

## *Austromitra maculosa*, a new species of Costellariidae from South Africa

(Gastropoda: Prosobranchia: Muricoidea)

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With 21 figures

### Abstract

*Austromitra maculosa* is described from a sublitoral reef habitat at Hout Bay (west coast of Cape Peninsula, South Africa). This new species differs from the other 6 *Austromitra* species known from South Africa in its larger size plus further conchological characteristics, and also differs in conchological and radula characteristics from the sympatric and variable species *Vexillum (Pusia) patulum* (REEVE). *A. maculosa* has a socket-like head which appears to be uncommon among the Costellariidae, and differs anatomically in several details from the type species *A. rubiginosa* (HUTTON) of New Zealand; the anterior digestive system, however, is very similar in both species, thus confirming the generic affiliation of the new species described herein.

**Key words:** Costellariidae, *Austromitra*, new species, South Africa, shell, anatomy, radula.

### Kurzfassung

*Austromitra maculosa* wird von einem sublitoral Riffhabitat der Hout Bay (Westküste der Kap-Halbinsel, Südafrika) beschrieben. Diese neue Art unterscheidet sich von den anderen sechs aus Südafrika bekannten *Austromitra*-Arten durch größeres Gehäuse und andere konchologische Merkmale. Sie unterscheidet sich ferner vom sympatrischen und vielgestaltigen *Vexillum (Pusia) patulum* (REEVE) sowohl durch Gehäuse- als auch Radula-Merkmale. *A. maculosa* hat einen sockelartigen Kopf, wie er bei anderen Costellariidae noch kaum bekannt ist. Einige anatomische Einzelheiten sind verschieden von der Typusart *A. rubiginosa* (HUTTON) aus Neuseeland, aber der vordere Verdauungstrakt ist in beiden Arten sehr ähnlich, was die Gattungszugehörigkeit der hier beschriebenen neuen Art bestätigt.

**Schlüsselwörter:** Costellariidae, *Austromitra*, neue Art, Südafrika, Gehäuse, Anatomie, Radula.

### Introduction

From the works of BARNARD (1959) and KILBURN (1972) it became evident that about eight species of the family Costellariidae are living in South Africa, mainly in the shallow waters of coastal reaches east of Jeffreys Bay. Only two of these species are rather common and more widely distributed, occurring also west of the Cape of Good Hope: *Austromitra capensis* (REEVE 1845) ranging from Table Bay to the Natal south coast, and *Vexillum (Pusia) patulum* (REEVE 1845) ranging from the N.W. Cape to the Natal south coast (KILBURN &

RIPPEY 1982: 109, pl. 25, figs. 13,15). *Austromitra canaliculata* (G. B. SOWERBY III 1900) (KILBURN & RIPPEY 1982: 109, pl. 25, fig. 12) holds third place in terms of frequency and distributional area; it is found from Jeffreys Bay to western Transkei. The remaining species are known only from restricted areas: the rare *Austromitra bathyrarpe* (G. B. SOWERBY III 1900) from Jeffreys Bay to East London, *A. rhodarion* (KILBURN 1972) from East London to the Natal south coast, and *A. kowieensis* (G. B. SOWERBY III 1901) (TURNER 1994: 109,

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pl. 2, fig. 15) mainly from the type locality at Port Alfred. (KILBURN & RIPPEY 1982, MARAIS & GRAEVE 1989.) The last of the known South African Costellariidae, *Austromitra distincta* (THIELE 1925) (TURNER 1994: 109, pl. 2, fig. 15 = holotype), is restricted to deep water (100–300 m) and was recorded from off Mossel Bay, off Algoa Bay and off Transkei. Besides these 7 South African Costellariidae species another mitriform species, *Mitra euzonata* G. B. SOWERBY III 1900, ranging from Algoa Bay to East London, has been affiliated to the Costellariidae (genus *Austromitra*) by several authors, but is here excluded from that family and assigned to Volutomitridae (genus *Microvoluta* ANGAS 1877) by virtue of certain conchological characters which are incompatible with the Costellariidae (TURNER 1993: 108, pl. 4, fig. 16).

From November 1992 onwards, Mr. PHILLIP JOOSTE (Cape Town, South Africa) found at least 11 specimens of an unknown mitriform species when he was diving in Hout Bay (west coast of Cape Peninsula). Four specimens of this group were sent to the senior author for identification in March 1993, who recognized them as belonging to a new species of Costellariidae and who then received four additional specimens as types for description. Two further specimens are now at the disposal of RICHARD SALISBURY (in litt. Dec. 7, 1996) and one other specimen is said to be in the collection of Prof. DOUW G. STEYN (Pretoria, South Africa).

#### Material and methods

The shells of the type series have been compared by the senior author to type material of the South African Costellariidae which have been investigated in the course of a recent taxonomic revision of the Costellariidae of the world.

From the original type series of eight specimens, two females, fixed in 70% ethanol, were made available to the junior author for anatomical study. The soft parts were extracted by means of an artificial orifice done in the penultimate whorl of the shell; the visceral mass, however, could not be extracted completely. The dissections were made by standard techniques with the specimen immersed in water. Shell details and radula were examined by SEM in the "Laboratório de Microscopia Eletrônica do Instituto de Biociências da Universidade de São Paulo". Anatomical terminology is based on PONDER (1972).

