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SHELL GROWTH RATES OF THE COMMON MUCKETS
 ACTINONAIAS LIGAMENTINA (LAMARCK, 1819) COMPLEX

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The growth of the *Actinonaias ligamentina* (Lamarck, 1819) complex (figure 1), has not been studied, even though this complex is very common in many rivers of midwestern North America. This investigation is part of an attempt to discover the basic growth patterns of populations of this complex in localities over the range. All of the collections used are in the Ohio State University Museum of Zoology.

Data on growth in length were collected from specimens from seven rivers. These were the Grand River, Ontario (55 specimens), Sandusky River, Ohio (100 specimens), Walhonding River, Ohio (111 specimens), Green River, Kentucky (120 specimens), Powell River, Tennessee (100 specimens), Clinch River, Tennessee (120 specimens), and the Kiamichi River, Oklahoma (90 specimens). The length, defined as the maximum antero-posterior dimension, of each annual ring on each shell was measured. The mean length for each year of growth was calculated and these means were used to construct the bar graphs.

The most rapid growth rate occurs during the second or third growing season in all the populations, with the possible exception of those in the Kiamichi River. The shells of the Kiamichi *A. l. gibba* (Simpson, 1900) were so badly eroded around the umbo, even in specimens collected alive, that accurate determination of the earliest growth rates was nearly impossible. All the populations showed the most rapid decrease of growth rates between the fourth and ninth years. In the tenth year and beyond, a slower, steady decline was established.

As shown in the bar graphs, figure 2, the most rapid growth rate, an average 20.3 mm per year, is found in the *A. l. carinata* (Barnes, 1823) from the Sandusky River. *Actinonaias l. carinata* from the Grand River maintained a rapid rate of growth for a longer period of time than those of the other rivers. Shells from these three samples were larger than those of the other rivers. The largest specimen was an individual at least 40 years old from the Sandusky River, with length 175 mm, width 86 mm, height 101 mm, and weight 1017 grams. The right valve of this shell measured 19 mm thick near the ventral margin. The slowest average growth rate during the first three years was 12 mm per year, and occurred in the *A. l. ligamentina* (Lamarck, 1819) from the Powell River. Beyond the fourth year, the *A. l. carinata* of the Green River and the *A. l. gibba* of the Kiamichi River maintained the slowest growth rates, dropping to an average of 0.3 mm per year in the oldest shells. The shells from the Green River were the most variable in size and shape of all the populations studied.

Among shells approximately 20 years old, the average total length was 151 mm in the Sandusky River, 136 mm in the Grand River, 128 mm in the Walhonding River, 121 mm in the Powell River, 121 mm in the Clinch River, 104 mm in the Kiamichi River, and 100 mm in the Green River.

Some of the difference in total length attained is due to differences in the shape of the shell of the three varieties, as illustrated in figure 1. *Actinonaias l. ligamentina* is relatively square, with a shorter length

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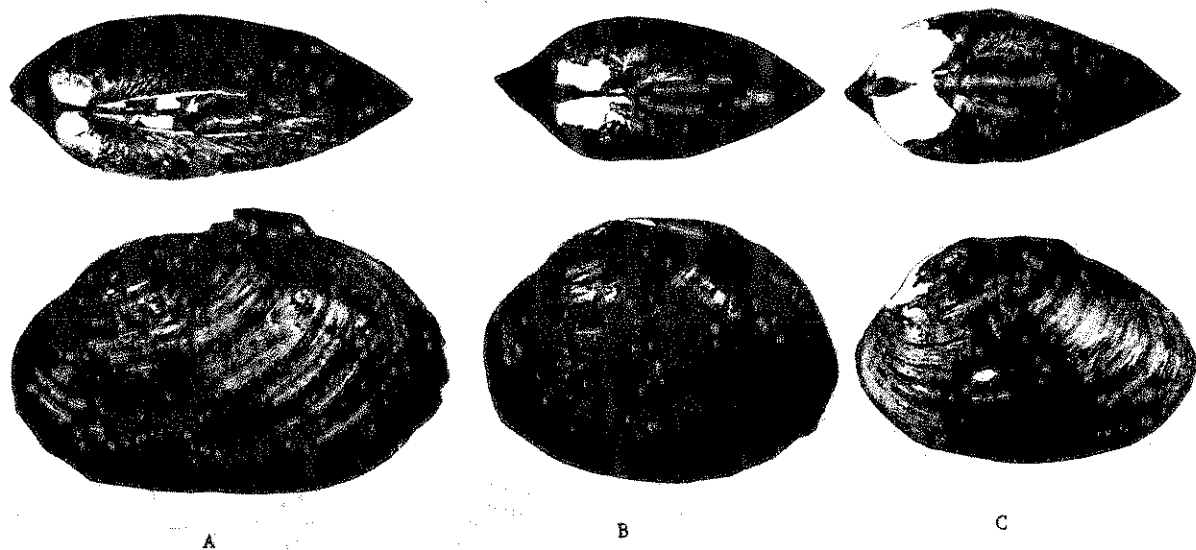


Figure 1. The Common Mucket, *Actinonaias ligamentina* (Lamarck)

- A = *A. l. carinata* (Barnes) OSUMZ catalogue number 10509.54 from the Grand River, Ontario. L = 138 mm, H = 77 mm, W = 53 mm, age = 18 years.
- B = *A. l. ligamentina* (Lamarck) OSUMZ catalogue number 16759.156 from the Clinch River, Tennessee. L = 105 mm, H = 75 mm, W = 45 mm, age = 13 years.
- C = *A. l. gibba* (Simpson) OSUMZ catalogue number 32825 collected alive from the Kiamichi River, Oklahoma. L = 106 mm, H = 67 mm, W = 47 mm, age = 12 years.

RIVER	AGE GROUP (MONTHS) (MOYERS)											
	1	2	3	4	5	6	7	8	9	10	11	12
GRAND (A. l. carinata)												
SANDUSKY (A. l. carinata)												
WALPOLE (A. l. carinata)												
GREEN (A. l. carinata)												
POWELL (A. l. ligamentina)												
CLINCH (A. l. ligamentina)												
KIAMICHI (A. l. gibba)												

Figure 2. Near Growth Rates of *Actinonaias ligamentina* (Lamarck) in Seven Rivers.

relative to the height (the dorsoventral dimension) when compared with the other two. *Actinonaias l. carinata* and *A. l. gibba* are about equally elongate.

Some of the difference in growth rates and total size attained is related to environmental conditions, especially the concentration of calcium and of bicarbonate. The most rapid growth rate occurs in the Sandusky River specimens of *A. l. carinata*, most of which were collected in one area, about one mile south of Upper Sandusky, Ohio. This is evidently a local environment with very favorable conditions for this species. The site is a run, downstream from several miles of alternate riffles and runs, with water from a few inches to about 4 ft deep. Stansbery (personal communication, 1973) reports that he has

never seen it dry or not flowing in over 40 years of observation. The current is moderate, and the bottom is coarse sand and gravel with some soft silt in the run and gravel and cobbles in the riffle. Each living naiad is about two-thirds buried in the gravel bottom areas. Water chemistry tests in September, 1972 (St. John, 1973) revealed calcium averaging 230 ppm and bicarbonate averaging 210 ppm. These calcium and bicarbonate levels were higher than those found in any of the other rivers studied. In the Green River, the calcium content, measured in June, 1971, averaged 76 ppm, and the bicarbonate content averaged 82 ppm. Radlinski (1972: 295) gave water chemistry for the Kiamichi River; calcium averaged 1.3 ppm and bicarbonate averaged 8.8 ppm.

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