

ANATOMICAL STUDY ON *TONNA GALEA* (LINNÉ, 1758) AND
TONNA MACULOSA (DILLWYN, 1817) (MESOGASTROPODA, TONNOIDEA,
TONNIDAE) FROM BRAZILIAN REGION.

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ABSTRACT

Tonna galea and *Tonna maculosa*, from Brazilian region, are described anatomically. Each character is compared between the species and also with other known Tonnoidea. These species differ anatomically in characters of the mantle color and collar, osphradium, hypobranchial gland, kidney, proboscis length, radular rachidian, lateral tooth, penis, vas deferens, and female genital opening. Characters of the anterior region of the digestive system, heart, penis and pallial oviduct are of particular interest in tonnoidean systematics.

INTRODUCTION

Tonna galea (Linné, 1758) is a very wide-ranging species, occurring in the Pacific and Atlantic oceans and in the Mediterranean Sea. *Tonna maculosa* (Dillwyn, 1817), in contrast, only occurs in the tropical west Atlantic (Rios, 1985: 70; Matthews et al., 1987: 33). *Tonna perdix* (Linné, 1758), which is closely related to *T. maculosa*, occurs in the Indo-Pacific region, and some authors consider them to be synonyms (e.g., Morretes, 1949). Two questions arise: (1) is "*Tonna galea*" a single species, and (2) are *T. maculosa* and *T. perdix* really separate species? These questions have been discussed (e.g., Turner, 1948; Matthews et al., 1987), with arguments based on shell characters, but are still unresolved.

The objective of this paper is not to answer these questions, but to be a step in this direction, providing anatomical descriptions of specimens identified as *Tonna galea* and *T. maculosa* from the Brazilian region. These data could be used in comparisons with supposed co-specific specimens from other areas to assist in clarifying the systematic problems. Another objective of this paper is to contribute to the understanding of systematic characters in the Tonoidea, identifying some useful characters not previously utilized in the systematics of this group.

Little has been published on the anatomy of the Tonnoidea, and in particular the Tonnidae. What has been has mainly concerned the alimentary canal and feeding habits. The

following information is available: *Tonna galea*: Weber (1927) studied the digestive system, and some of his data were reproduced by Hyman (1967); Turner (1948) described the penis and figured the radula; Matthews et al. (1987) figured the penis, jaw and radular rachidian; and Bentivegna & Toscano (1991: 37) figured an active specimen preying on *Holothuria tubulosa* and *H. sanctori*. *Tonna maculosa*: Turner (1948) described the penis and figured the radula; and Matthews et al. (1978) figured jaw and radular rachidian. Other Tonnoidea described anatomically and used here for comparison are: Reynell (1905)—description of a male *Cassidaria rugosa* (Linné) (Ranellidae); Day (1969)—digestive system of *Argobuccinum argus* (Gmelin) (Ranellidae); Houbbrick & Fretter (1969)—digestive system and other organs of three species of *Bursa* (Bursidae) and four of *Cymatium* (Ranellidae); Lewis (1972)—anatomy of anterior region of digestive system, head-foot complex and penis of *Distorsio perdistorta* Fulton (Ranellidae); and Hughes & Hughes (1981)—digestive system of *Cassis tuberosa* (Linné), (Cassidae).

MATERIAL AND METHODS

The specimens studied belong to malacological collection of the Museu de Zoologia, Universidade de São Paulo (MZUSP). They are preserved in 70% ethanol.

All specimens were dissected using standard techniques. The buccal region, region of

female genital opening and pallial oviduct were extracted, dehydrated in ethanol series, stained by carmine, cleared, and fixed with creosote. Radulae and jaws were examined on slides with Hoyer. All drawings were made using a camera lucida.

Anatomical terminology is based on Reynell (1905) and Hughes & Hughes (1981). Conchological description and synonymy are omitted, and can be found mainly in Matthews et al. (1987) and Turner (1948).

Tonna galea (Linné, 1758)
(Figs. 1–19, 37)

Synonymy and types material: Turner (1948: 173) and Matthews et al. (1987: 31)

Diagnosis

Shell of clear, homogeneous color; outline globose; sculptured with strong, spiral, somewhat isometrical ridges. Mantle border thick; hypobranchial gland poorly developed. Kidney large, with complex tissue arrangement. Proboscis about half projecting from rhynchodeum in fixed specimens. Central cusp of radular rachidian smooth; main cusp of lateral tooth smooth. Penis with a small pointed papilla; anterior region of vas deferens fused with seminal receptaculum. Female genital opening with larger inner division for the bursa opening.

Description

Shell: Detailed descriptions of the shell given by Turner (1948: 173 pl. 78) and Matthews et al. (1987: 31, figs. 1, 2). Protoconch brown, of almost four glassy, convex whorls.

Head-Foot Complex (Figs. 1, 2): Foot large, solid, rounded posteriorly, notched anteriorly; propodium narrow, with anterior pedal gland opening to ventral slit (Fig. 1, mp). Operculum lacking in adult, present in young (Rios, 1985). Tentacles long, fairly thick, bluntly pointed. Black eyes on tubercles on outer upper part of tentacle bases. Rhynchodeum with simple, rounded opening. Proboscis with about half of length projecting from rhynchodeum in all specimens (Fig. 2). Head-foot structures beige, with dark brown, irregular spots.

