

## PHYSA MARMORATA GUILDING, 1828 (PULMONATA : PHYSIDAE)

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A description of *Physa marmorata* Guilding, 1828, based on material collected at its type-locality, the Caribbean island of Saint Vincent, is presented.

The shell is thin, horn-colored, surface very glossy, diaphanous. Spire acute, elevated; protoconch distinct, rounded-conical, reddish-brown; five not shouldered, broadly convex whorls with subobsolete spiral lines and thin growth lines. Aperture elongated, 1.4-2.0 times as long as the remaining shell length, narrow obovate-lunate; upper half acute-angled, lower half oval, narrowly rounded at the base; outer lip sharp, inner lip completely closing the umbilical region; a very distinct callus on the parietal wall; columellar lip with a low ridge gradually merging into the callus. Ratios: shell width/shell length = 0.44-0.52 (mean 0.47); spire length/shell length = 0.33-0.41 (mean 0.39); aperture length/shell length = 0.59-0.67 (mean 0.62).

Oral lappets laterally mucronate, foot spatulate with deeply pigmented acuminate tail. Mantle reflection with 6-10 short triangular dentations covering nearly half the right surface of the body whorl, and 4-6 covering a part of the ventral wall. Body surface with tiny dots of greenish-yellow pigment besides melanin.

Renal tube tightly folded into a zigzag course.

Ovotestis diverticula acinous, laterally pressed against each other around a collecting canal. Ovispermiduct with well-developed seminal vesicle. Oviduct highly convoluted, merging into a less convoluted nidamental gland which narrows to a funnel-shaped uterus and a short vagina. Spermathecal body oblong, more or less constricted in the middle and somewhat curved; spermathecal duct uniformly narrow, a little longer than the body. About 20 prostatic diverticula, simple, bifurcate or divided into a few short branches, distalmost ones assembled into a cluster. Penis long, nearly uniformly narrow; penial canal with lateral opening about the junction of its middle and lower thirds. Penial sheath with a bulbous terminal expansion the tip of which is inserted into the caudal end of the prepuce. Prepuce shouldered, much wider than the narrow portion of the penial sheath. Penial sheath/prepuce ratio about 2.08 (1.45-2.75). The main extrinsic muscles of the penial complex are a retractor, with a branch attached to the bulb, and another to the caudal end of the penial sheath; and a protractor, with a branch attached to the shoulder of the prepuce and adjoining area of the penial sheath, and another to the caudal end of the penial sheath.

Egg capsule C-shaped, with 10-30 elliptical eggs (snails 10mm long) measuring about 1.10mm (0.90-1.32) through the long axis and surrounded by an inner and an outer lamellate membranes.

Jaw a simple obtusely V-shaped plate. Radula will be described separately.

Key words: Mollusca – Physidae – *Physa marmorata* – Taxonomy

As shown by Clench (1930), *Physa marmorata* is the oldest available name for a Neotropical physid. This species was described by Guilding (1828:534) in the following terms (without figure and reference to size):

Ph. viridis, atro irrorata: pallio nigro marmorato, posticè lobato-venoso: capite maximè lobato: soleâ livida.

Testa tenuis, ovato-oblonga, flavescens-fuscens, diaphana, nitida, longitudinaliter obscure plicata; columellario lato, pallido; peritremate saepe purpurascens; spirâ exsertâ, acutâ, anfractibus sex. Var.  $\alpha$ . maculis subtus opacis.

Habitat in fossis Sti. Vincentii copiosissimè.

*P. rivalis*, Sow., Gen., species Guadaloupensis affinis est, at incolâ invisâ res incerta manet. Hostes decipiens testam vesturâ viridi tegit, et sic in fundo tuta serpit. Species duae Barbardenses, et fortè subgenus distinctum, cum *Planorbi parvulo* mox describendae.

The next author to deal with a physid from St. Vincent was Smith (1895), who referred to *Physa rivalis* (Maton & Rackett, 1807), considering it a senior synonym of *P. marmorata* and giving no figure. He stated (p. 301) that Guilding's collection had been purchased by the British Museum in 1839. However, I was recently informed that the type of *P. marmorata* is not held there. Harrison & Rankin made extensive studies of the freshwater fauna (1976) and especially freshwater molluscs (1978) of St. Vincent, describing numerous habitats of *P. marmorata*, the distribution and structure of its populations, but having no concern with taxonomy.

The name *Physa marmorata* has been applied by many authors to physids from Caribbean islands and American mainland localities from Texas to Argentina. Like other Neotropical nominal species of physids, it is involved in great taxonomic and nomenclatural confusion, apparent from Clench's (1930) and Parodi's (1956) reviews.

Anatomical descriptions of Puerto Rican specimens were given by Richards (1964) and by Harry & Hubendick (1964), but further discussion was prevented "owing to the taxonomic confusion in this group, and the lack of anatomical data" (Harry & Hubendick, 1964). As stated by the last-mentioned authors, "the *Physae* have received intensive study from the standpoint of ecology, physiology and parasitology. Yet the anatomy of these snails is the least well known among the Hygrophila (see Duncan, 1958), genera are poorly defined, and an excessive number of nominal species have been proposed. The generic definitions previously proposed in this family are not satisfactory, being based on a few characters in combination which do not consistently occur together in the species allocated to a given genus" (Harry & Hubendick, 1964: 16-17).

