

SEASONAL VARIATION IN GONAD ACTIVITY IN FRESHWATER
MUSSELS, AND ITS SYSTEMATIC SIGNIFICANCE

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ABSTRACT

Seven species of naiads (*viz.*, *Anodonta gibbosa*, *A. peggyae*, *Carunculina paula*, *Ellipto strigosus*, *Quincuncina burkei*, *Villosa lienosa* and *V. vibex*) were collected from the same locality in northwestern Florida at monthly intervals over one calendar year. Histological examination of the gonads of the animals was made, and notes were taken on the size/age of the animals and the periods of gravidity.

Observations on the condition of the gonads of each sex in each species for all collections made it possible to plot the gonad activities on a seasonal basis. The seasonal gonad activities of males and females were divided into four stages, each characterized by a predominant feature: 1. mature gametes; 2. spermatogenesis in males, many ova and some nutrient matter in females; 3. sperm morulae in males, oögenesis and much nutrient matter in females; and 4. spent/inactive phases.

The gonad activities of *A. gibbosa*, *E. strigosus*, *Q. burkei*, *V. lienosa* and *V. vibex* are highly seasonal, the sequence of stages being 4-3-2-1 in both sexes. Periods of peak quantities of mature gametes occur just prior to the appearance of ova and subsequent early embryos in the marsupial demi-branches, regardless of whether the duration of incubation is short (*i.e.*, tachytictic, in *E. strigosus* and *Q. burkei*; *A. gibbosa*?) or long (*i.e.*, bradytictic, in *V. lienosa* and *V. vibex*). Non-seasonal gonad activities (mature ova and spermatozoa occur throughout the year) appear in *A. peggyae* and *C. paula* (both bradytictic). Some variation in the gonad activity of male *A. peggyae* and female *V. vibex* was found in animals of different age classes in the same collection. However, there was found no such variation in performance in female *A. peggyae* and male *V. vibex* of different age classes, and the activity of males and females of *C. paula*, *E. strigosus*, *Q. burkei* and *V. lienosa* was consistent among different-sized animals.

Males are more useful than females in defining seasonal gonad activity, partially due to the temporary presence of sperm morulae. These peculiar bodies, usually termed inclusions, have been suggested to undergo catabolism to provide nutrient molecules for the subsequent typical spermatogenesis. Some morulae, however, have been reported to transform into mature spermatozoa. Unfortunately, information on the origin, structure and function(s) of sperm morulae remains fragmentary and largely hypothetical.

Both seasonal and non-seasonal gonad activities appear in representatives of different subfamilies of the Unionidae (even within a single genus), and they also are independent of the duration of glochidial incubation. Consequently, it is concluded that these glandular behaviors are species-specific adaptations.