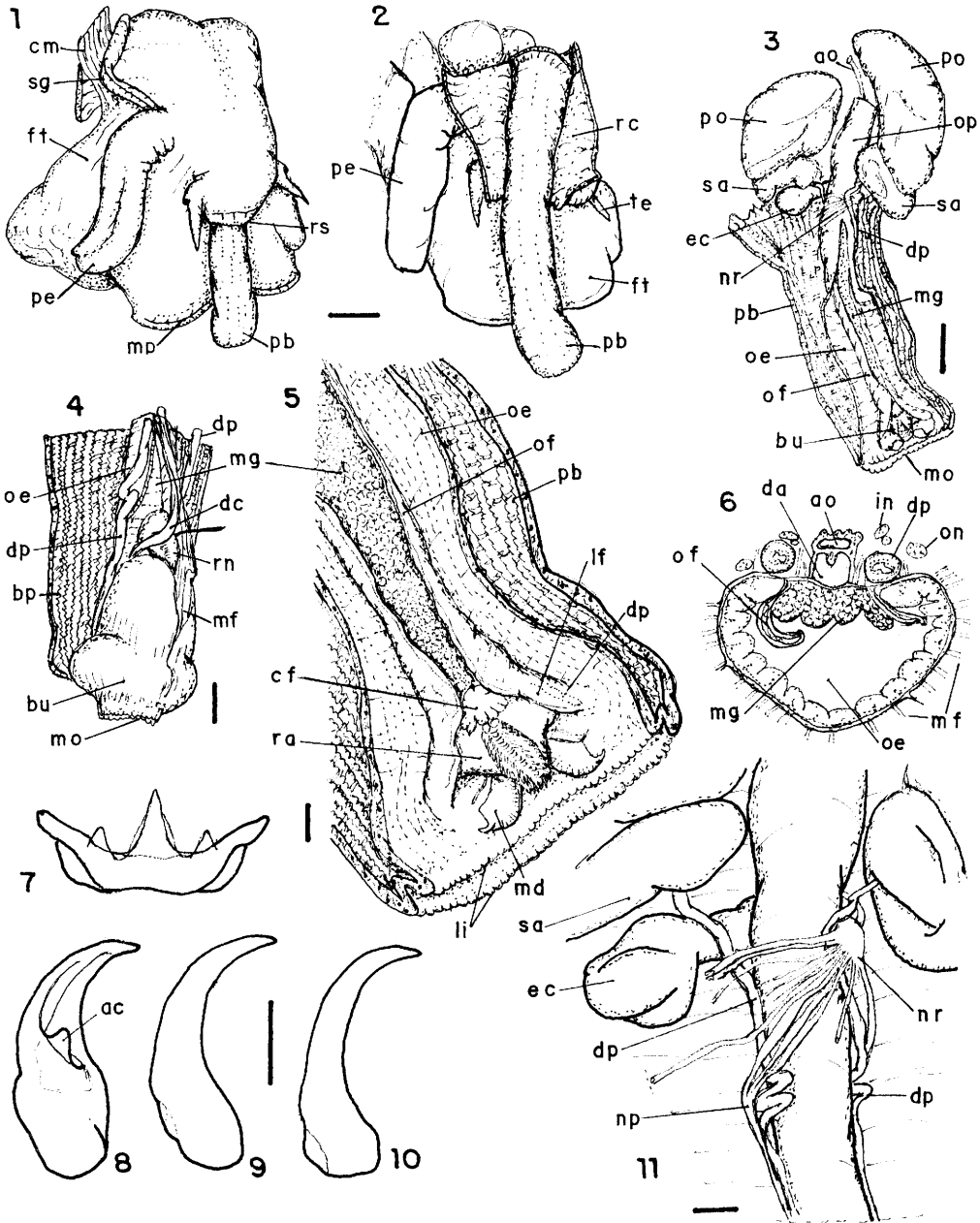
Pallial Complex (Fig. 12): Mantle edge entire, simple, not reflected, thick, rounded, pale cream in color. Pallial cavity occupying first

whorl. Siphon long, well developed, pale-beige, with dark-brown, somewhat longitudinal, irregular spots. Osphradium large, bipectinate, on pallial roof at base of siphon; osphradium leaflets lamellate, pigmented brown. Ctenidium very large, monopectinate (Fig. 12); leaflets very numerous, triangular, low. Hypobranchial gland not well developed; some specimens with folds of this gland running from the anterior and left region of rectum. Flaccid tissue covering rectum (and pallial oviduct in females) on right side of mantle cavity, allowing a well-developed ad-rectal sinus.