In this paper a description of topotypic specimens of *P. marmorata* is given. The problem of genus will not be approached until further anatomical data are accumulated through the study of additional species.

## MATERIAL AND METHODS

On May 18, 1985, I collected 77 specimens from the Argyle rivulet, immediately south of the Yambou river, on the east coast of St. Vincent island. Another sample of 28 specimens was collected on the following day from two ornamental ponds in the Botanical Gardens. The breeding-places correspond to the PSS 21, PSS 22 and SV 26 sampling stations in Harrison & Rankin's (1976) paper.

Ten larger specimens (8-10mm long) from each sample were relaxed in a 0.05% solution of nembutal for 6h, then immersed for 40 sec in hot water at 70°C, drawn from the shell and placed in slightly modified Railliet-Henry's fixative (distilled water 930ml, sodium chloride 6g, formalin 50ml, acetic acid 20ml). The two samples proved indistinguishable in shell and anatomic characters.

The remaining specimens were brought to the laboratory in Rio de Janeiro, where they were put in aquaria on May 24, and immediately proceeded with egg-laying. A small number of individuals (1 to 4) died daily. The last original specimen died 53 days after arrival. Under a room temperature of  $25 \pm 1^\circ\text{C}$ , the embryos from eggs laid on May 25 began hatching on the 7th day, and egg-laying by laboratory-born specimens occurred from the 21st day after hatching, when the largest individual had reached 5mm in shell length. A flourishing colony, derived from the Argyle rivulet specimens, is being kept with negligible mortality. Ten specimens, 10-14mm in shell length, were selected from this offspring and preserved as described above for morphological study, in addition to the 10 parental ones and the other 10 from the Botanical Gardens. Two additional specimens and the everted penial complex of another one were embedded in paraffin, sectioned serially and stained with hematoxylin-eosin for microanatomical observation.

## DESCRIPTION

The shell (Fig. 1) is thin, horn-colored, ovate, surface very glossy, diaphanous; spire acute, elevated; protoconch distinct, rounded-conical, reddish-brown; five not shouldered, broadly convex whorls with subobsolete spiral lines and thin growth lines. The apical margin of the second and following whorls overlaps the preceding whorls and forms a shallow suture bordered by a whitish band where the risen growth lines are packed together over a reddish-brown, yellowish or white subsutural line, giving the suture region a shirred appearance.

The aperture is elongated, 1.4 to 2.0 times (mean 1.64) as long as the remaining length of the shell (measures on 30 specimens 8.7mm to 14mm long), narrow obovate-lunate; upper half acute-angled, lower half oval, narrowly rounded at the base; outer lip sharp, inner lip completely closing the umbilical region; a very distinct callus on the parietal wall; columellar lip with a low ridge gradually merging into the callus.



The following ratios were calculated from the above-mentioned specimens, 8-14 mm long: shell width/shell length = 0.44 to 0.52 (mean 0.47); spire length/shell length = 0.33 to 0.41 (mean 0.39); aperture length/shell length = 0.59 to 0.67 (mean 0.62).

In the freely moving animal the oral lappets are laterally mucronate and the foot is rounded in front, spatulate in shape, with an acuminate tail (Figs. 7, 8). The melanin pigment is especially concentrated as irregular specks at the head and oral lappets, and as an axial line in the tentacles and the foot tail. The body surface is spangled with tiny greenish-yellow dots; as observed by Richards (1964), this pigment dyes a paper towel when the snail is crushed in it. The same effect is obtained if, to avoid exogenous pigment such as chlorophyll present in ingested vegetable matter, the cephalopodal mass is crushed on a piece of filter paper. The melanic pigment spreads over the roof of the pulmonary cavity, leaving numerous roundish spots unpigmented; the area over the attachment of the physid muscle (see Harry & Hubendick, 1964 :11, 14) is either free of melanic pigment, or more or less melanic and speckled with very minute unpigmented spots (Fig. 2).

The mantle collar proper does not extend beyond the edge of the shell aperture. An extension of the mantle projects from underneath the collar (Figs. 2, 3) and is more or less reflected over the shell. In the crawling animal this mantle extension just folds into a narrow band over the basal lip of the shell and gradually widens caudad along the outer lip; past the pneumostome, reaching the apertural angle, it forms a broad reflection over the ventral and right walls of the shell, with two lobes separated by a narrower segment (Fig. 5). Short triangular dentations project from the border of each lobe; they vary in number from 4 to 6 in the left lobe (near the pneumostome) and from 6 to 10 in the right lobe (on the columellar side). On the right the reflected portion of the mantle extension covers nearly half the right surface of the body whorl; on the left side its dentate portion covers the ventral surface of the shell up to the suture line (Figs. 3, 4, 8).

