Anatomical Study of *Volutopsius deformis* (Gastropoda)

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(*With 3 Text-figures*)

Volutopsius deformis is a remarkable species among gastropods by its sinistral volution and a brief note of its anatomy was given by Dall, but yet some details were remained. There is an opportunity for me to contribute to its anatomy, thus the 9 specimens of this species were kindly left to my disposal by the courtesy of Prof. Kiyu Kobayashi of Hokkaido University, who collected them at Bristol Bay, Alaska, in September 1956, whom I must express my sincere thanks for his kindness.

General features: head, foot, anterior part of mantle, proboscis and siphon patched in usual or rarely densely with dark brown; snout short, thick with large aperture; eyes black, fixed on prominences, situated near the base of tentacles on their out side; foot slightly auricled on both sides of epipodium, grooved transversely at the anterior margin; metapodium a little raised with opercular scar of oval shape; sole broad without any patches; columellar muscle rather small.

Alimentary canal: Proboscis cylindrical in shape, almost uniform in calibre throughout its entire length, strikingly thick walled, interior of proboscis longitudinally grooved, median ridge on the floor of proboscis demarcated by 2 deep grooves on both sides and by thick muscular wall from buccal cavity as pointed out by Thiele; radula very long, consisting regularly of as many as 86 rows, of which posterior 6 or 7 rows very thin, weak, would not stained well by the dye, central tooth tricuspidate, cusps long, bending slightly ventrally, pointed sharply at the tip, median cusp definite, not variable in shape, smaller and shorter than both lateral cusps, which equal in size, base rather broad, arcuated anteriorly, excavated posteriorly with a shallow notch on both sides; lateral tooth bicuspid, cusps nearly equal in size, arcuated inwardly, pointed sharply at the tip, base narrow, somewhat curved in sigmoid; oesophagus thin walled slender tube, smooth interiorly; a pair of salivary glands large, lobular in structure; salivary duct strikingly long, running along the oesophagus, entering into the buccal cavity, opening to the radular sheath near its base: stomach divided into 2 parts, primary stomach lunar in shape with an opening of liver, situated between anterior and posterior lobe of liver; secondary stomach globose in shape with an opening

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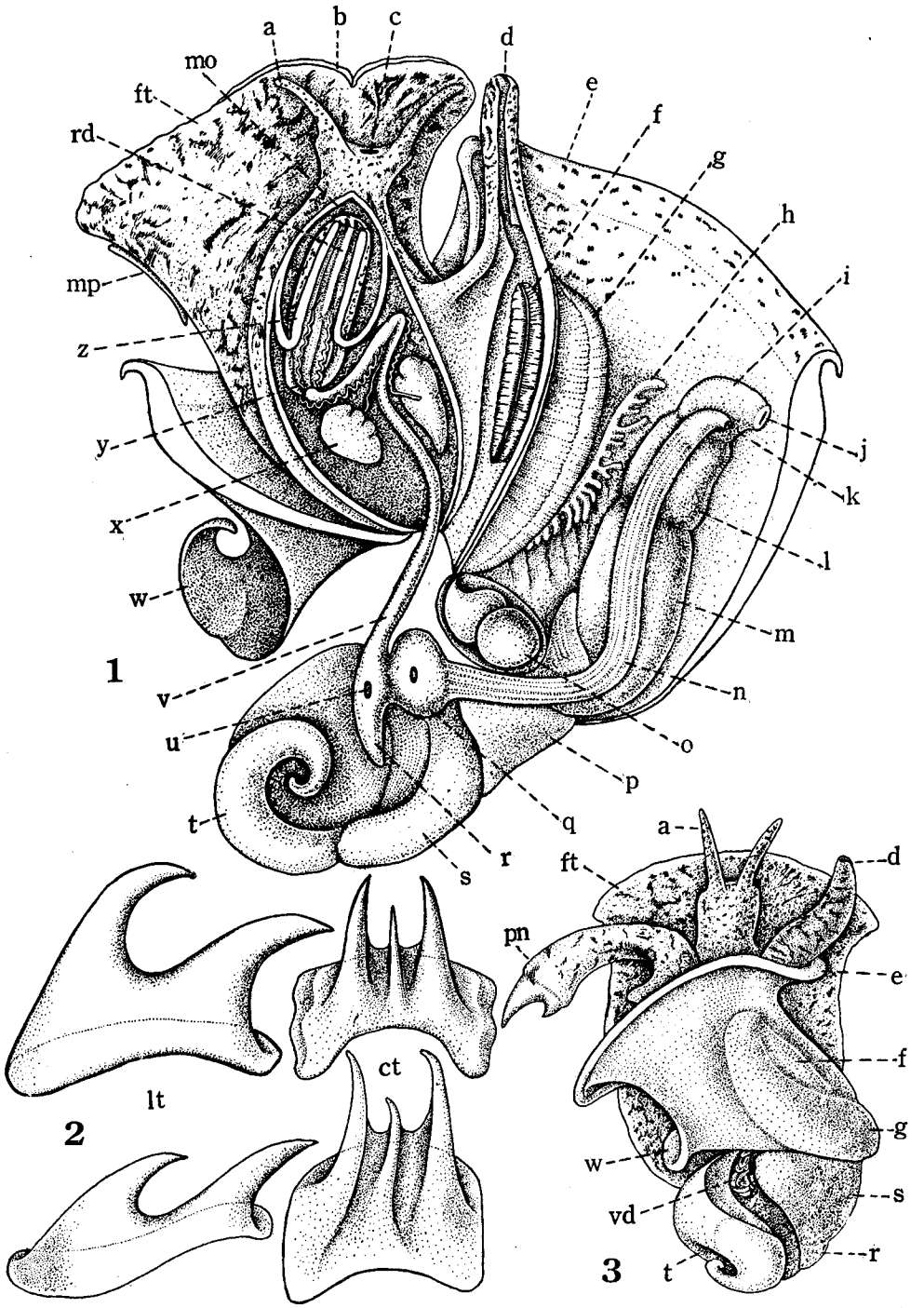
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of liver; intestine thick in calibre, thin walled, longitudinally ridged interiorly; anal portion smooth, opening a little behind the female orifice, kidney large, attaching to the posterior part of uterus, initial part of intestine and pericardium; ventricle thick walled, while auricle thin walled.