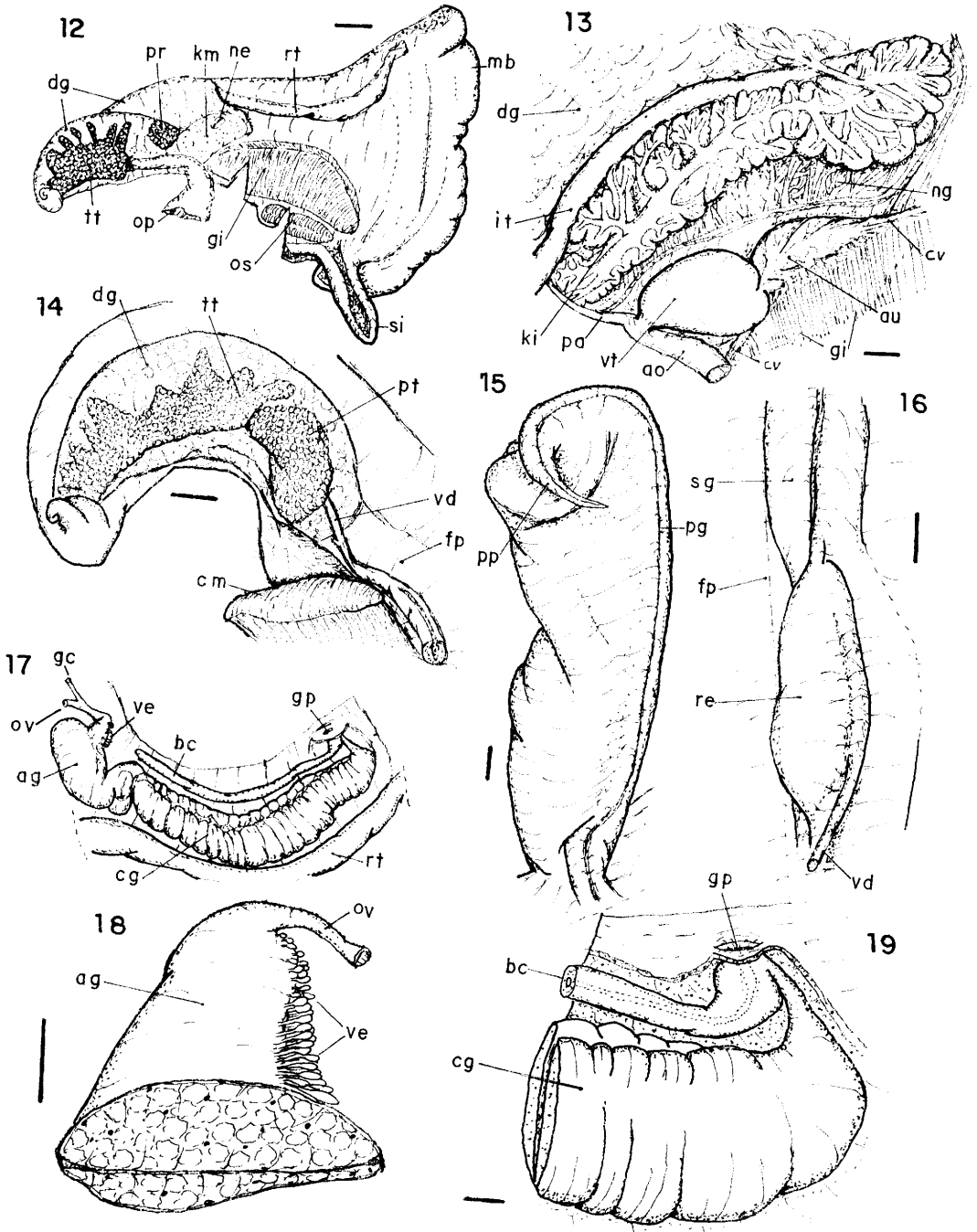
Excretory-Circulatory Systems: Kidney very large, on right side of pericardium, immediately behind pallial cavity, from which it is separated by a thin, nearly transparent membrane (Fig. 12, km); this membrane with slit-like nephrostome, surrounded by muscular fibres to form a sphincter (Fig. 12, ne). Kidney traversed by intestine, which divides it into two lobes, the largest (Fig. 13) anterior, the smallest posterior. Internally, the kidney is very complex, the outer divisions being formed by green-brown lobes and tubes, its anterior limit bulging the posterior region of pallial oviduct glands of females. Nephridial gland cream-colored, poorly developed, situated above nephrostome (Fig. 13, ng). Heart (Fig. 13) with very thin, transparent, flaccid auricle and a very thick, rounded ventricle (Fig. 13). Ctenidial vein on right margin of gill, entering auricle both anteriorly and posteriorly (Fig. 13). Central part of auricle inserting directly in gill margin (Fig. 13, au).

Ad-rectal sinus very developed, apparently continuous from chamber of kidney into an aperture, with muscular walls, near the anus (Fig. 37, at), similar to an ureter.