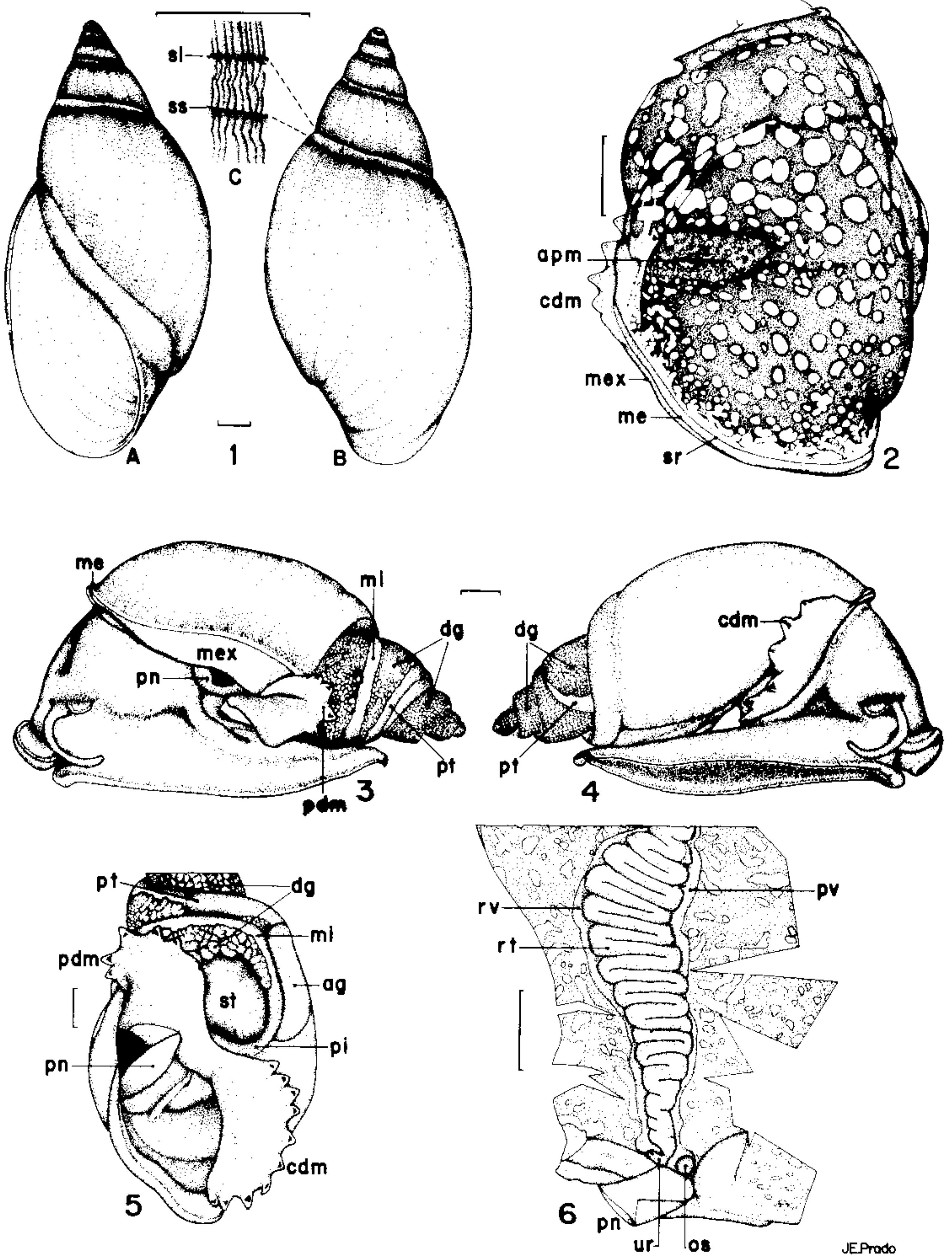
The renal tube (Fig. 6) is tightly folded into a zigzag course, ending by a short leftward ureter which opens through a subterminal meatus just behind the pneumostome.

The genital system is shown in Figs. 10, 11.

