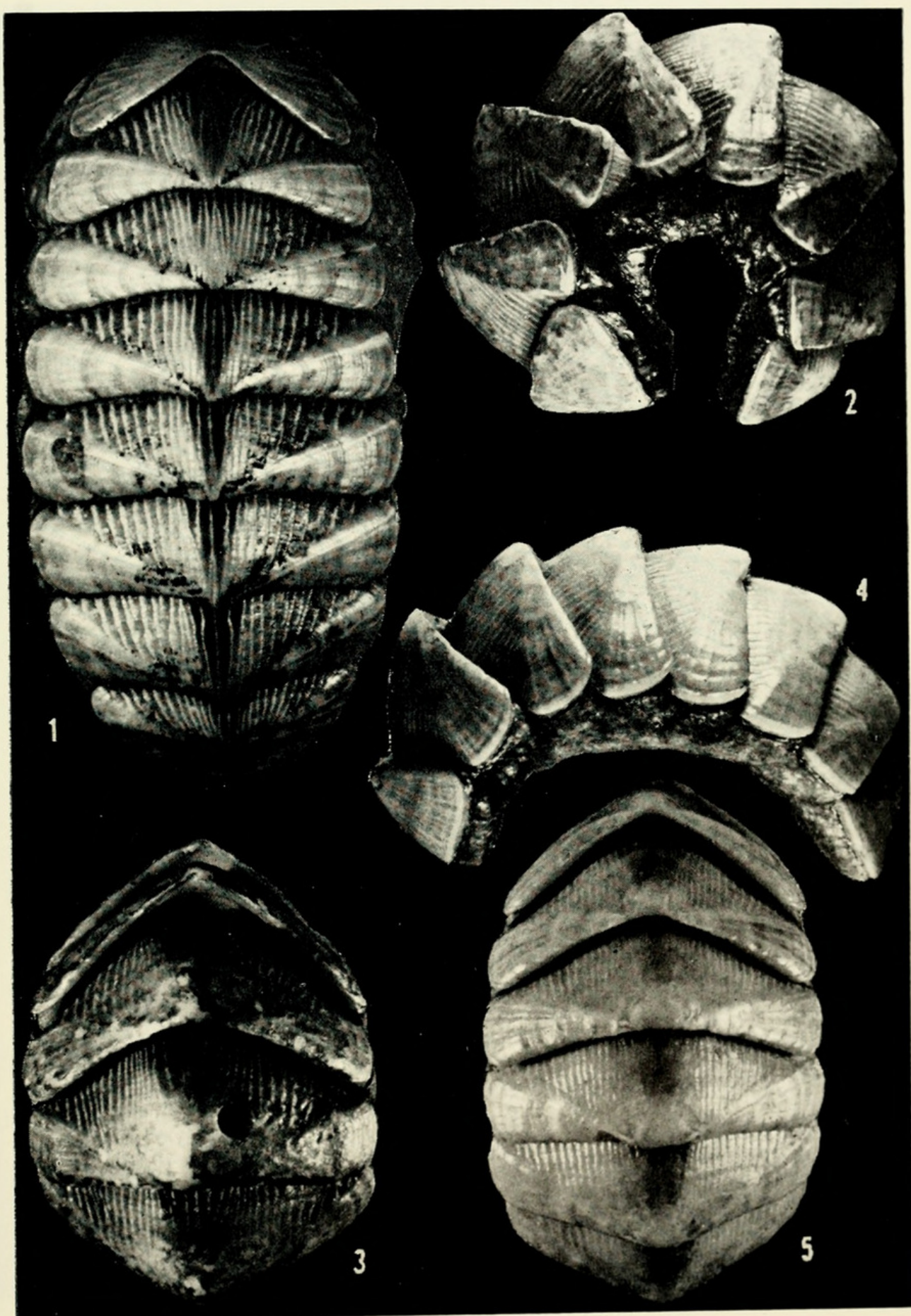


Plate 34

Plate 35

Figs. 1, 2. *Stereochiton felipponei* Dall. Mar del Plata, Argentina. Holotype, USNM 333469 (2 ×).

Figs. 3, 4. *Chiton ferrugineus* Spengler. Mediterranean. Lectotype, from the Zoological Museum, Copenhagen (2 ×).

Fig. 5. *Typhlochiton felipponei* Dall. Southern Brasil. Holotype USNM 333091 (3.5 ×).



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