#### Abbreviations

BMNH	The Natural History Museum London
MZSP	Museu de Zoologia da Universidade de São Paulo
NMSA	Natal Museum Pietermaritzburg
NMW	Naturhistorisches Museum Wien
OUMZ	Oxford University Museum, Zoological Collections
SMF	Senckenberg-Museum Frankfurt/M
ZMB	Zoologisches Museum der Humboldt-Universität Berlin

## Systematics

### Costellariidae MACDONALD 1860

#### *Austromitra* FINLAY 1927

Type species by original designation: *Columbella rubiginosa* HUTTON 1873, Recent, New Zealand.

#### *Austromitra maculosa* n. sp.

Figures 1–20

Type material: Holotype: shell length 13.4, width 5.4, height of aperture 6.1 mm; NMSA V4687/T1452 (fig. 1).

Paratypes: No.1: 14.0 x 5.5 x 6.5 mm; SMF. –No. 2: 13.5 x 5.3 x 6.6 mm; MZSP 28 670 (figs. 2–3, 6) –No. 3: 13.0 x 5.2 x 6.2 mm; MZSP 28 671 (fig. 4) –No. 4: 12.0 x 5.3 x 6.2 mm; BMNH. –No. 5: 12.0 x 5.2 x 6.5 mm; coll. BRIAN HAYES, Port Elizabeth, S.A. –No. 6 & 7: 10.1 x 4.4 x 5.0 mm (fig. 5) & 10.2 x 4.6 x 5.2 mm; coll. H.T. –No. 8–9: 12.5 x 4.9 x 5.4 mm & 12.0 x 6.5 x 6.8 mm; coll. RICHARD SALISBURY, Boise, Idaho, USA.

Type locality: Hout Bay (Houtbaai) near Kommetjie, 34°08'S, 18°21'E, west coast of Cape Peninsula, approximately 25 km S.S.W. of Cape Town, South Africa.

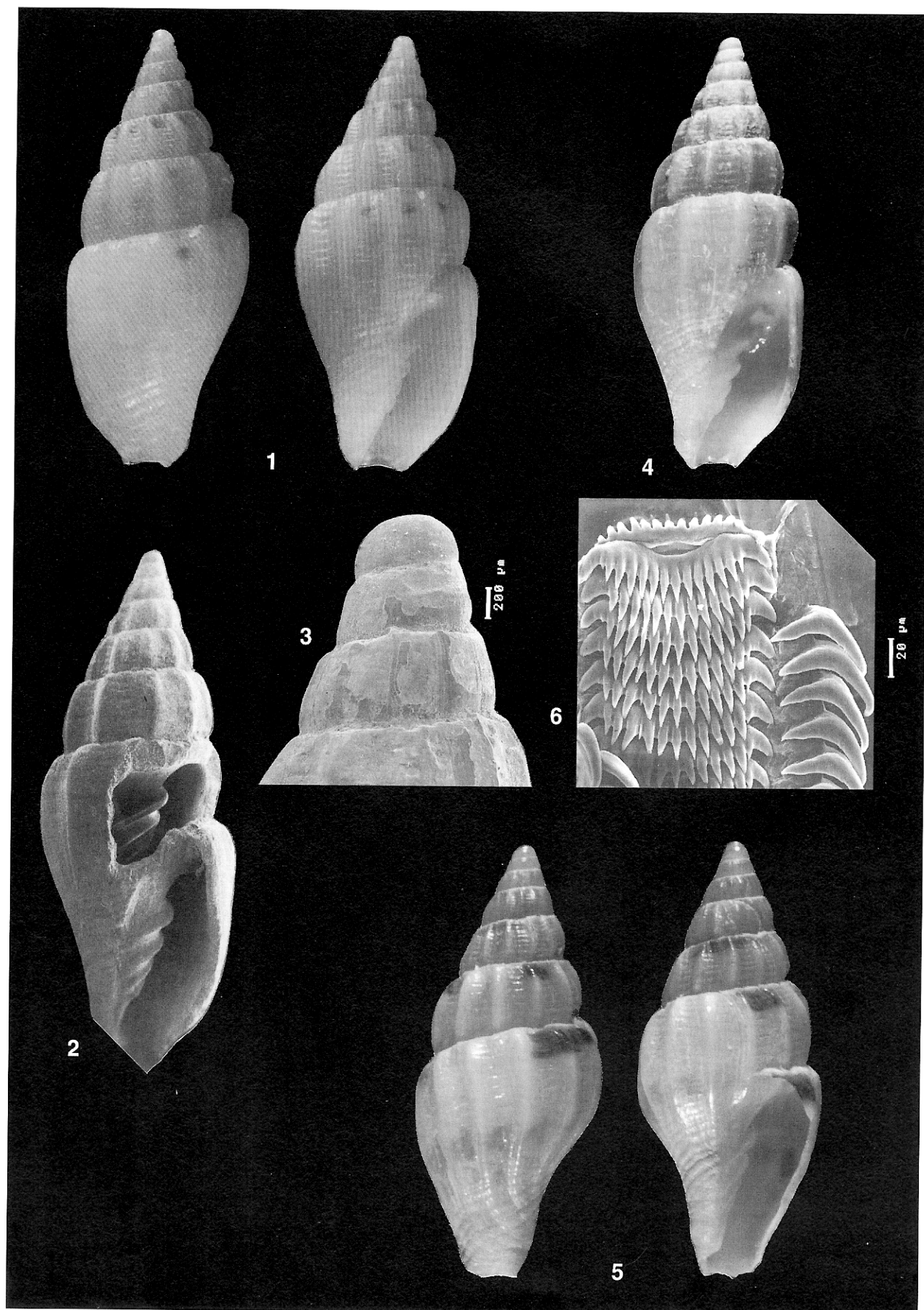
Distribution and Habitat: All specimens known to us are from the type locality, collected by diving on a reef in 36/40 m water depth.