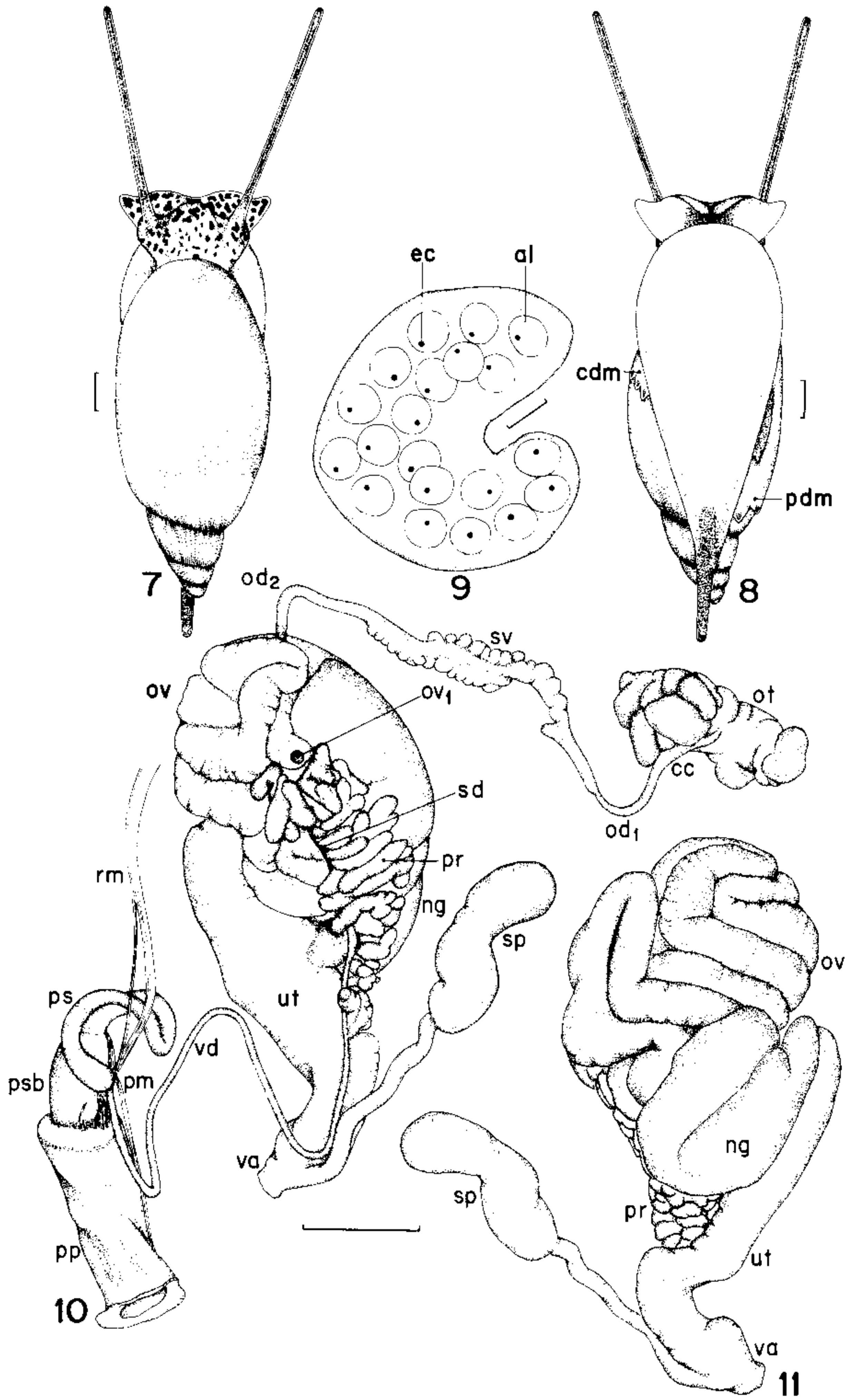
The ovotestis is embedded in the digestive gland, its apex being situated underneath the caudalmost intestinal loop (postintestine); it has a lobulate surface formed by numerous acini laterally pressed against each other around a collecting canal which continues into the ovispermiduct. The middle segment of the latter has a series of small pouchlike swellings which form the seminal vesicle; the distal segment is even-walled as the proximal one, discharging eggs and sperm into the carrefour.

The albumen gland, removed in the specimen of Fig. 10, is a large bean-shaped organ whose duct empties into the caudal portion of the carrefour. The carrefour (Fig. 13) is partly embedded in the ventral surface of the albumen gland. From its right side the oviduct emerges as a narrow duct which runs leftward, gradually widens and becomes highly convoluted. Then it merges, without a morphological line of distinction, into the less convoluted nidamental gland, which narrows to a funnel-shaped uterus and a short vagina. The spermatheca has an oblong body, more or less constricted in the middle and somewhat curved in most specimens, and a narrow duct, a little longer than the body, which empties into the vagina just above the vaginal outlet. The spermatheca is bound by its apex to the roof of the pulmonary cavity and by its left side to the pericardium, so that it has to be carefully disentangled lest it should be severed during dissection; it is also loosely attached to the wall of the esophagus.

The spermiduct emerges from the carrefour by a short trunk that at the same time receives the ovispermiduct; a valvelike structure, visible as a buttonhole through the duct wall, prevents the mixing of the incoming material from the ovispermiduct with the material that flows into the spermiduct (Figs. 12, 13). As soon as it arises from the carrefour, the spermiduct gives off a long series of prostatic diverticula, the number of which varies around 20, distributed down to the level of the uterine wall. The prostatic diverticula are fingerlike offshoots from the spermiduct and may be simple, bifurcate or divided into a few short branches; sometimes a diverticulum lies across the spermiduct, the lumens of both communicating through their touching walls (Fig. 12). The distalmost diverticula are assembled into a cluster and hardly can be individualized. After giving off the last prostatic diverticulum, the spermiduct continues into the vas deferens which, as in other *Hydrophila*, descends to a point near the base of the prepuce, interweaving fibers of its outer coat with those of the surrounding tissue. At that point it loops back into an ascending limb longer than the descending one, to open into the caudal end of the penis. The penis (Figs. 14, 25, 26, 27),



