



## Bivalves in the stomach contents of *Calliostoma coppingeri* (Callistomatidae: Gastropoda)

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### Abstract

Five prodissoconchs of Lamellibranchia bivalves was found in stomach contents of *Calliostoma coppingeri*. This is the first findings of bivalves in the stomach of a *Calliostoma* species. In a consensus, the feeding behavior of *Calliostoma* was predominantly herbivorous or detritivorous. However, several papers have reported many species as carnivorous, which is discussed. The presence of innermost marginal teeth in the Calliostomatinae radulae seems to be associated with carnivory.

Key-words: *Calliostoma*, carnivorous, feeding, bivalves, radula.

### Resumo

Cinco prodissoconchas de bivalves Lamellibranchia foram encontradas no conteúdo estomacal de *Calliostoma coppingeri*. Este é o primeiro registro da presença de bivalves no estômago de *Calliostoma*. Consensualmente, o hábito alimentar de *Calliostoma* era predominantemente herbívoro ou detritívoro. Entretanto, diversos artigos têm relatado muitas espécies como carnívoras, como aqui discutido. A presença de um dente marginal mais interno modificado parece estar associada com carnívoria.

Palavras chave: *Calliostoma*, carnívoria, alimentação, bivalves, rádula.

### Introduction

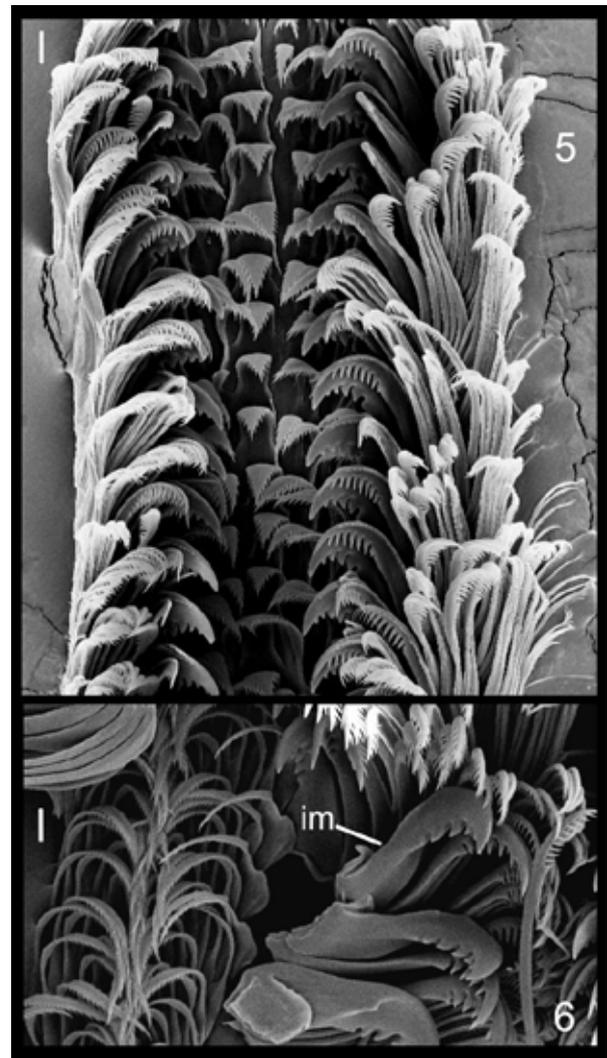
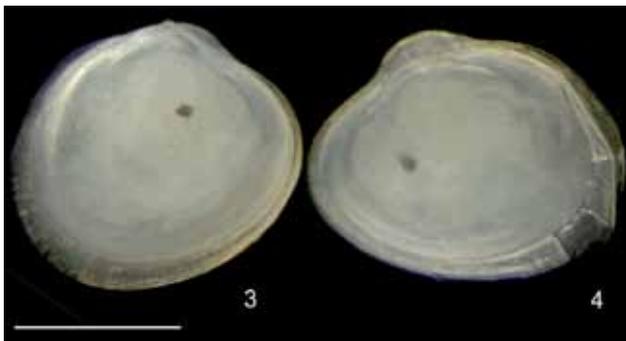
Calliostomatidae is an abundant taxon among Trochoidea which includes about 250 species (Marshall, 1995) inhabiting worldwide on varied substrates and frequently in association with sessile invertebrates, such as hydroids, cnidarians, gorgonians and corals (Hickman & McLean, 1990). Some papers, however, have indicated some species of *Calliostoma* Swainson, 1840 as carnivorous (Perron, 1975; Perron & Turner, 1978; Quinn, 1981; Marshall, 1988; Williams et al., 2010). In those cases, the specimens feed specially Cnidaria (commonly hydroids), but also sponges, gorgonians and corals. Most of vetigastropods taxa is herbivorous or detritivores, but among them, the key-hole limpets (Fissurellidae) are also carnivore, eating sponges and tunicates (Williams et al., 2010). The carnivore feeding behavior makes the calliostomatids an unusual group, in addition to the strictly herbivorous or detritivorous diets previously thought (Clench & Turner, 1960), but this issue is not yet known within the genus as a whole. *Calliostoma coppingeri* (Smith, 1880) (Figs. 1-2)