Etymology: Latin feminine adjective *maculosa* (blotched), according to a distinctive shell character of the species.

Diagnosis: South African *Austromitra* species with a unique combination of relatively large fusiform shell up to 14 mm in length, 6 rounded teleoconch-whorls with well developed, widely spaced & smooth axial ribs (10–12 per whorl) and ornamented with a subsutural row of (sparse) brown blotches on a semitranslucent white shell.

Description: **Shell** (figs. 1–5): Relatively large for the genus, up to 14 mm in length and 5.5 mm in width, thin but rather solid, shape fusiform; aperture slightly shorter than spire in adult specimens (45–49% of total shell-length). Protoconch (fig. 3) involute-paucispiral with 1 1/4 smooth glassy whorls. Teleoconch with 6 moderately convex whorls, suture deeply impressed. Penultimate whorl with 10–12 straight and rather narrow axial ribs with rounded and smooth edge; axial ribs separated by broad and concave interspaces articulated by 8 weak spiral threads and grooves, crossed by fine axial striae. Posterior part of ultimate whorl with 12–13 axial ribs, 2–3 of them becoming obsolete towards aperture; interspaces of axial ribs with 20–24 weak spiral threads and grooves between suture and siphonal fasciole; structure of fasciole with 3–4 rather weak oblique threads in continuation of 4 columellar plicae which decrease in size and distance anteriorly (fig. 2). Aperture moderately wide (width = 27–30% of height), somewhat attenuated at base, not lirate within, parietal angle acute and with a callus pad, inner lip of glazed enamel not elevated from columella, outer lip simple and smooth, siphonal notch moderately distinct. Shell semitranslucent white, with distinc-

Figs. 1–6. *Austromitra maculosa* n. sp. –Morphology of shell and radula. 1: holotype (13.4 mm). 2: paratype no. 2 (13.5 mm), SEM-figure of shell after extraction of the soft parts through an artificial orifice in the penultimate whorl. 3: protoconch and early teleoconch whorls of paratype no. 2, SEM-figure (scale = 200 µm). 4: paratype no. 3 (13.0 mm). 5: paratype no. 6 (10.1 mm). 6: part of the radula of paratype no. 2, SEM-figure (scale = 20 µm).



tive subsutural row of brown blotches; these blotches appear in some interstices of axial ribs, but in a few shells (e.g. juvenile paratype 6, see fig. 5) sparse brown blotches extend over 2–3 axials, with an additional weak subperipheral brown belt.

**Head-foot** (figs. 7, 8): Homogeneous pale cream in colour. Head truncated, socket-like. Tentacles short, stubby, with rounded tip. Eyes dark, of considerable size, sited on small elevations of middle-outer region of tentacles. Foot large, without divisions, with a narrow anterior furrow of pedal glands. Columellar muscle flattened, of 1.5 whorls, divided distally in four branches due to columellar plicae (fig. 7).

**Pallial organs** (figs. 9, 10): Mantle border simple, thick, pale cream in colour. Siphon short, pale cream in colour, smooth borders. Osphradium bipectinate, elliptical, about half of gill length; right filaments larger than left filaments and with an angled projection covering part of the gill. Gill long, with many filaments, anterior extremity discretely posterior to that of the osphradium and near siphon base; each filament triangular, with central, sharp tip. Between gill and rectum a somewhat broad smooth space. Hypobranchial gland white, thin, narrow, edging left side of rectum; discretely broader in its posterior third part. Rectum very narrow, lying at left margin of pallial oviduct. Anus simple, sessile, near mantle border. Pallial oviduct broad, running at right margin of cavity, described below.

**Circulatory and excretory systems:** Not seen in details. Heart of medium size, sited posterior to pallial cavity, behind gill end. Kidney massive, beige, with nephridial gland in its limit with the pericardium.

**Digestive system** (figs. 8, 11–20): Rhynchostome a deep, longitudinal orifice in ventral region between tentacles (fig. 8). Proboscis wall thin, semi-transparent. Proboscis' buccal mass large – about same length as the remainder of the proboscis – and broad, with thick muscular walls (figs. 8, 11, 12). Pair of lateral retractor muscles very developed, inserted in lateral-ventral region of the haemocoel. Mouth small, in proboscis tip, preceded by a short, discretely broad oral tube. Esophageal and odontophoric branches of buccal mass connected with one another in their anterior region by several pairs of transversal muscles (fig. 12: tm); but anatomically separated for the most part, united only by a small orifice (fig. 13). Odontophore proportionally small, preceded anteriorly by a chamber of almost the same length, with thick muscular walls and two pairs of divergent inner folds (figs. 13, 15). Odontophore muscles (figs. 14–20): m1) several small jugal fibres which connect odontophore with esophagus and inner surface of proboscis; m2) large pair of retractors of odontophore, origin in ventral-posterior region of inner surface of haemocoel, insertion in posterior surface of odontophore; m3) pair of