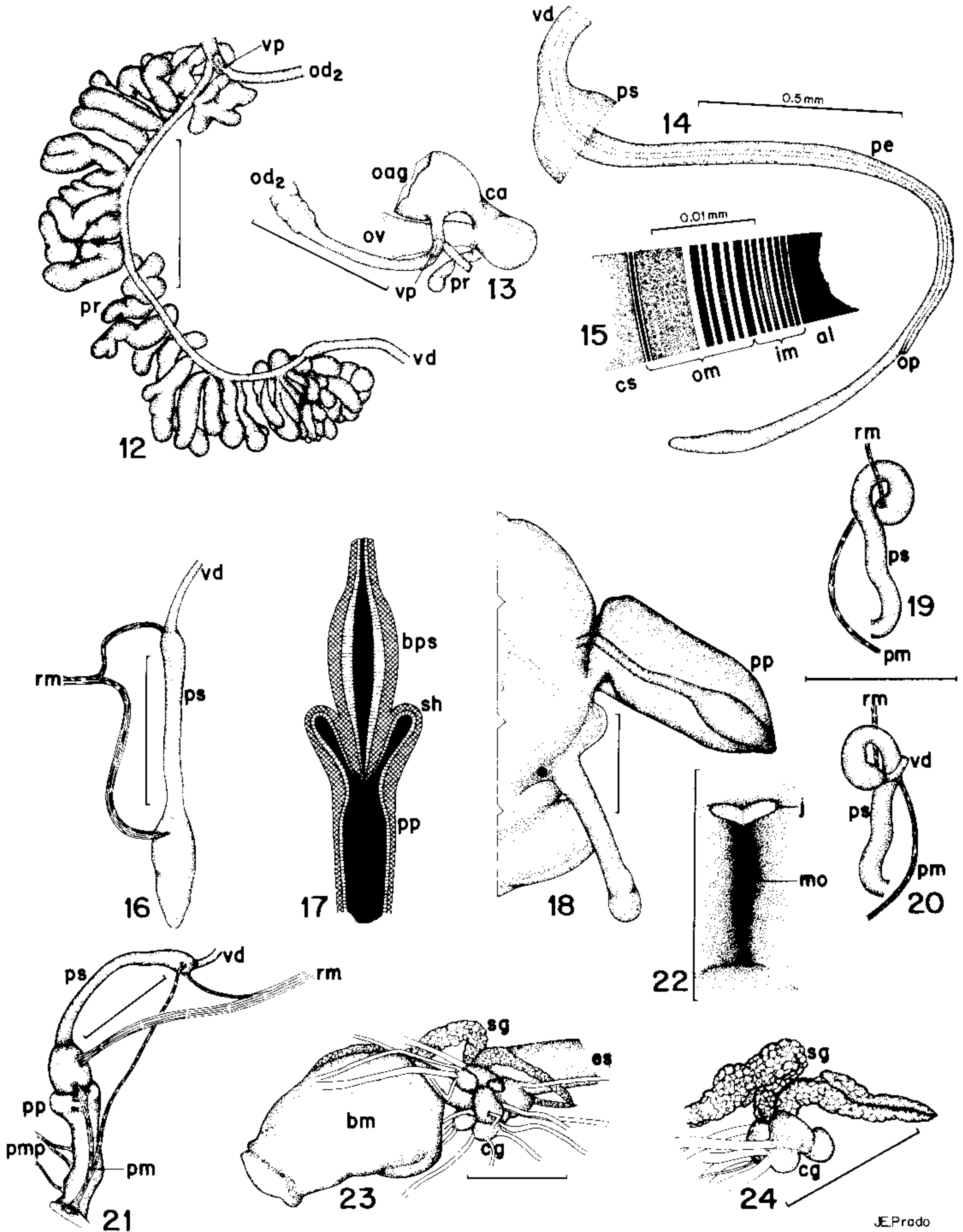
*Physa marmorata* - Fig. 1: shell of specimen from St. Vincent (A = ventral view, B = dorsal view, C = suture area enlarged). Fig. 2: outer surface of mantle. Fig. 3: preserved specimen drawn from shell, left side. Fig. 4: the same, right side. Fig. 5: ventral view of preserved specimen, cephalopodal mass removed. Fig. 6: renal tube and neighboring organs. - Bar = 1 mm. See list of abbreviations.



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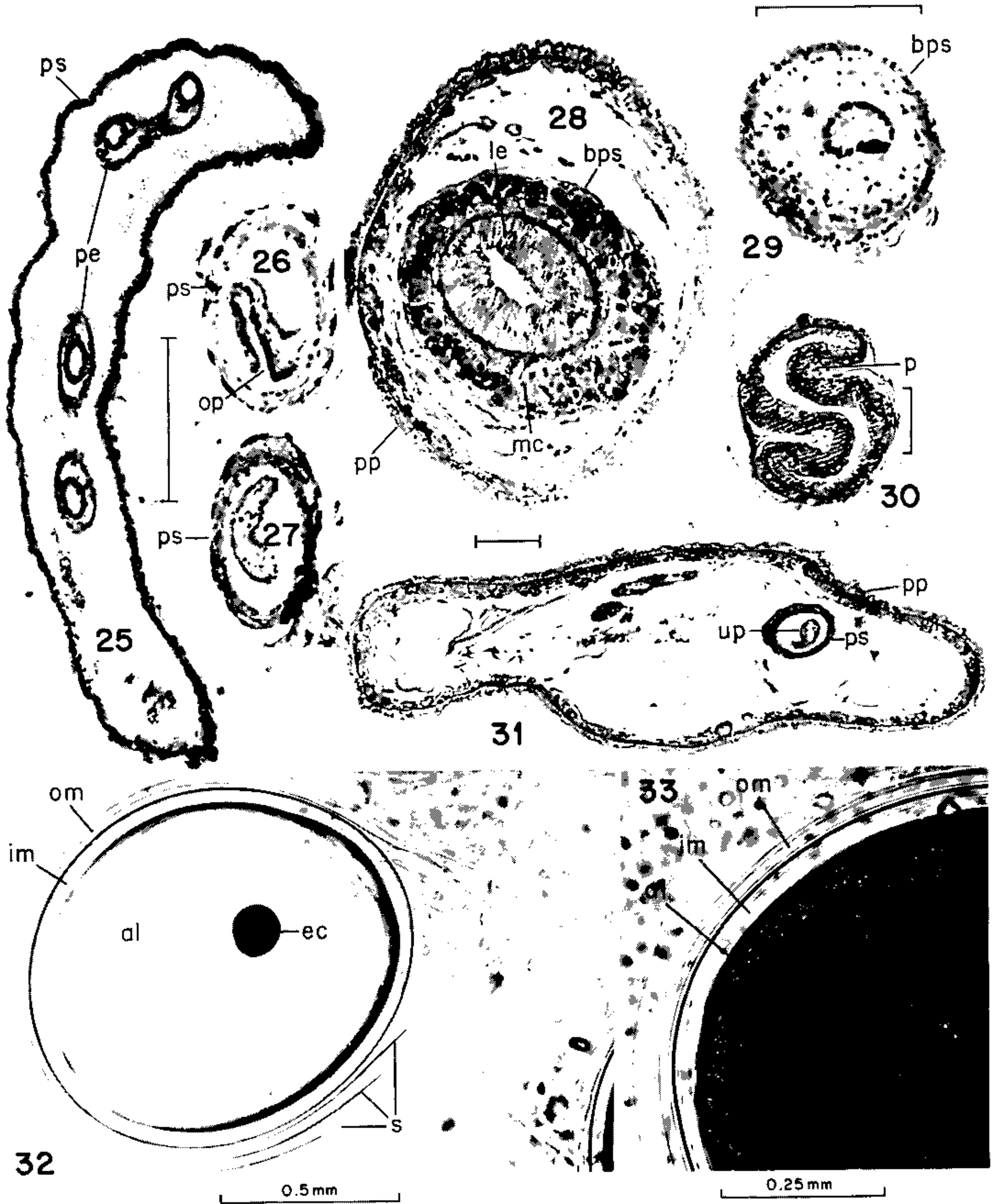
*Physa marmorata* – Fig. 7: animal, from life, dorsal view. Fig. 8: the same, ventral view. Fig. 9: egg capsule. Fig. 10: genital, system, ventral view. Fig. 11: part of the same, dorsal view. – Bar = 1mm. See list of abbreviations.





