

Killifishes of Nantucket

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Biogeography, the study of past and present distributions of organisms, is at once fascinating and confusing when applied to killifishes. The island of Nantucket, 35 km off the southeastern coast of Massachusetts, is of interest biogeographically because it lies on the transition zone from the relatively warm waters of the Virginia Province to the south, to the cold boreal waters of the Labrador Province to the north. For killifish this means that Nantucket is at the extreme northern limit for some species.

Five species of killifish are found in the waters of Nantucket: the mummichog, *Fundulus heteroclitus* (Fig. 1); the banded killifish, *F. diaphanus* (Fig. 2); the striped killifish, *F. majalis* (Figs. 3 and 4); the rainwater killifish, *Lucania parva*; and the sheepshead minnow or pupfish, *Cyprinodon variegatus* (Fig. 6). A sixth species, the spotfin killifish, *F. luciae* (Fig. 5), has been found in southeastern Massachusetts near Nantucket, which seems to define its northernmost range.

Five species of killifish is not an overwhelming species diversity compared to Florida or Texas, much less tropical areas of Africa and South America. What is interesting about the coexistence of these five species is how they are able to partition the available ecological niches so that they are not all in direct competition with each other. This partitioning basically runs along a gradient from deeper, saltier bay waters, through salt marshes and creek mouths, and finally to the higher, freshwater areas of creeks and ponds. All five of these species are capable of living in a fairly wide range of salinities, but each seems to have a preference within this range. This salinity preference reflects other preferences such as feeding and temperature and is useful as a broad descriptor of habitat.

The strongest preference for a marine environment is shown by the striped killifish. Scallopers who work in Nantucket Harbor tell me that striped killifish are one of their

more common incidental catches when they trawl in the middle of the Harbor. This water is typically about 28 parts per thousand (ppt) salinity, close to oceanic salinity of 35 ppt. The striped killifish is also found in salt marshes around the island.

On Nantucket the mummichog is by far the most common killifish, as is true on most of the Atlantic coast. They can be found in deeper waters of the Harbor but are most typical of salt marshes and the mouths of creeks. Mummichogs thrive in the harsh conditions of salt marshes, where they face strong, tidally induced swings in water temperature, salinity, turbidity, and dissolved oxygen. Freshwater tributaries of salt marsh creeks also often contain large mummichog populations.

The sheepshead minnow is as tolerant of fluctuating environmental conditions as the mummichog. On Nantucket the sheepshead is relatively uncommon, usually found only on the upper edges of salt marshes. In Folger's Marsh in Quaise, a morning's collecting will result in maybe five or six sheepsheads, while several hundred mummichogs would be collected. This relative rarity may be due to the position of Nantucket at the extreme northern edge of the sheepshead's range.

The status of the rainwater killifish on Nantucket is still unclear. This fish was not collected and identified on Nantucket until 1995, when I found them in Folger's Marsh in Quaise in the same area of the upper marsh as the sheepsheads. Rainwater killifish are common on both nearby Martha's Vineyard and the southern coast of Cape Cod, so their apparent absence on Nantucket was curious. Since finding them in Quaise I have also collected them on the other side of the island in a marsh in Madaket where they were very common. It is unclear whether they have been on Nantucket all along and escaped detection, or whether they are recent introductions through the agency of "bucket biologists" releasing unwanted bait fish. Both known locales

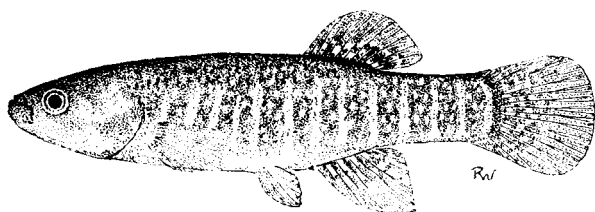


Fig. 1.

Mummichog, *Fundulus heteroclitus*, Toms River, NJ.

Illustration by Rudolf H. Wildekamp. © American Killifish Association.

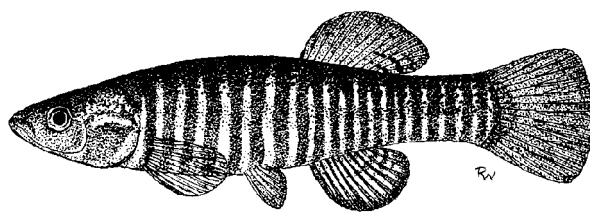


Fig. 2.