Digestive System: Similar to that described by Weber (1927), typical of tonnoideans (Hughes & Hughes, 1981). Some details of insertion of proboscis gland duct and oesophageal caecum duct in buccal complex are shown in Figure 4; detail of buccal complex (sectioned dorsally) shown in Figure 5; transversal section of the mid region of anterior oesophagus shown in Figure 6. Salivary glands surrounding duct of proboscis gland (Fig. 3). Duct of each proboscis gland looping anteriorly to nerve ring in all specimens examined (Fig. 11). Radular rachidian tricusate (Fig. 7; Matthews et al., 1987); lateral teeth with a flattened, irregular base and two cusps, a long, large acuminate cusp and a



FIGS. 1-11: *Tonna galea*: (1) head-foot complex from a male, scale = 10 mm; (2) the same, with proboscis sheath exposed, scale = 10 mm; (3) anterior region of digestive system, dorsal view, scale = 10 mm; (4) anterior extremity of opened proboscis, right-dorsal view, scale = 1 mm; (5) buccal complex opened dorsally, inner view, scale = 2 mm; (6) transversal section in mid region of the anterior oesophagus, ventral region down, scale = 1 mm; (7) rachidian tooth of the radula; (8) lateral tooth showing the accessory cusp (ac); (9) inner marginal tooth; (10) outer marginal tooth, scale (Figs. 7-10) = 0.5 mm; (11) dorsal view of the region of nerve ring, scale = 2 mm.



FIGS. 12-19: *Tonna galea*: (12) inner view of pallial cavity and visceral mass of a male, scale = 10 mm; (13) detail of opened nephridial and pericardial chambers, scale = 2 mm; (14) visceral mass of a male, mantle partially removed, scale = 2 mm; (15) ventral view of the penis, scale = 2 mm; (16) detail of insertion region of the vas deferens in seminal groove, showing the receptaculum, scale = 2 mm; (17) pallial oviduct, tegument removed, scale = 10 mm; (18) detail of the albumen gland showing the vesicles (ve), scale = 2 mm; (19) detail of female genital pore, tegument removed, scale = 2 mm.

minute cusp (Fig. 8, ac); base of inner marginal teeth (Fig. 9) a little longer than that of outer marginal teeth (Fig. 10). Stomach poorly developed, with two ducts to digestive glands, without developed style sac, folds or typhlosole.

Nervous System: Nerve ring (Fig. 11, nr) with cerebral ganglia turned to left side in all specimens; from these, three pairs of nerves run anteriorly, fusing near the proboscis gland duct loops to become only one pair, which lie ventrally to the oesophagus (Fig. 11, np). In mid oesophageal region, this pair of nerves bifurcates, the median nerves (Fig. 6, in) innervating radular bulb and the lateral nerves (Fig. 6, on) innervating proboscis wall.

Genital System, Male: Testis (Fig. 14, tt) branching into digestive gland, mainly on columnar surface of viceral mass. Convoluted seminal vesicle rather spheric (Fig 14, pt), confined to anterior part of viceral mass just anterior to testis. Vas deferens thin walled (Fig. 14), its anterior region to right of the receptaculum, fused with its walls (Fig. 16). Receptaculum a modified, bulging region of the spermatic groove posterior to vas deferens insertion in spermatic groove (Fig. 16). In floor of right margin of pallial cavity, spermatic groove thick walled near prostate gland (Figs. 1, 14, 16). Penis large, somewhat flattened, with open penial groove, which terminates in a small, pointed papilla at central region of penis tip (Fig. 15).

Female: Ovary branching into digestive gland. Oviduct slender (Fig. 17), with a small gonopericardial duct. Oviduct opening into a short, thick-walled albumen gland. A series of small, paired vesicles present in ventral side of the albumen gland (Figs. 17, 18, ve). Capsule gland long, curved, thick walled (Fig. 17). Bursa copulatrix long, claviform, separate and to right of capsule gland. Posterior limit of bursa sacciform, thin walled, the walls gradually becoming thickly muscular anteriorly (Figs. 17, 19, bc). Genital pore small (Figs. 17, 19, gp), to right, behind anus; pore with two inner divisions: the largest and posterior is the end of the bursa, the smallest and anterior the end of pallial oviduct (Fig. 19).

Measurements

Length, width in mm and if mature (m) or immature (i): MZUSP 27967: male, 78.5 by 66.5, m; female, 73.0 by 61.0, i; male, 69.5

by 55.5, m; MZUSP 27984: male, 74.2 by 60.6, m; MZUSP 27968: female, 102.0 by 85.0, m; MZUSP 27986: male 118.5 by 104.0, m; MZUSP 27969: female 135.0 by 115.0, m; male 98.7 by 71.0, m.

Habitat

The specimens were obtained by diving, burrowing in sandy sediment, near rocks or reefs. Some specimens were also dredged from about 150 m depth in muddy sediment.

Material Examined

BRAZIL. Espirito Santo: MZUSP 27970, 1 male and 1 female, Barra do Riacho (8/ix/72). São Paulo: MZUSP 27967, 2 males and 1 female, Saco da Ribeira Beach, Ubatuba; MZUSP 27983, 2 females, Enseada Beach, Ubatuba (x/91); MZUSP 27984, 1 male, est. 42, otter traw (22/x/86); MZUSP 27985, 1 male, IOUSP-Veliger, "rede de pesca fixa 8"; URUGUAY. off Maldonado: MZUSP 27968, 1 female, 35°18'S 52°32'W, "W. Besnard," station 1920, 150 m deep (30/x/72); MZUSP 27969, 2 males and 1 female, same data; MZUSP 27986, 4 males and 1 female, "W. Besnard," station 1921 OT.9 (20/x/72).