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*Physa marmorata* - Fig. 12: prostate, side adherent to female duct. Fig. 13: carrefour and related organs. Fig. 14: penis. Fig. 15: interpretation of egg membranes as seen in optical section. Fig. 16: penial sheath. Fig. 17: longitudinal section through bulb of penial sheath and proximal portion of prepuce. Fig. 18: specimen with everted prepuce. Fig. 19: proximal portion of penial sheath. Fig. 20: the same, from opposite side. Fig. 21: penial complex. Fig. 22: jaw and mouth. Fig. 23: buccal mass and salivary glands. Fig. 24: salivary glands showing relation with circumesophageal nerve ring. - Bar (unless otherwise stated) = 1mm. See list of abbreviations.



*Physa marmorata* – Fig. 25: sections through canaled portion of penis within penial sheath. Fig. 26: oblique section through lateral opening of penial canal. Fig. 27: oblique section through uncanaled portion of penis. Fig. 28: cross-section through bulb of penial sheath within everted prepuce. Fig. 29: cross-section through tip of penial sheath. Fig. 30: cross-section through prepuce. Fig. 31: cross-section through everted prepuce containing uncanaled portion of penis within penial sheath. Fig. 32: egg. Fig. 33: egg membranes. – Bar (unless otherwise stated) = 100  $\mu$ m. See list of abbreviations.

free within the penial sheath, is about as long as the latter and nearly uniformly narrow; for about two thirds of its length it is traversed by the penial canal which opens laterally, leaving the distal third uncanaled. A blood vessel runs parallel to the penial canal, and extends beyond the canal opening along the uncanaled portion of the penis, which is a little swollen near the tip; such a vessel with the tenuous cellular meshwork that fills the space between the canal and the outer epithelial coat of the penis constitute an erectile tissue. The penial sheath (Fig. 16) is a little swollen at the caudal portion, then keeps a uniform width for about three fourths of its length,



and ends as a bulbous expansion with a cephalic tip inserted into and covered with the caudal end of the prepuce (Fig. 17). On approaching the bulbous expansion, the epithelial lining of the penial sheath gradually assumes a glandular appearance; the epithelium is encircled by a ring of fibromuscular tissue which separates it from the belt of mucous cells that discharge their secretion by thin ducts leading through the fibromuscular ring (Fig. 28). More distally there is a gradual dominance of the fibromuscular tissue, at the same time that the epithelial lining loses its glandular character (Fig. 29). The tapering end of the bulb opens into the prepuce by a very narrow orifice. Its inserted end apart, the penial sheath is about 2.08 times (1.45 to 2.75) as long as the prepuce. The prepuce, much wider than the narrow portion of the penial sheath, has a shouldered caudal end as a result of the intromission of the bulb of the penial sheath (Fig. 17); the two joined ends are connected externally by thin fibers. There are two longitudinal folds (pilasters) in the preputial wall, giving a cross-section of the organ an S-shaped appearance (Fig. 30); these folds disappear on eversion of the prepuce (Figs. 18, 31).

The extrinsic muscles of the penial complex (Fig. 21) are a retractor and a few protractors. The retractor muscle arises from the columellar muscle and splits into two branches which attach to distant points of the penial sheath: the thicker one to its bulb and the slender one to its caudal end (Fig. 16). Of the protractor muscles, one arises from the tissue surrounding the base of the prepuce and gives two branches, a shorter one attached to the shoulder of the prepuce and adjoining area of the bulb of the penial sheath, and a longer one attached to the caudal end of the penial sheath, or sometimes to the distal end of the vas deferens (Fig. 20). Two or more slender muscles arising from the left side of the head wall and attached to the distal portion of the prepuce function as protractors of this organ.