approximators of cartilage; origin broad in lateral-middle region of cartilages, insertion narrow in middle-outer region of muscle m4; m4) large pair of dorsal tensors of radula, origin very broad in ventral surface of cartilages, connected also with subradular membrane, insertion in the tissue which covers part of the middle-dorsal region of radular ribbon; m5) large pair of ventral-posterior tensors of radula; origin in ventral-posterior region of cartilages near m4, insertion in ventral surface of the radular ribbon in level of m4 insertion; m6) horizontal muscle; short and broad, unites both pairs of cartilages in their median-ventral surfaces; m7) narrow pair of ventral-anterior tensors of radula, origin in posterior region of cartilages, between origins of m4 and m5, run attached to subradular membrane in its dorsal surface near median line, insert in anterior-middle region of subradular membrane which connects with radular ribbon; m8) retractor of radula, origin in ventral surface of haemocoel between m2 origin, inserts in middle-posterior region of radular nucleus. Subradular membrane (br) covers most of the ventral surface of the odontophore and appears to be extended by m4 and m7 muscles; this membrane connects with subradular cartilage (sc) inner surface. Odontophore pair of cartilages somewhat narrow, flattened, connected with one another in anterior extremity by a cartilaginous bridge. This anterior connection presents a broad median region (fig. 20).

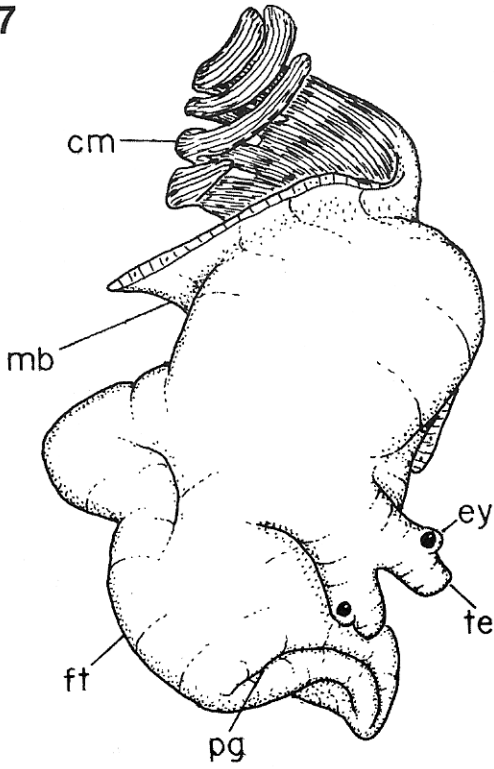
**Radula:** Very short, almost the same length as the odontophore. A tissue situated in the middle-posterior region of dorsal surface of radular ribbon, elliptical, in which both m4 insert. Radular nucleus spherical, immersed in m2 insertion. Rachidian tooth broad and short, bearing from 12 to 15 sharp pointed cusps, certain variation occurs in cusp size and number even along the same ribbon; lateral tooth hook-shaped, base broad and flattened, tip sharp, long, curved inwards (fig. 6).

Anterior **esophagus** simple, narrow and short (figs. 11, 12). Salivary glands large, white, cluster around middle region of esophagus, nerve ring and adjacent structures (figs. 8, 11); pair of salivary gland ducts reddish-iridescent, connect in anterior esophagus just anterior to valve of Leiblein, runs immersed in dorsal region of esophageal wall, open in lateral region of aperture between esophagus and odontophore (fig. 13). Pair of accessory salivary glands large, elliptical, somewhat flattened, partly covered by salivary glands; thick glandular, external surface smooth, inner walls white; one side thicker than the other (fig. 16); their duct not found. Valve of Leiblein well-developed, bulged, sited just posterior to proboscis (figs. 11, 12). Middle esophagus narrow in its anterior region where it runs through the nerve ring, suddenly expanding and becoming thick walled like a gland (fig. 11). Gland of Leiblein conical,

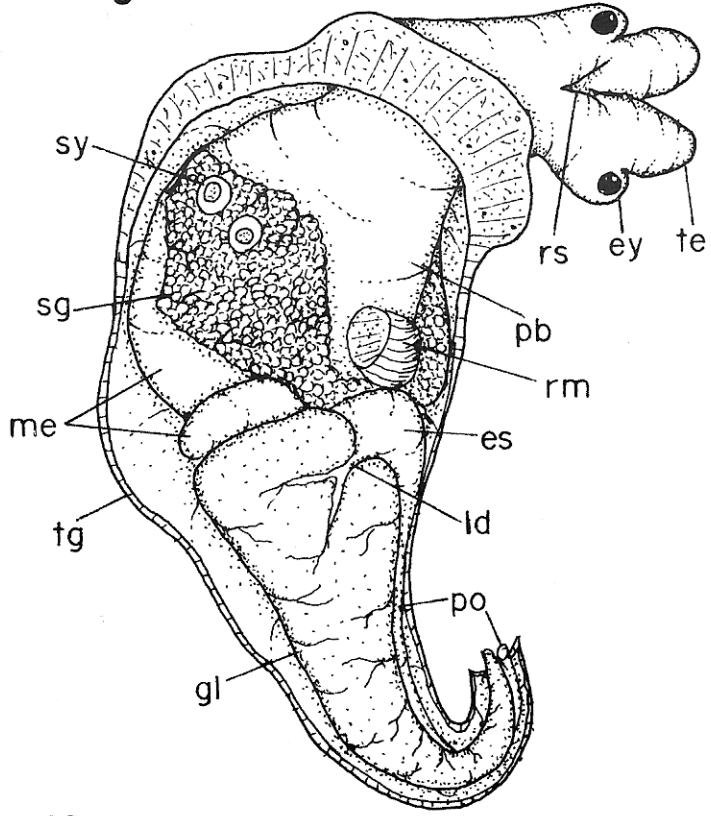
Figs. 7–10. *Austromitra maculosa* n. sp. – Anatomy. 7: head-foot of female, frontal view; 8: head and haemocoel, ventral view, foot removed; 9: pallial cavity roof, ventral-inner view; 10: transversal section in pallial cavity roof, at the level of the posterior region of the osphradium; scales = 1 mm.