Tonna maculosa (Dillwyn, 1817) (Figs 20–36)

Synonymy and type material: Turner (1948: 169) and Matthews et al (1987: 37)

Diagnosis

Shell dark-brown, spotted; outline fusiform; sculpture of low spiral ridges. Mantle border thin. Hypobranchial gland developed. Kidney with a smooth surface. Proboscis totally within rhynchodeal cavity in fixed specimens. Radular rachidian with crenulations on base of central cusp; crenulation on main cusp of lateral radular teeth. Penis without papilla, with a flap of the tegument on tip. Anterior region of vas deferens separated from walls of receptaculum. Inner division in female genital opening of capsule gland larger than in *T. galea*.

Description

Shell: Detailed descriptions of shell are given by Turner (1948: 169–172, pl. 75, fig. 2, pl. 76, figs. 1, 2) and Matthews et al. (1987: 37, fig.

6). Protoconch of almost four glassy, convex whorls, brown in color (Figs. 20, 21).

Head-Foot Complex (Fig. 22): Foot solid, large, rounded posteriorly, notched anteriorly; propodium narrow, with anterior pedal opening to ventral slit (Fig. 22, mp). Operculum lacking in adult. Tentacles long, fairly thick, bluntly pointed (Fig. 22). Black eyes on tubercles on outer upper part of tentacle base. Rhynchodeum with simple, rounded opening. Proboscis completely retracted within proboscis sheath in all specimens. Color of all head-foot structures beige, with clear-brown irregular spots.

Pallial Complex (Fig. 31): Mantle edge entire, simple, not reflected, thin, flattened, pale cream in color. Pallial cavity occupying first whorl. Siphon long, well developed, pale-beige in color, with clear-brown irregular spots. Osphradium large, bipectinate, proportionally larger than that of *T. galea*, situated on pallial roof at base of siphon; osphradium leaflets lamellate, pigmented brown. Ctenidium very large, monopectinate, with many low, triangular filaments. Hypobranchial gland developed, along left side of anterior region of rectum. Tissue covering rectum and pallial oviduct of females less flaccid than that of *T. galea*, but allowing a well-developed ad-rectal sinus.

Excretory-Circulatory Systems: Kidney moderately large (Fig. 30), forming a sac situated like that of *T. galea*. Well-developed, slit-like nephrostome, surrounded by muscular fibres to form a sphincter (Figs. 30, 31, ne). Internal structures of kidney similar, but simpler than in *T. galea*, with a smooth surface and a cream color; its anterior limit does not bulge with albumen gland of females. Nephridial gland somewhat inconspicuous, situated dorsal to nephrostome (Fig. 30, ne). Heart (Figs. 30, 31) with a very thin, transparent, flaccid walled auricle, and a very thick-walled, rounded ventricle. Ctenidial vein and auricle like those of *T. galea*.

Ad-rectal sinus well developed but less than that of *T. galea*; as in that species, sinus apparently continuous from kidney chamber into an aperture (Figs 35, 36, at), with muscular walls, near anus, like an ureter.