The egg capsule (Fig. 9) is a slimy C-shaped ribbon that attaches well to the substrate. Both ends are usually rounded, and the concavity tends to be narrow. The greater width of 100 capsules laid by 10mm-long snails ranged from 5.0mm to 8.8mm (mean 6.8). The number of eggs per capsule in the same sample varied from 10 to 29 (mean 18.5). The eggs (Figs. 32, 33) are elliptical in outline, but seldom do they display at full length in a horizontally spread capsule examined from above for they are fastened more or less perpendicularly to the substrate. Taking advantage of its stickiness, the capsule may be fixed by a convenient point of its rim, in a more or less vertical position, to the bottom of a small petri dish, so that a number of eggs show their long axis. The long axis of 100 eggs, including the inner membrane, considered by Bondesen (1950) a part of the egg, measured 0.90mm to 1.32mm (mean 1.10). The egg is encircled by a continuous inner membrane containing six pairs of very tenuous concentric lamellae and surrounded by an outer membrane. The latter also shows a set of four lamellae surrounded by a glassy belt about as wide as the lamellate part, beyond which there are two outermost lamellae (Fig. 15). Whereas the inner membrane is continuous, the outer one dissociates as it approaches an area of the egg surface where it forms an "egg string". The string is present on one egg side, not on opposite sides as figured by Bondesen (1950) and Duncan (1958) for other species of *Physa*. Although disrupted, the lamellae persist after hatch.

Hatching does not take place until the growing embryo nearly fills the whole space within the egg vesicle. At that stage it tends to align with the long axis of the vesicle. At a room temperature of 26°C it moves for short periods alternated with longer periods of immobility, and its heart beats about 130 times per minute. Vigorous movements may cause the surface of the egg vesicle, immediately under the inner membrane, to slide against the latter, showing that, at least at that stage, the two structures are not united. Hatching is preceded by strokes of the cephalopodal mass against the thin egg wall, which is ruptured by the tearing action of the radula (only now able to stick out of the mouth) combined with the outward pressure of the embryo body. Finally the inner and outer membranes are also torn and the hatchling escapes through a rent usually at a pole of the long axis.

The jaw (Fig. 22) is a single obtusely V-shaped plate. The salivary glands (Figs. 23, 24) pass through the circumesophageal nerve ring and are joined to each other at their tips. The radula is not dealt with in this paper owing to the unreliability of light microscopy for details of its structure; observations by scanning electron microscopy, now in progress, will be published later.

## REMARKS

The ovotestis of *P. marmorata* has the same appearance as that of lymnaeids (see, e.g., Paraense, 1984); it is similar to that of *P. papaveroi*, represented in Fig. 3 of Leme's (1966) description. Different figures were given by Slugocka (1913) for *P. acuta* and by Duncan (1958) for *P. fontinalis*. Slugocka (1913) found it impossible to separate the ovotestis from the digestive gland because the follicles of both organs are "very intermingled". In reality, the ovotestis is



coated by the digestive gland and the contacting surfaces of the two organs do not intermingle but are held together by loose connective tissue. Thus the ovotestis can be uncoated by carefully and patiently picking off bit by bit the surrounding digestive gland, heeding the different texture of the two organs. Distinction may be facilitated if the two organs are contrasted by feeding the snail for some days with, for instance, deeply colored gelatin, which is taken by the digestive gland.

The arrangement of the organs related to the carrefour (duct of albumen gland, ovispermiduct, spermiduct and oviduct) is the same as described by Slugocka (1913) for *P. acuta*.

The penis of *P. marmorata* is described by Harry & Hubendick (1964) as having a terminal opening. Richards (1964), however, states that its duct opens out laterally, as shown in his Figs. 10, 12, 13, a disposition that is confirmed in the present study.

According to Harry & Hubendick (1964), the penial sheath of *P. marmorata* is "largest at its upper end, from which it tapers gradually to its junction with the preputium. A fleshy sarcobelum is present at the junction of these two sacs". Richards (1964), however, describes the distal wall of the penial sheath as "swollen" and makes no mention of a sarcobelum. This contradiction is rather apparent than real, since what Harry & Hubendick regard as a sarcobelum corresponds to the swollen distal end mentioned by Richards. A sarcobelum, as defined by Baker (1928 :189), is a fleshy ring of tissue at the upper or inner end of the prepuce. As shown in Figs. 16 and 17, the bulbous swelling is neither a ring of tissue nor a part of the prepuce, actually belonging to the penial sheath. Comparable to the bulbous swelling of *P. marmorata* is that of *Physella integra* shown by Baker (1928, Fig. 186), described as follows (Baker, 1928 :459, subgenus *Physodon*): "no distinct sarcobelum, but the walls of the penis sheath above the preputium are much thickened and form a rounded sac".

Comparing some taxonomic characters of *P. marmorata* as described above (SV) and of *Stenophysa marmorata* in Te's (1978) study of Physidae (TE), similarities and differences may be pointed out. Similarities concern the shell as a whole and its aperture and spire, the mantle extension, oral lappets and the shape of the penial complex. Differences concern the following characters: shell width/shell length – TE = 0.53, SV = 0.47 (0.44-0.52); spire length/shell length – TE = 0.26, SV = 0.39 (0.33-0.41); foot tail – TE = narrowing suddenly as an aristate leaf, SV = narrowing gradually as an acuminate leaf; jaw – TE = a three-pointed star, SV = an obtusely V-shaped plate, as in Te's *fontinalis* group; egg size – TE = 0.86mm, SV = 1.10mm (0.90-1.32); penial sheath/prepuce – TE = ca. 1.5, SV = 2.08 (1.45-2.75).