In figures 7–20, explanation of lettering is as follows: ac, accessory salivary gland; ae, anterior esophagus; ag, albumen gland; an, anus; bc, bursa copulatrix; bm, buccal mass; br, subradular membrane; cg, capsule gland; cm, columellar muscle; cv, ctenidial vein; es, esophagus; ey, eye; fp, female genital pore; ft, foot; gi, gill; gl, gland of Leiblein; hg, hypobranchial gland; ig, ingesting gland; ir, insertion of m4 in dorsal region of radula (to); is, insertion of m5 in ventral region of radula; ld, duct of gland of Leiblein; m1 to m8, odontophore muscles; mb, mantle border; me, middle esophagus; mo, mouth; nr, nerve ring; oa, odontophore anterior chamber; oc, odontophore cartilage; os, osphradium; ot, oral tube; pb, proboscis; po, posterior esophagus; pg, pedal gland anterior furrow; ra, radula; rm, retractor muscle of proboscis; rn, radular nucleus; rs, rhynchostome; rt, rectum; sc, subradular cartilage; sd, salivary gland duct; sg, salivary gland; si, siphon; sy, statocyst; te, cephalic tentacle; tg, tegument; tm, transversal muscles uniting odontophore and esophagus; to, tissue on middle-dorsal region of radula; vl, valve of Leiblein.

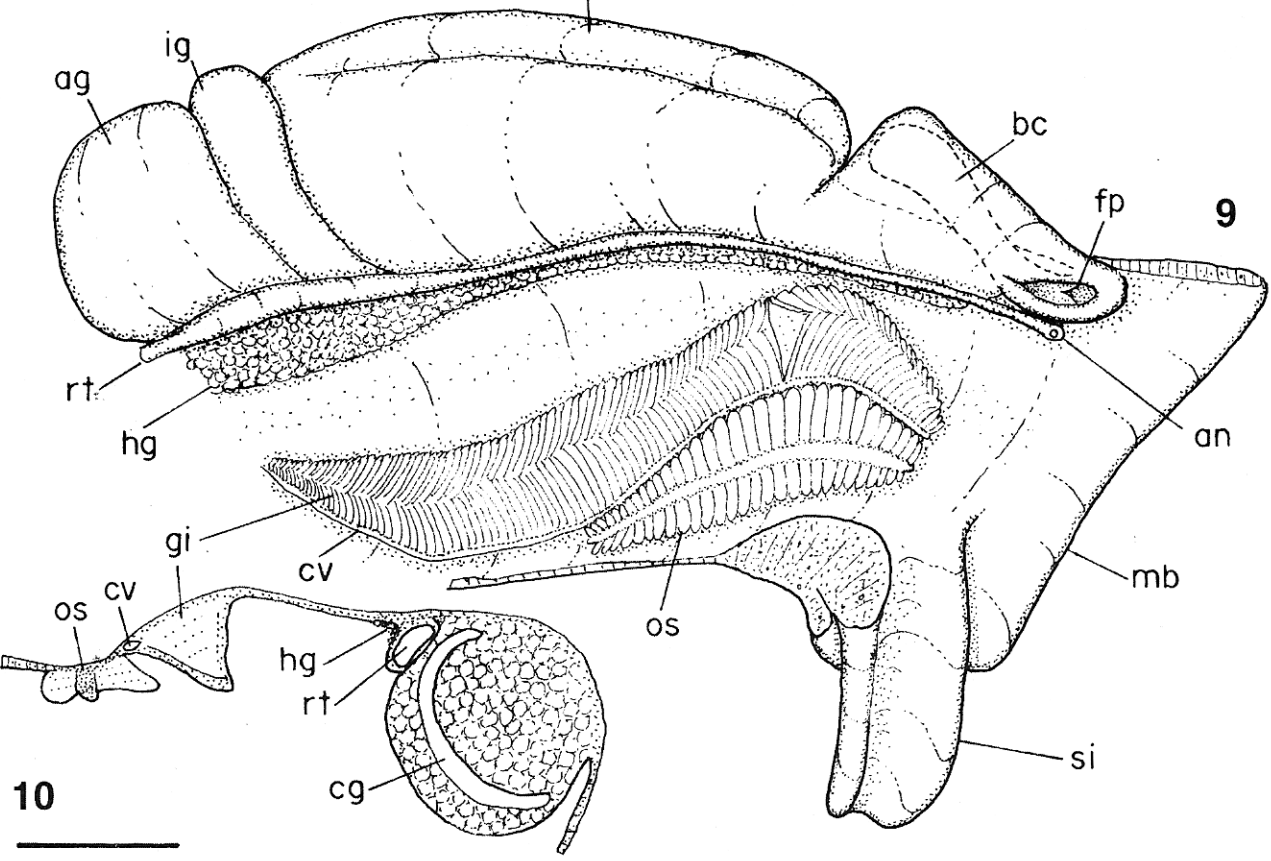
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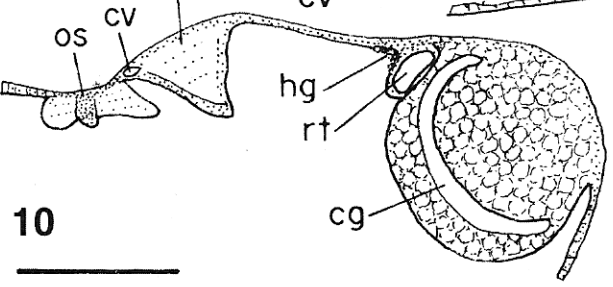


