

HERMAPHRODITISM AMONG NORTH AMERICAN
FRESHWATER MUSSELS

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ABSTRACT

Coe (1943) published at length on the sexual differentiation among mollusks. However, little has been contributed on the numerous species of freshwater mussels in the United States. Intensive work with this naiad group during the past several years indicates that most of the species have separate sexes (dioecious). Only three appear to be usually hermaphroditic; several have occasional hermaphrodites. Altogether 1,733 freshwater mussels were relaxed in sodium nembutal, killed and fixed (usually in Bouins fluid), sectioned using the paraffin technique, and then stained with haematoxylin and eosin. An additional 2,000 specimens were sectioned using a cryostat.

The following four species were found to be hermaphroditic: *Anodonta imbecillus* Say, *Lasmigona compressa* (Lea) and a near relative *Lasmigona subviridis* (Conrad), and *Carunculina parva* (Barnes). Considered on a family basis, there were no Margaritanidae that were usually monoecious or hermaphroditic. Two species, *Margaritana margaritifera* (L.) and *Cumberlandia monodonta* (Say), each had an occasional hermaphrodite. Additional study is needed in this group. Among the widespread family Unionidae, representatives of all three subfamilies were studied. The results can be summarized, as follows:

Unionidae - Some 561 specimens in this subfamily were sectioned, and altogether 29 species were represented. None were found to be usually monoecious; six were occasionally hermaphroditic. Since specimens in this group often show striking visceral coloration running to orange, pink or bright crimson, some have questioned whether this feature was sex determined. Sections of both orange and white *Fusconaia flava* (Raf.) indicated that the color was present in both males and females. This observation agrees with Ortmann (1912), who indicated there is no relation of these colors to sex.

Anodontinae - It was possible to section 19 species representing 414 specimens in this group. As already indicated, two (*Anodonta imbecillus* and *Lasmigona compressa*) are usually monoecious; the remaining 17 were occasionally so. It was surprising to find that *Anodonta imbecillus* had representatives in Florida which were dioecious, indicating that such a wide ranging species may not be consistently hermaphroditic. In the case of *Lasmigona compressa*, its habitat is usually very small creeks and streams, and for other natives. In this case there is a question as to whether hermaphroditism may be related to difficult ecological conditions. It may be an adaptive mechanism.

Unionidae - Of the 734 specimens sectioned representing 16 species,

7 had occasional hermaphroditism; one is usually monoecious, i.e. *Carunculina parva* (Barnes). While several southern species of *Carunculina* were studied, none were hermaphroditic. Tepe (1943) observed that an occasional male follicle of *C. parva* contained eggs. This same condition was observed (H. & A. van der Schalie, 1963) in one specimen of some 200 of *Actiononaias ellipsiformis* (Conrad) sectioned. This specimen represented one of the most bizarre hermaphrodites found in its eggs and sperm were scattered in a most haphazard way. A report on this species and one other in another genus will be published elsewhere.

Purchon (1951), Fretter & Graham (1964), and others, have indicated that hermaphroditism appears more commonly among freshwater than among marine mollusks. Some authors have also emphasized that the monoecious condition is apt to appear under conditions in which the animal is confronted with difficulties in its normal reproductive activity. While the relatively few (only three) naiades, among some hundred species examined, were usually hermaphroditic, the causes are still quite obscure. A substantial amount of data to indicate hermaphroditism as conditioned by ecology is wanting in the three species cited. Further investigations are warranted.

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A more detailed account of these studies will be published in a later issue of *Malacologia*.