Banded killifish, *Fundulus diaphanus*, Toms River, NJ.

Illustration by Rudolf H. Wildekamp. © American Killifish Association.

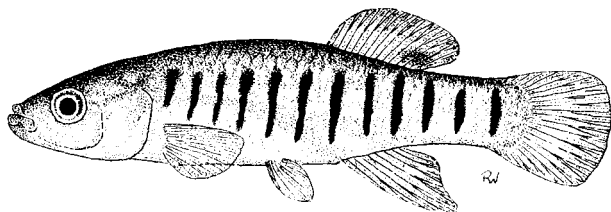


Fig. 3.

Striped killifish, *Fundulus majalis*, male, Beasley's Point, NJ.

Illustration by Rudolf H. Wildekamp. © American Killifish Association.

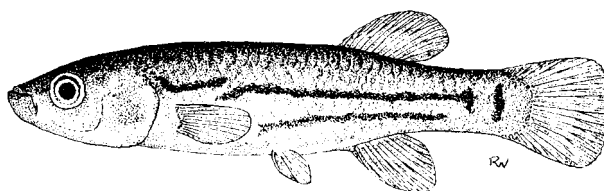


Fig. 4.

Striped killifish, *Fundulus majalis*, female, Toms River, NJ.

Illustration by Rudolf H. Wildekamp. © American Killifish Association.

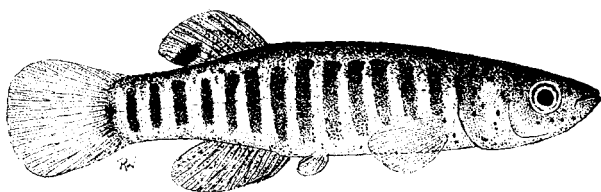


Fig. 5.

Spotfin killifish, *Fundulus luciae*, Wachapreague Creek, VA.

Illustration by Rudolf H. Wildekamp. © American Killifish Association.

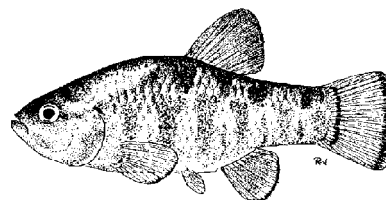


Fig. 6.

Sheepshead topminnow, *Cyprinodon variegatus*, Long Island Sound, NY.

Illustration by Rudolf H. Wildekamp. © American Killifish Association.

are at the upper ends of salt marshes, with an average salinity of about 8 ppt. This species thrives in a broad range of salinities from fresh to oceanic in the rest of its range, but like the sheepshead may be restricted in its habitat at the northern edge of its range. I plan further field collections to determine in which other locales on the island it might be found.

The fifth species, the banded killifish, is the least tolerant of salt water. Banded killifish are found across a wide range of the Atlantic drainage from Newfoundland to South Carolina, and as far west as the Mississippi primarily in fresh water. It's common in the same Madaket marshes where the rainwater killifish has been found, with 8 ppt appearing to be its upper salinity limit. In small bodies of freshwater on Nantucket such as Gibbs Pond, banded killifish are the only killie found to date; in Gibbs Pond the other known fish species are white perch (*Morone americana*), chain pickerel (*Esox americanus*) and swamp darters (*Etheostoma fusiforme fusiforme*).

One can find similar patterns of habitat partitioning among other groups of closely related fishes, or most other organisms for that matter. Nantucket is an interesting example because it's relatively small (roughly three miles wide by eight

miles long), has a variety of coastal aquatic habitats, and several of the species are at the northern edge of their range.

I tried to find *F. luciae* on Nantucket, Martha's Vineyard and Cape Cod in the summer of 1999 but was unsuccessful. The northern edge of the species' range seems to be tributaries of Narragansett Bay along the Rhode Island-Massachusetts border. The preferred habitat for *F. luciae* is very shallow fresh-to-brackish water at the far upper end of a tidal system. *F. luciae* could fit into an arguably open niche on Nantucket, but for whatever exact reason(s) the species is absent.

Note: The definitive source for information about the distribution of freshwater fishes of Massachusetts is the Massachusetts Freshwater Fish Project, with both an annotated list and identification key, on the Web at www.mcz.harvard.edu/fish, click on "Projects."

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