Genital organ: uterus large, thick tube, strikingly thick walled, which provided interiorly with irregular, thick ridges, arranged densely; vagina thick glandular walled, divided interiorly into several portions; vaginal atrium rather thin walled, opening outside just behind the mantle edge; penis large, long, with 2 pointed tips, anterior tip longer than the posterior one.

Pallial organs: osphradium elongate oval in shape, consisted of numerous, fine lamellae on both sides of axis, situated near the base of siphon, occupying the greater part of inhalant groove; gill rather short, extending from near the base of siphon as far as to the bottom of the pallial cavity; hypobranchial gland irregularly branched low ridge; posterior part of hypobranchial gland on the mantle thin walled, corrugated irregularly, seemed to be an extension of the gland.

Remarks: Dall (1921) described the radula of this species that it is rather irregular, the median cusp of the central tooth variable. As far as I observed, the radula of this species is very much regular, and the median cusp of the central is constant and definite in shape. It seems that the variable shape of the central cusp may be resulted by observing from various directions. Thiele said that the cusps of the central tooth stand on the hind edge of the basal plate, but as shown in my figure the cusps are situated on the basal plate at the middle portion.

Literature

Dall, W. H. 1921. Summary of marine shell-bearing mollusks of Northwest coast of America. U.S. Nat. Mus. Bull. 112.

Thiele, J. 1931. Handb. syst. Weichtkde. Bd. 1.

Explanation of figures 1-3

1. *Female*, dorsal view with the mantle and the dorsal wall laid open, illustrated diagrammatically. a. tentacle; b. transverse groove of foot at the front edge; c. aperture of snout; d. siphon, forming posteriorly the inhalant groove; e. mantle; f. osphradium; ft. foot; g. gill with branchial vessel along the inhalant ridge; h. hypobranchial gland; i. vaginal atrium; j. female orifice; k. anus; l. vagina; m. uterus; mo. mouth, situated at the anterior end of proboscis; mp. metapodium with opercular scar; n. rectum (intestine); o. heart in the pericardium; p. kidney; pn. penis; q. secondary stomach with an opening of liver; r. primary stomach; rd, radula, covered with muscular wall; s. anterior lobe of liver; t. posterior lobe of liver; u. opening of liver; v. oesophagus; vd. vas deferens; w. columellar muscle; x. left salivary gland; y. salivary duct; z. interior of proboscis.
2. *Radula*, 2 halves a row, ct, central, anterior figure seen from above, posterior from oblique direction; lt. lateral tooth : anterior, lateral view: posterior, oblique view.
3. *Male*, dorsal view, removed from its shell, illustrated diagrammatically.