VARIABILITY IN NORTH AMERICAN *LYMNAEA STAGNALIS* L. (GASTROPODA: LYMNAEIDAE)

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ABSTRACT

The nomenclatural history of the pond snail, Lymnaea stagnalis L., *in North America is briefly reviewed. An examination of a population of coexisting* L. s. appressa (=jugularis) *and* L. s. sanctaemariae *shows continuous variation suggesting that these two forms are ecophenotypes.*

The pond snail, *Lymnaea stagnalis* L., is widely distributed in the northern hemisphere, occurring in North America, Europe, parts of North Africa and much of Asia (Hubendick, 1951). Its wide tolerance ranges for many water chemistry parameters (e.g. Pip, 1978) and its apparently effective dispersal have contributed towards its extremely numerous populations. The ecological success of *L. stagnalis,* combined with the isolation of individual populations characteristic of many freshwater organisms, has been accompanied by a great variety of shell form. The often striking morphological differences between various populations may be regarded in large part as a product of environmental conditions acting on the fixed genetic resources of a population which frequently results from interbreeding among the descendants of a small number of colonizers. Any additional variation in such populations must be introduced through mutation or immigration of new genotypes.

The variability of *L. stagnalis* has been responsible for a long history of nomenclatural excesses. During the latter part of the 19th century a great number of European named varieties were distinguished (e.g. Baker, 1898), many of which were shown by Vignal (1911) to be obtainable from average populations by altering environmental conditions. Subsequent workers (e.g. Zhadin, 1952; Frömming, 1956) suggested that environmental quality and availability and type of food were important factors in influencing variability in this species. Zhadin (1952) and Germain (1969) declined to assign any names to subspecific rank in their treatments on the basis that continuous variation appeared to exist between different forms.

In North America, the great variability of *L. stagnalis* was recognized by Walker (1892-3), who figured several extreme forms. Baker (1898) initially assigned the bulk of the North American forms to *L. s. appressa* Say 1818 (=*L. s. jugularis* Say 1817), noting the substantial variation in spire length. Subsequently (1911) he recognized six forms that were differentiated on the basis of relative spire length, and degree of shouldering and lip expansion. Hubendick (1951) suggested that the forms cited by Baker (1911) have overlapping ranges of variation and therefore represent ecophenotypes. The former worker pointed out that the full range of variation may be found in every geographical region where this species occurs. La Rocque (1968) presented a similar viewpoint and also noted that Pleistocene examples of this species in North America are primarily referable to *L. s. jugularis.*

Clarke (1973) compared a number of population samples from the Canadian Interior Basin and found that the major characters distinguishing some of the forms were not valid because of the extent of variation that could be encountered within the same population. He did retain *L. s. sanctaemariae* Walker 1892 since the ratio of the aperture length to total shell length in population samples of this form (>0.65) appeared to show some discontinuity with the ratios for *L. s. appressa* samples (<0.60). The former variant also appeared to show some geo-

graphical unity, occurring in the Winnipeg River, Lake Superior, Lake Huron and Wisconsin River systems, where it is present as local populations interspersed with populations of *L. s. appressa*. However some single populations on the periphery of the range of *L. s. sanctaemariae* were reported by Clarke (1973) to consist of morphological intergrades between the two forms.

A large population which contains both the two forms and their intergrades (Fig. 1) is present in Pike Lake, Cass Co., Minnesota (47°18'N, 94°37'W), approximately 200 km south of the present known boundary range of *L. s. sanctaemariae*. The aperture length to shell length ratios measured for a sample from this population (Fig. 2) indicate that the generally accepted ratios for distinguishing between the two forms are not valid for this population, which apparently shows continuous variation.

Shortness of the spire in *L. s. sanctaemariae* is generally regarded as a result of selection pressures in turbulent habitats (Baker, 1928; Clarke, 1973). The coexistence of both forms and their intergrades in the same habitat suggests that such a population contains an unusually diverse range of genotypes, perhaps the result of multiple immigrations from different sources and/or endogenous origin of some forms. The origin of the short-spired form in Pike Lake is perplexing as a search of lakes in the same and adjacent counties yielded only the long-spired form.