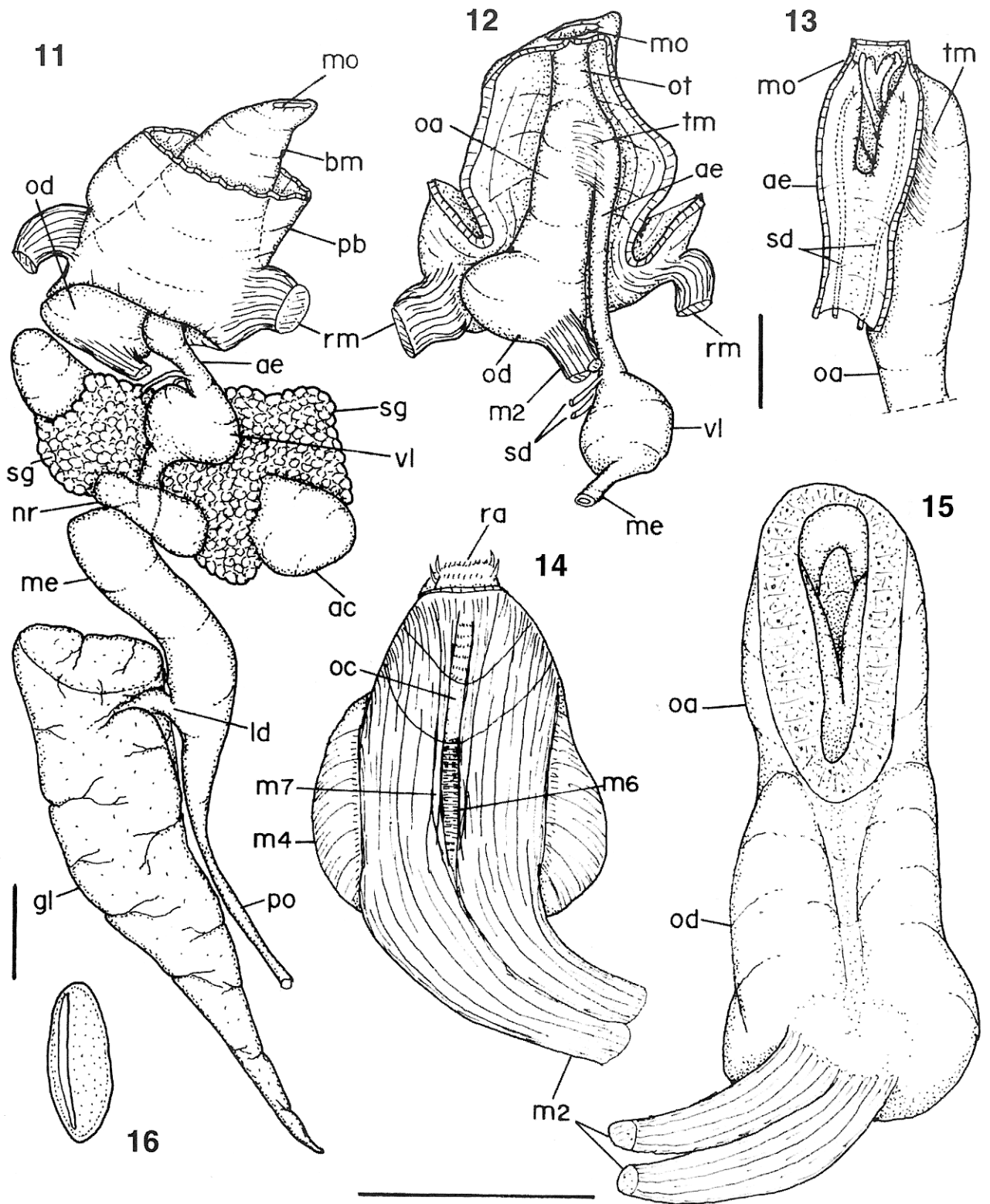
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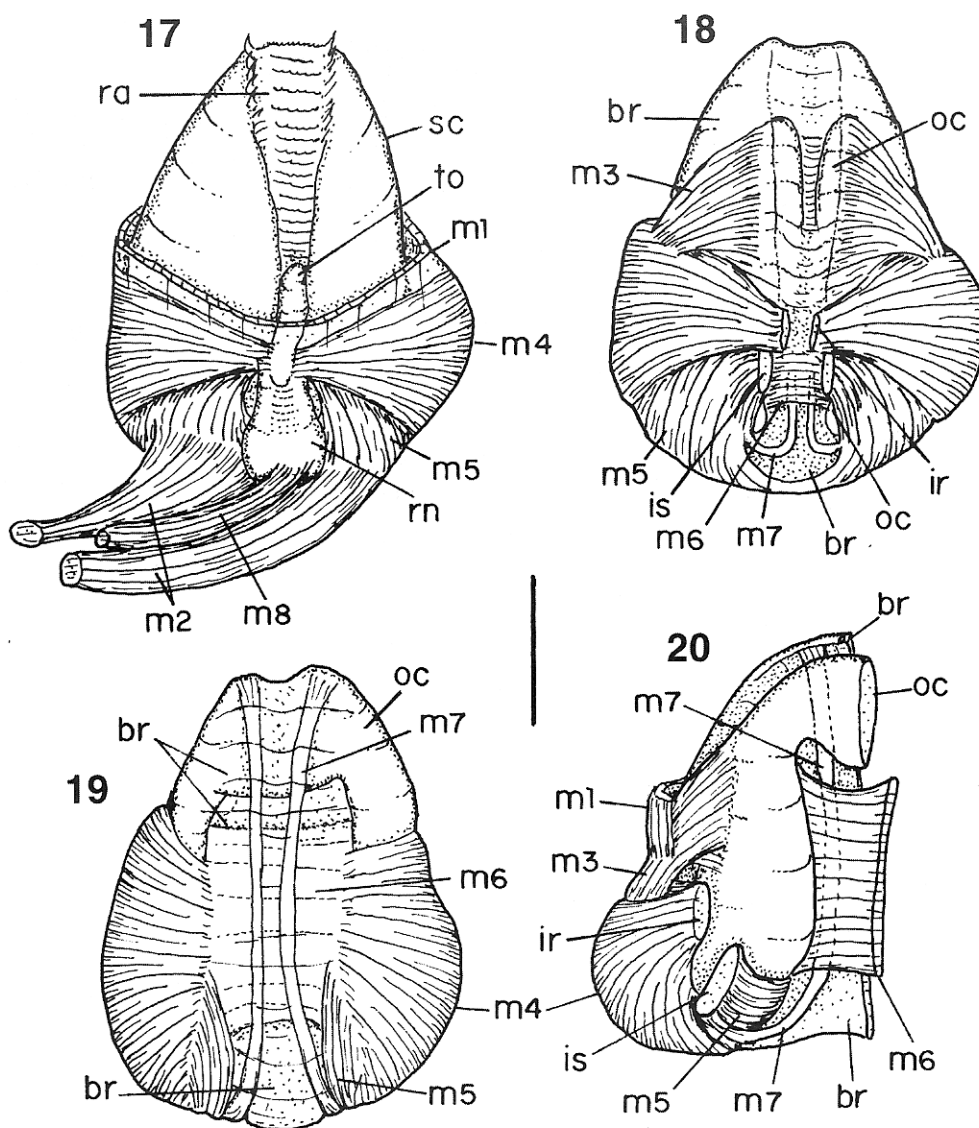
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Figs. 11–16. *Austromitra maculosa* n. sp. – Anatomy. 11: anterior region of digestive system removed from haemocoel, ventral view; 12: buccal mass, proboscis wall opened longitudinally, ventral view; 13: inner part of buccal mass, left view, esophagus opened longitudinally; 14: odontophore extracted, ventral view, outer layer of membranes and muscles removed; 15: odontophore with its anterior chamber, dorsal view, esophagus removed; 16: accessory salivary gland, transversal section in its middle region; scales = 0.5 mm. For an explanation of the lettering see legend for figs. 7–10.