## RESUMO

É apresentada uma descrição da espécie *Physa marmorata* Guilding, 1828, baseada em material coletado na sua localidade-tipo, a ilha Saint Vincent, no Caribe.

A concha é delgada, de coloração córnea, superfície muito lustrosa, diáfana. Espira aguda, elevada; protoconcha distinta, cônica-arredondada, parda-avermelhada; cinco giros sem ombro, largamente convexos, com linhas espirais pouco perceptíveis e linhas de crescimento delgadas. Abertura alongada, 1.4-2.0 vezes mais longa que o resto do comprimento da concha, em crescente oboval; metade superior acutangular, metade inferior oval, estreitamente arredondada na base; lábio externo cortante, lábio interno fechando completamente a região umbilical; calo bem aparente na superfície parietal; lábio columelar com crista baixa fundindo-se gradualmente com o calo. Razões: largura da concha/comprimento da concha = 0.44-0.52 (média 0.47); comprimento da espira/comprimento da concha = 0.33-0.41 (média 0.39); comprimento da abertura/comprimento da concha = 0.59-0.67 (média 0.62).

Mufla mucronada lateralmente, pé espatulado com cauda acuminada intensamente pigmentada. Reflexão do manto com 6-10 denteações triangulares curtas cobrindo quase metade da superfície direita do giro corporal, e 4-6 cobrindo parte da parede ventral. Superfície do corpo com minúsculos pontos de pigmento amarelo-esverdeado além da melanina.

Tubo renal descrevendo curvas muito unidas, em ziguezague.

Divertículos do ovoteste acinosos, comprimidos lateralmente uns contra os outros em torno do canal coletor. Ovispermiduto com vesícula seminal bem desenvolvida. Oviduto muito sinuoso, continuando-se na glândula nidamental menos sinuosa que se estreita para dar lugar ao útero afunilado e a curta vagina. Corpo da espermateca oblongo, mais ou menos cinturado na parte média e um tanto curvo; canal da espermateca uniformemente estreito, um pouco mais longo que o corpo. Cerca de 20 divertículos prostáticos simples, bifurcados ou divididos em poucos ramos curtos; os mais distais reunidos em um cacho. Pênis longo, quase uniformemente estreito; canal peniano com abertura lateral mais ou menos na junção dos terços médio e inferior. Bainha do pênis

com expansão terminal bulbosa cuja ponta se insere na extremidade caudal do prepúcio. Prepúcio com ombro, muito mais largo que a porção estreita da bainha do pênis. Razão bainha do pênis/prepúcio cerca de 2.08 (1.45-2.75). Os músculos extrínsecos principais do complexo peniano são um retrator, com um ramo inserido no bulbo e outro ramo na extremidade caudal da bainha do pênis; e um protrator, com um ramo inserido no ombro do prepúcio e área adjacente da bainha do pênis e outro ramo na extremidade caudal da bainha do pênis.

Cápsulas ovíferas em C, com 10-30 ovos elípticos (de caramujos com 10mm de comprimento) medindo cerca de 1.10mm (0.90-1.32) no eixo mais longo e envolvidos por duas membranas lameladas, interna e externa.

A mandíbula é uma placa simples em V obtuso. A rádula será descrita em outro trabalho.

#### ABBREVIATIONS USED IN THE FIGURES

ag	albumen gland	pdm	parietal dentation of mantle
al	albumen	pe	penis
apm	area of insertion of physid muscle	pi	prointestine
bm	buccal mass	pm	protractor muscle of penial complex
bps	bulb of penial sheath	pmp	protractor muscle of prepuce
ca	carrefour	pn	pneumostome
cc	collecting canal of ovotestis	pp	prepuce
cdm	columellar dentation of mantle	pr	prostate
cg	circumesophageal ganglia	ps	penial sheath
cs	common ground substance	psb	bulb of penial sheath
dg	digestive gland	pt	postintestine
ec	egg cell	pv	pulmonary vein
es	esophagus	rm	retractor muscle of penial complex
im	inner membrane	rt	renal tube
j	jaw	rv	renal vein
lc	lining secretory epithelium	s	egg string
mc	mucous cell layer	sd	spermiduct
me	mantle edge	sg	salivary gland
mex	mantle extension	sh	shoulder of prepuce
mi	midintestine	sl	suture line
mo	mouth	sp	spermatheca
ng	nidamental gland	sr	supramarginal ridge
oag	outlet of albumen gland	ss	subsutural line
od <sub>1</sub>	proximal segment of ovispermiduct	st	stomach
od <sub>2</sub>	distal segment of ovispermiduct	sv	seminal vesicle
om	outer membrane	up	uncanaled portion of penis
op	outlet of penial canal	ur	ureter
os	osphradium	ut	uterus
ot	ovotestis	va	vagina
ov	oviduct	vd	vas deferens
ov <sub>1</sub>	beginning of oviduct cut off from carrefour	vp	valvelike passage
p	pilaster of prepuce		

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