That the morphological diversity of *L. stagnalis* in North America is an ecophenotypic one is supported by observations that anatomical differences between the forms are minor (Baker, 1928) or doubtful (Clarke, 1973). However Alaskan forms of this species may constitute a separate race (Baker, 1928; Hubendick, 1951).

FIG. 1. *Specimens of* L. stagnalis *from a single population in Pike Lake, Cass Co., Minnesota. First shell is 30 mm. Others to same scale.*

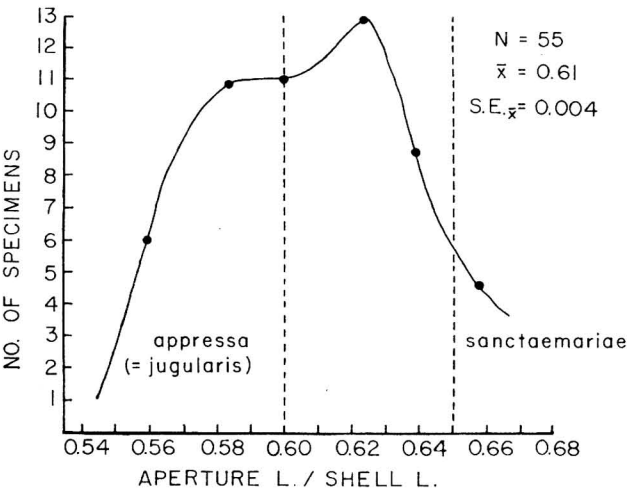

FIG. 2. *Distribution of aperture/ shell length ratios rounded off to nearest even number from a Pike Lake sample of* L. stagnalis.

It is interesting that Baker (1928) noted that some populations of the short-spired form exhibit a high proportion of scalariform-like abnormalities characterized by a forward slippage of the affected whorls along the shell axis. In long-spired forms this anomaly is very rare. In the Pike Lake sample approximately 10% of the individuals exhibited this anomaly (Fig. 1).

Voucher specimens from this sample have been deposited in the National Museum of Canada (NMC 77376).

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UNEXPLAINED OCCURRENCE OF THE MACTRID BIVALVE, *RANGIA CUNEATA*, FROM THE ARROWHEAD FARMS INDIAN SITE NEAR LOUISVILLE, KENTUCKY

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ABSTRACT

Over three thousand valves of the Atlantic Coast brackish water clam Rangia cuneata *(Gray) were unearthed from the Arrowhead Farm archaeological site near Louisville, Kentucky. These clams were brought to this site by Lake Woodland or Archaic inhabitants of the Ohio River Valley for unknown reasons. This represents only the second mid-continent occurrence of these shells in an archaeological site. The reasons that the Indians had for bringing them to the Arrowhead Farm Site are obscure.*

Marine mollusk shells in archaeological sites far from the ocean no longer are startling discoveries because of the rather large numbers of them found associated with human living areas (Parmalee 1958). These mollusks, however, mainly share the common denomination of being beautiful, unique or useful (Biggs, 1970).

It was thus with great interest that several thousands of valves of the exceedingly common estuarine clam, *Rangia cuneata* (Gray 1831), were discovered at Arrowhead Farm, a multicomponent Late Archaic through Lake Woodland archaeological site in Jefferson County, Kentucky (USGS Lanesville, Indiana-Kentucky quadrangle 38° 10′ 15′ 'N 85° 53′ 48′ 'W). A report of the archaeological investigation at the Arrowhead Site is in print (Mocas 1976). Identification of the shells as *Rangia cuneata* (Gray), the Common Rangia, was verified by Dr. Henry vander Schalie of the University of Michigan after an original determination by the author. Also, Dr. Dee Dundee of Louisiana State University was kind enough to send several recently collected shells of this clam for comparative purposes.

Rangia cuneata is an old species, first appearing in the Miocene of North America (Dall 1898). During the Pleistocene it occurred on the East Coast from New Jersey to northern South America (Richards 1938, 1939, 1962; Moore 1969). Until 20 years ago *R. cuneata* was restricted to the Gulf of Mexico coast of the United States and Mexico. However, since the late 1950's it has re-invaded its former range, occurring presently along the East Coast from Florida to Maryland (Hopkins and Andrews 1970).

Hopkins et al. (1973) describe *R. cuneata* as the most widely distributed and by far the most abundant species of brackish water clam in its