Figs. 17–20. *Austromitra maculosa* n. sp. – Odontophore. 16: dorsal view, outer layer of membranes and muscles removed; 17: same, with radula, subradular cartilages and posterior muscles removed; 18: same, ventral view; 19: left half, dorsal view, ventral-anterior region of subradular membrane (br) removed; scales = 250  $\mu$ m. For an explanation of the lettering see legend for figs. 7–10.

large, long, beige in colour; its duct broad and short (figs. 8, 11). Posterior esophagus narrows gradually and becomes a very narrow tube. Stomach not seen. Rectum and anus described above.

**Genital system** (figs. 9, 10): Only females examined. Pallial oviduct broad. Albumen gland rounded and short. Ingesting gland short, situated anterior to albumen gland. Capsule gland long, cylindrical, with a superficial furrow in its right surface and a broad, flattened duct (fig. 10). Vaginal tube long – about half of capsule gland length and width – cylindrical, opens anteriorly near anus, at some distance from the mantle border. Bursa copulatrix long, somewhat narrow, with about the same length as the vaginal tube; posterior region

rounded, at right of vaginal tube; crosses gradually to ventral region of vaginal tube and opens ventral to its aperture.

**Nervous system:** Nerve ring very similar to that described by PONDER (1972, fig. 6D). Statocysts each with a single and large statolith (fig. 8).

### Systematic discussion

*A. maculosa* differs conchologically from all other South African *Austromitra* species in having a larger shell size (13–14 mm versus 5–10 mm shell length for the other species)

and showing brown subsutural blotches on an otherwise white shell.