(for description of shell see Clench & Turner, 1960), ranges from Rio Grande do Sul, Brazil to Chubut, Argentina, and has a bathymetric range of 13-86 m (Rosenberg, 2009). The present study focuses on the stomach contents and radula of *C. coppingeri*, with the strange finding of bivalves in the former.



Figs 1-2 *Calliostoma coppingeri*: 1, specimen MZSP 34487, frontal view; 2, same, umbilical view. Scale = 5 mm.

The material examined is from Museu de Zoologia da Universidade de São Paulo: MZSP 18842: Uruguay, Maldonado; MZSP 34487: Brazil, Paraná State off Paranaguá. Four specimens preserved in 70% alcohol were extracted from their shells and dissected under stereomicroscope. SEM examination of radulae was made in the Laboratório de Microscopia Eletrônica do Museu de Zoologia da Universidade de São Paulo. One of the four *Calliostoma coppingeri* stomachs examined contained about five juvenile prodissoconch of Lamellibranchia bivalves (Figs. 3-4). According to Clench & Turner (1960), *C. coppingeri* lives on rocky shell bottoms and mussel beds, and it is commonly fed by the starfish *Astropecten cingulatus* Sladen, 1883. There is no knowledge about the diet of this species. Some papers have documented the feeding of *Calliostoma* species on coelenterates (Salvini-Plawen, 1972; Perron, 1975; Perron & Turner, 1978; Quinn, 1981; Marshall, 1988, 1995), either through observation of feeding individuals or examination of gut contents. *C. occidentale* (Mighels & Adams, 1842) have been reported to contain perisarcs of campanulariid and sertulariid hydroids and skeletal spicules of sponges in the gut (Perron & Turner, 1978); as well as *C. orion* Dall, 1889 guts containing spicules of sponge (Quinn, 1981). Aquarium specimens of *C. annulatum* (Lightfoot, 1786), *C. variegatum* (Carpenter, 1864) have been observed eating dead mollusks and other carrion, and *C. annulatum* was seen to attack a living dorid nudibranch, however, an exception is the species *C. ligatum* (Gould, 1846) which seems to feed on diatoms and detritus (Perron, 1975).



Figs 5-6 Radula in SEM: **5**, whole view; **6**, detail of innermost marginal teeth (im). Scale = 30 µm.

Figs 3-4 Larvae (protoconch) of Lamellibranchia bivalves: **3**, specimen MZSP 99560, right valve view; **4**, same, left valve view. Scale = 100 µm.

The radula is probably associated with feeding behaviors. The presence of the innermost pair of modified marginal teeth (Figs. 5-6: im) in Calliostomatinae seems to be related with carnivory. On this account these innermost marginal functions like a pair of chainsaws (Marshall, 1995).

Another Calliostomatidae taxon, the subfamily Thysanodontinae, has unusual radula teeth that may be somehow involved in suctorial feeding (Marshall, 1988). Although some reports are related to *Calliostoma* feeding other mollusks, there never was registered the occurrence of bivalves in their stomach contents. Despite in being possible the presence of bivalve prodissoconchs in gut content of detritivore species, accidentally ingested, the present findings show complete, semi-digested bivalve specimens. The presence of those complete bivalves, associated with the fact of nothing else is discernible, and that some congener species are carnivorous as above discussed, we can conclude that, possibly, *C. coppingeri* has some adaptation of ingest young bivalves as part of its diet.

Institutional abbreviation: MZSP: Museu de Zoologia da Universidade de São Paulo, Brazil.

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