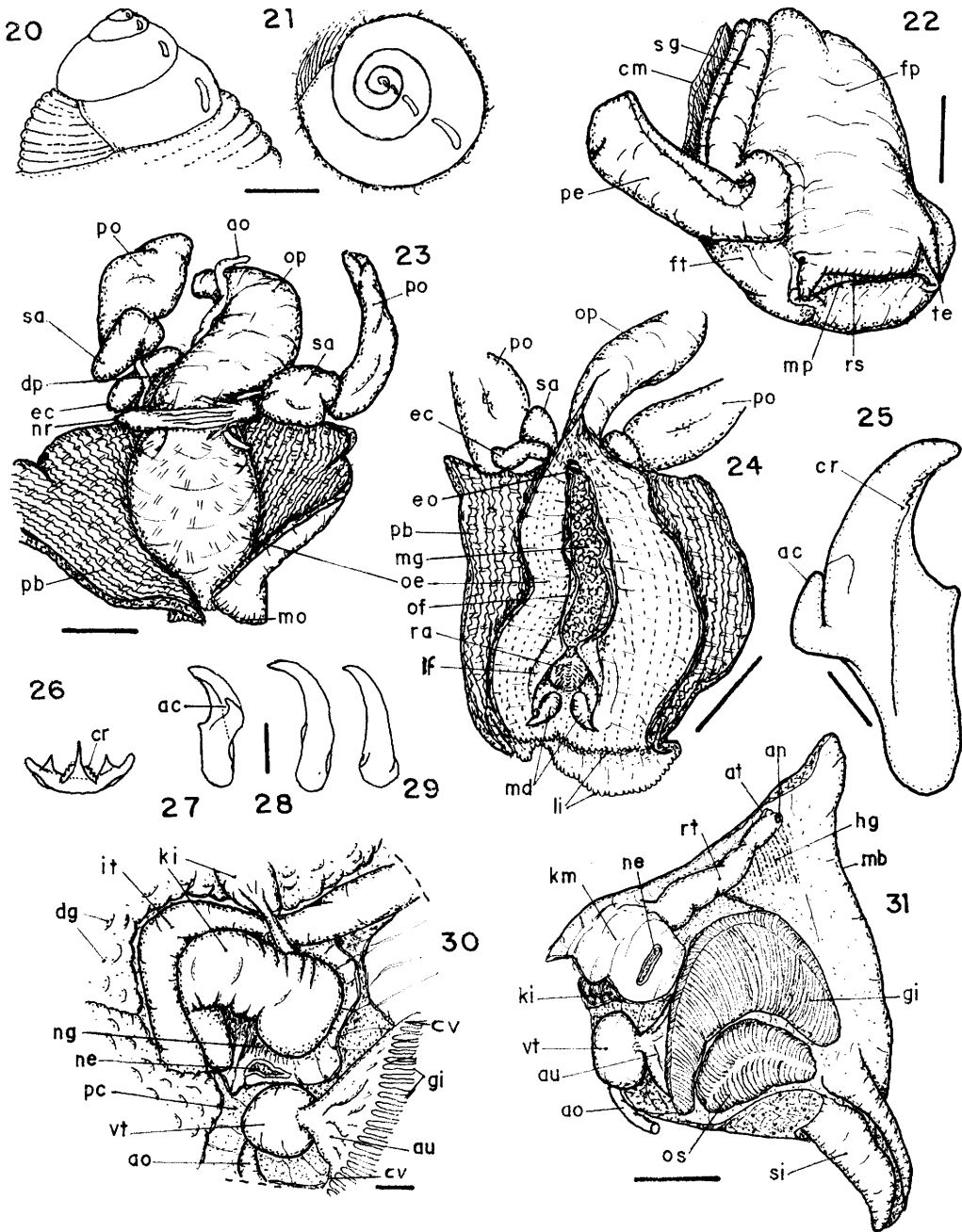
Digestive System: Like that of *T. galea* (Figs. 23–29). Structures within buccal bulb very similar to those of *T. galea*; a pair of ventral jaws (Fig. 24, md), two dorso-lateral folds (lf) in buccal cavity, one on either side, with

opening of proboscis gland duct median to fold and near its anterior end. Radula with rachidian with a crenulation on base of its central cusp; tip of this cusp slender and smooth (Fig. 26). Lateral teeth with a series of crenulations on main cusp (Fig. 25, cr); small accessory cusp present (Figs. 25, 27, ac). Inner (Fig. 28) and outer (Fig. 29) marginal teeth similar of those of *T. galea*. Oesophagus and its inner ventral folds and glands similar to *T. galea*, but much shorter (Figs. 23, 24). Oesophageal caecum present, the folds and glands of the oesophagus terminating in ostium of caecum (Fig. 24, eo). Posterior oesophagus without distinct glands or crop. Stomach poorly developed, with two ducts to digestive glands, but without developed style sac, folds, or typhlosole. Inner surface of posterior oesophagus, stomach and intestine with low longitudinal folds. Salivary glands, proboscis glands and their ducts (Figs. 23, 24), similar of those of *T. galea* (Weber, 1927). All anterior structures of digestive system maintained in position by a tridimensional net of muscle fibres running to wall of oesophagus, body wall and foot. Looping section of ducts of proboscis gland lying anterior to nerve ring, as in *T. galea*.

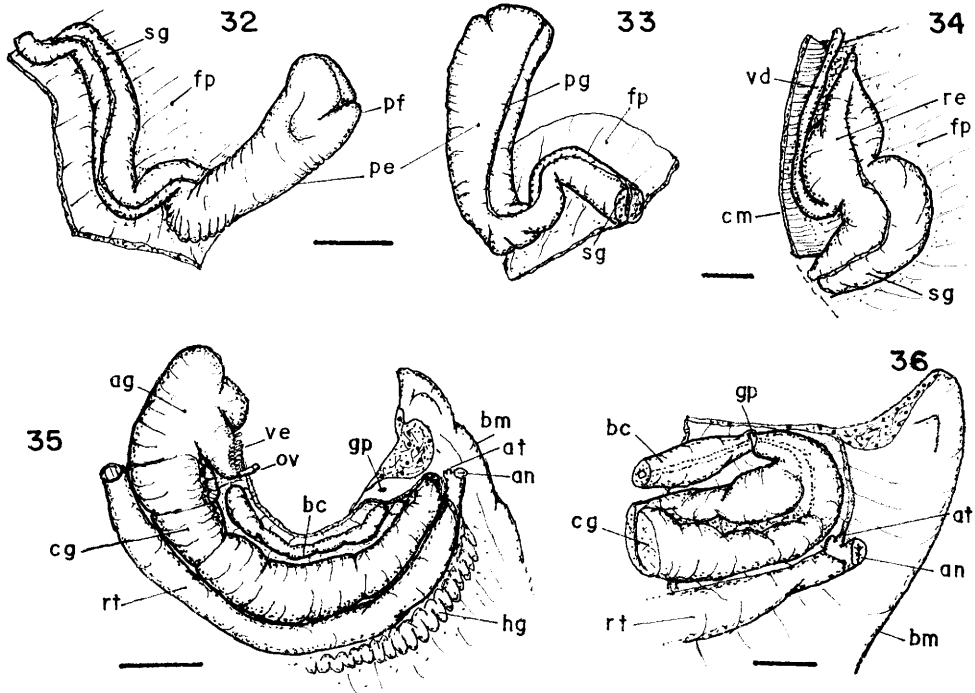
Nervous System: Nerve ring (Fig. 23, nr) with cerebral ganglia turned to left side in all specimens examined. Ventral pair of nerves of proboscis similar to those of *T. galea*.