Beyond that, *A. maculosa* differs from *A. distincta* (THIELE 1925) (lectotype & 2 paralectotypes ZMB coll. "Valdivia", examined 12.1993) in having less shouldered and less rounded whorls, weaker spiral sculpture (spiral threads not overriding the axial ribs), an acute parietal aperture angle, smooth outer lip and a pronounced siphonal notch.

In addition, *A. maculosa* differs from *A. kowicensis* (G. B. SOWERBY III 1901) (3 syntypes BMNH 1901.10.3.91–93; topotype ex TURTON ZMB 55709) (including *M. eucosmia* TURTON 1932) in having an acuminate apex, axial ribs not roll-like and not curved, a less translucent shell, an acute parietal aperture angle, and a siphonal notch being present.

*A. maculosa* differs clearly from *A. canaliculata* and *A. bathyraphe* (both of G. B. SOWERBY II 1900) (3 *canaliculata* syntypes BMNH 1900.5.232.56–58; *bathyraphe* holotype BMNH 1900.5.22.63) in lacking a deeply channelled suture (besides having a significantly different shape, sculpture and colour pattern).

*A. maculosa* differs also from the various colour-morphs of *A. capensis* (REEVE 1845) (including *M. ima* BARTSCH 1915, *M. albanyana* and *M. hera* both of TURTON 1932) in having an acuminate apex, inflated whorls, widely spaced and more elevated axial ribs, in lacking a variegated colour pattern (broad and narrow spiral colour bands with a whitish peripheral zone), etc.

*A. maculosa* was also compared with the various forms of *V. (P.) patulum* (REEVE 1845) [1. forma typica: 2 syntypes BMNH1967831, 2. *M. simplex* DUNKER 1846: 3 syntypes ZMB coll. DUNKER, 3. *M. merula* G. B. SOWERBY III 1889: lectotype and paralectotype OUMZ, 4. *M. fidis* G. B. SOWERBY III 1916: holotype BMNH 1919.12.31.43, 5. *M. simplex* var. *alfredensis* TURTON 1932: NMW 64742/1], but was found to differ in having a thinner and semitranslucent shell, fewer and more elevated axial ribs which are always present, a siphonal notch, and lacking a mainly uniform brownish or cloudy brown/white shell colour. Furthermore, *A. maculosa* can be distinguished from *V. patulum* by a different radula with multicuspid rachidians (versus tricuspid rachidians in *V. patulum*) (see our fig. 6 and BARNARD 1959: fig. 11f).

*A. maculosa* differs anatomically from *A. rubiginosa* (HUTTON 1873) (see PONDER 1972: 312–319) from New Zealand, in having a non-pigmented head-foot and mantle border, less developed hypobranchial gland, broader oral tube, smaller odontophore, broader vaginal tube, narrower bursa copulatrix, and larger female gonopore. The general plan of the anterior digestive system is, however, very similar in both species, confirming the generic attribution of the species described herein.

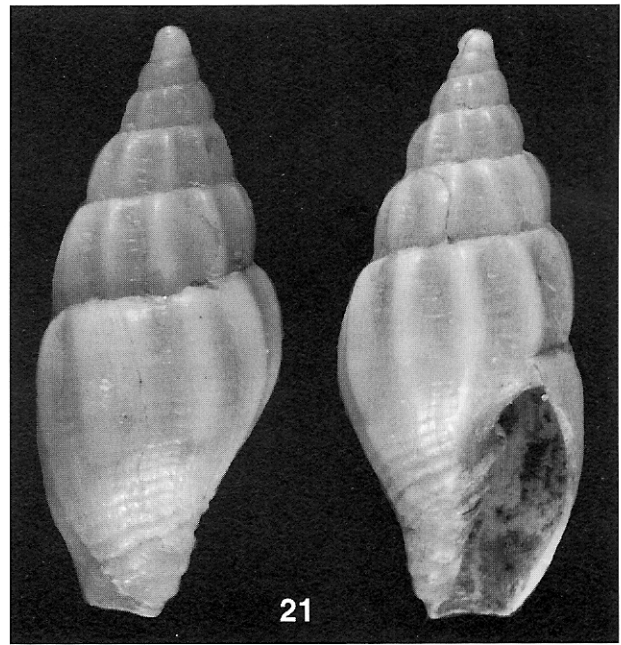


Fig. 21. Heterospecific syntype of *Mitra festa* REEVE 1845 (BMNH 1967756; 8.8 mm) = *Austromitra maculosa* n. sp.

The socket-like head of *A. maculosa* is uncommon, and differs from the head of *Thala floridana* (DALL 1883) (sensu MAES & RAEHLE 1975) and *T. crassa* SIMONE 1995. On the other hand, a truncated socket-like head is found in the Columbellidae (MARCUS & MARCUS 1962; pers. com.).

The examination of three syntypes of *Mitra festa* REEVE 1845 (BMNH 1967756; type locality: Puerto Galero, Island of Mindoro, Philippines, found on the sands; CUMING) has revealed that only the two larger types (shell length 14.5 resp. 11.0 mm) correspond with the description and are the true *Vexillum (Pusia) festum* (REEVE). The smallest "type" (shell dimensions 8.8 x 3.6 mm, aperture height 4.2 mm) (see fig. 21) is substantially different and belongs obviously to *Austromitra maculosa*. It is not known to us how this shell was mixed with the *M. festa* types.

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