Genital System, Male: Testis branching into digestive gland, concentrated mainly on columellar surface of viceral mass. End of vas deferens an enclosed, small, thin-walled tube, lying to right of receptaculum, without fusion except for insertion (Fig. 34). Receptaculum a modified, bulging region of spermatid groove, posterior of insertion of vas deferens in floor of pallial cavity (Fig. 34). Spermatid groove in right side of floor of pallial cavity, thick walled, by the prostate gland (Figs. 22, 32, 33, 34). Penis very large (Figs. 32, 33), curved backwards, somewhat flattened, its free end curving downwards following curve of floor of pallial cavity, blunt at the apex. At right side, near apex of penis there is a flap of tissue (fig. 32: pf), under which the penial duct opens; there is no papilla.

Female: Ovary branching into digestive gland. Oviduct slender, opening into a short, thick-walled albumen gland (Fig. 35). A series of paired vesicles present in ventral side of



FIGS. 20-31; *Tonna maculosa*: (20) protoconch in profile; (21) protoconch, apical view, scale (Figs. 20, 21) = 2 mm; (22) head-foot complex from male, scale = 5 mm; (23) dorsal view of anterior region of the digestive system, proboscis opened, scale = 5 mm; (24) the same, oesophagus opened longitudinally, scale = 5 mm; (25) lateral tooth of radula, showing the crenutation (cr) and the accessory cusp (ac), scale = 0.1 mm; (26) rachidian tooth; (27) lateral tooth; (28) inner marginal tooth; (29) outer marginal tooth, scale (Figs. 26-29) = 0.2 mm; (30) detail of opened nephridial and pericardial chambers, scale = 2 mm; (31) pallial cavity of a male, inner view, scale = 5 mm.



FIGS. 32–36: *Tonna maculosa*: (32) penis and seminal groove, dorsal view; (33) the same, ventral view, scale = 5 mm; (34) detail of the insertion of vas deferens in seminal groove, showing the receptaculum, scale = 1 mm; (35) pallial oviduct ventral view, tegument partially removed, scale = 5 mm; (36) detail of female genital pore, tegument removed, scale = 2 mm.

albumen gland, similar to those of *T. galea*. Capsule gland long, curved, thick walled (Fig. 35, cg). Bursa copulatrix long, claviform, slender, separate and to right of capsule gland; posterior end of the bursa sacciform, thin walled, the walls becoming thick and muscular anteriorly (Fig. 35, bc). Small genital opening at right and posterior to anus (Figs. 35, 36, gp). Genital opening with two inner divisions, the smallest and posterior is end of bursa (bc), and the larger and anterior is end of capsule gland (cg) (fig. 36).

Measurements

MZUSP 27961, female = length 65.0 mm by width 44.0 mm; male = 40.4 mm by 26.5 mm. MZUSP 27962, female = 45.3 mm by 31.0 mm.

Habitat

The collected specimens were found by diving or at low tide, burrowing on sandy bottoms near reefs.

Material Examined

BRAZIL. Bahia: MZUSP 27961 (one male and one female) Itapuã Beach, Salvador (7/vii/71); MZUSP 27962 (one female) Itapuã, Salvador (29/ix/84).

DISCUSSION

Tonna galea differs anatomically from *T. maculosa* in having (1) a thick mantle border; (2) darker spots on the epidermis; (3) a less-developed hypobranchial gland; (4) a proportionally smaller osphradium; (5) a more developed kidney, with more complex internal structure; (6) proboscis extending 50% from rhynchodeum (in *T. maculosa* proboscis always completely retracted within proboscis sheath) in fixed specimens; (7) oesophagus and inner oesophageal structures much longer; (8) central cusp of radular rachidian teeth and lateral teeth without crenulations (present in *T. maculosa*); (9) penis with a pa-

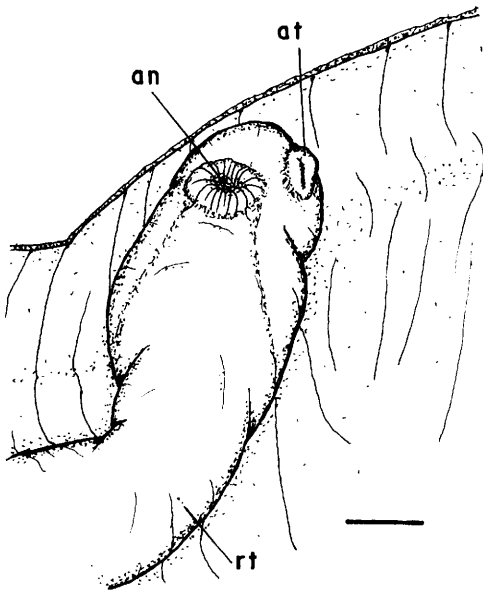


FIG. 37: detail of anal region of *Tonna galea*, scale = 2 mm.

pilla (*T. maculosa* has a flap, without papilla); (10) end region of vas deferens fused with the receptaculum walls (in *T. maculosa* this duct is free); and (11) female genital pore with larger inner opening to the bursa (*T. maculosa* has the larger opening leading to the capsule gland).

The function of the aperture near the anus (Figs 36, 37, at) in both species is unknown. It probably controls the exit of the inner fluid of the ad-rectal sinus, which is apparently continuous to the kidney chamber. These structures resemble the ureter of the Viviparidae (Hyman, 1967), for example, which have no well-developed nephrostome as in *Tonna* (Figs. 21, 31, ne). The fortuitous use of the ad-rectal sinus as an ureter merits further study.

Some differences between the literature accounts (Turner, 1948; Matthews et al., 1987) and the specimens studied here were: (1) the protoconchs of both species are closely similar, and of almost four whorls, in contrast with the data of Matthews et al. (1987), in which differences in number of whorls was given; (2) the jaw lies ventral to the proboscis; (3) the radular rachidian of *T. maculosa* has a crenulation only on the base of the central cusp; the tip of this cusp is smooth and slender (Fig. 26, cr); (4) the radular lateral tooth

has a small, but conspicuous accessory basal cusp in all specimens examined of both species (Figs 8, 25, 27, ac); (5) Turner (1948: 168) reported an extremely long and flagellate papilla in the penis of *T. maculosa*, different from the penis described herein, in which the papilla is lacking (Figs. 32, 33). Further investigation is needed to determine the significance of these differences.

The proboscis of *Tonna*, as in all known Tonnoidea, has a great development of the buccal mass, this region taking most of the proboscis length (Figs. 2, 23). The proposal of the tonnoidean proboscis as a distinct type (Day, 1969) is perhaps not justified, but rather it can be regarded as a specialized and modified pleurembolic type.

The auricle structure and pallial oviduct may be considered as additional characters of Tonnoidea, in addition to the anterior region of the digestive system. This type of auricle is found in *Cassidaria rugosa* (Ranellidae) (Reynell, 1905). However, no reference to the pallial oviduct has been found in the literature except for *Bursa cruentata* (Houbrick & Fretter, 1969: 417), but details are missing that would allow a full comparison.

Besides radular aspects, other characters of the *Tonna* digestive system differing from other Tonnoidea (Reynell, 1902; Day, 1969; Houbrick & Fretter, 1969; Lewis, 1972; Hughes & Hughes, 1981) are (1) the presence of an oesophageal caecum and (2) the absence of a clear oesophageal gland (crop or bulb) in the posterior oesophagus. These are perhaps characters of Tonnidae.

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ABBREVIATIONS

ac:	accessory cusp of lateral tooth	fp:	floor of pallial cavity
ag:	albumen gland	ft:	foot
ao:	anterior aorta	gc:	gonopericardial duct
an:	anus	gi:	gill
at:	aperture of ad-rectal sinus	gp:	female genital opening
au:	auricle	hg:	hypobanchial gland
bc:	bursa copulatrix	in:	inner proboscis nerve
bu:	buccal complex	it:	intestine
cf:	central fold of buccal complex	ki:	kidney
cm:	columellar muscle	km:	membrane between kidney and pallial cavities
cp:	capsule gland	lf:	lateral fold of buccal complex
cr:	crenulated ridge	li:	buccal lips
cv:	ctenidial vein	mb:	mantle border
dc:	duct of oesophageal caecum	md:	mandibule (jaw)
dg:	digestive gland	mf:	muscle fibers
dp:	duct of proboscis gland	mg:	mid-ventral mucous gland of oesophagus
ec:	oesophageal caecum	mo:	mouth
eo:	ostium of oesophageal caecum	mp:	anterior pedal gland
		ne:	nephrostome
		ng:	nephridial gland
		nr:	nerve ring
		oe:	anterior oesophagus
		of:	oesophageal folds
		on:	outer proboscis nerve
		op:	posterior oesophagus
		os:	osphradium
		ov:	oviduct
		pa:	posterior aorta
		pb:	proboscis
		pc:	pericardial chamber
		pe:	penis
		pf:	penian flap
		pg:	penian seminal groove
		pn:	proboscis nerve
		po:	proboscis gland
		pp:	penian papilla
		pr + pt:	convoluted seminal vesicle
		ra:	radular complex
		rc:	proboscis sheath
		re:	receptaculum seminalis
		rn:	radular nucleus
		rs:	rhynchodeum
		rt:	rectum
		sa:	salivary gland
		sg:	seminal groove
		si:	siphon
		te:	cephalic tentacle
		tt:	testis
		vd:	vas deferens
		ve:	vesicles of albumen gland
		vt:	ventricle