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# Virginia's Anadromous Fishes

By WILLIAM H. MASSMANN and ROBERT S. BAILEY

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**W**HEN icy winter nights grow shorter and the sun begins to warm land and water, the shad return. By silvery thousands, guided through instincts as yet unknown and propelled by powerful strokes, shad migrate from the sea to Virginia rivers to spawn as they have since before the days of man. The sea is the usual home of shad but to reproduce they must return to fresh water.

Steaming strong currents and passing enormous obstacles, such as fishing nets and polluted waters, the annual spawning migrations are accomplished. Most often adult shad return to the river in which they were hatched. After spawning, spent fish make their way back to sea, beyond reach of their greatest enemy—man. Here they feed and fatten in preparation for their migration the following year.

The eggs, broadcast and fertilized in fresh waters, soon hatch and the tiny shad resulting remain in the rivers until fall, feeding mainly on insects. As the water cools in autumn shad fingerlings, now about four inches long, move seaward, where they remain far offshore in ocean waters until they mature in from three to five years. Then, impelled by instincts, the long and hazardous spawning migration begins.

Shad, like river herrings, rockfish, white perch, sturgeon, and sea lamprey, are anadromous fishes—marine fishes that migrate to fresh water for spawning. The spawning migrations, which concentrate shad in our rivers, have been of great value to man. It has not been necessary to search in the ocean for them, but only to wait until the spawning runs begin and set nets to intercept these runs. Since colonial times great numbers of shad have been harvested each spring. In some cases, spawning stocks have been severely depleted. Fortunately, in Virginia, there is no evidence that shad runs have declined because of overfishing.

In some places dams have been built across rivers that these fish once ascended. Shad formerly penetrated to the head-

waters of the James and Rappahannock rivers for spawning. They are now blocked at Richmond and Falmouth. Fortunately, extensive shad spawning areas remain below these dams but some of these areas are badly polluted. Conditions in Virginia, however, do not approach those in the Delaware River where pollution has virtually destroyed the shad fishery. From 19 million pounds in 1896, commercial catches there have dropped to nothing in recent years.

Closely related to shad are the river herrings, which include the alewife, blue back or glut herring and hickory shad. Except for their smaller size, they closely resemble shad. Their distinguishing characteristics have been pointed out in a previous article (The shad in Virginia waters, by W. H. Massmann and Robert S. Bailey, *Virginia Wildlife*, Vol. XVII, No. 4, April 1956). River herrings not only look like shad but behave much like them.

The alewife has penetrated inland waters to the Great Lakes where a landlocked form has arisen. Anadromous fishes become landlocked when they no longer have access to the sea. Great Lakes alewives spend most of their lives in the Lakes, but for spawning they ascend tributary streams. Landlocked fishes do not generally grow as large as those that have access to the sea. In addition to the alewife, the salmon, smelt, sea lamprey, white perch, and recently rockfish have developed landlocked forms.

A spectacular representative of this anadromous group of fishes is the Atlantic sturgeon, which was formerly much more abundant than it is now. Although most of its life is spent in the sea, the sturgeon spawns in fresh water. Highly prized for roe, from which caviar is made, sturgeon sometimes reach a length of twelve feet and weigh up to 600 pounds. Although sturgeon have almost disappeared from Virginia waters, large individuals are sometimes captured. A 437-pound sturgeon was taken from the James River in December 1960



Commission Photos

Fisheries laboratory biologists tag shad to determine if enough spawners are reaching the breeding grounds so that shad fishermen (left) can be assured of a continuing supply of the fish they depend on for part of their livelihood. A small Atlantic sturgeon (center) is shown being held by State Waterfowl Refuge Supervisor W. H. Taylor. Rockfish (right) are more abundant in Chesapeake Bay than anywhere else in the United States. They are highly prized by both commercial and sports fishermen. The most usual weight is one to two pounds, though sportsmen take a number weighing well over 20 pounds. The illustration is from a painting of a rockfish by S. A. Kilbourn. This painting was made for the then United States Commission of Fish and Fisheries in 1878.

and one weighing 204 pounds was caught in May 1958. A 200-pound sturgeon, trapped in shallow water of the Rappahannock River near Falmouth, was captured with a lasso in August 1958.

The sea lamprey is an eel-like fish two to three feet in length whose mouth is a large sucking disk containing twelve rows of large, hooked teeth. The lamprey, a carnivorous parasite, feeds on other fishes. Clinging with its sucker-like mouth, the lamprey rasps a hole in the skin of its prey with its sharp teeth and sucks out the blood. The victim may be killed by such attacks, especially if the lamprey is large or if several individuals attack the same fish. Lampreys prey on shad, herring and a great variety of other fishes. Not a problem in their normal habitat, which is Atlantic coastal waters, sea lampreys made their way into the Great Lakes by way of the Welland Canal and are now blamed for the almost complete collapse of the once lucrative lake trout fishery.

Methods for controlling lampreys in the Great Lakes region have been based on their anadromous habits. Lampreys ascend the rivers and enter small streams for spawning. Circular nests two or three feet in diameter are constructed in gravelly areas by adults, who clear away the stones by carrying them with their mouths. When the eggs hatch the young lampreys drift to muddy sections of streams where they burrow into the bottom and remain for several years feeding on small aquatic animals. It is during this period of development that lamprey nursery areas are located and the young are killed by poisons which are toxic for larval lampreys but relatively harmless to other fishes. Although lamprey eradication is costly, it is necessary if the lake trout is to be restored.

The white perch is often called an anadromous fish, but is really a borderline case. Closely related to the more glamorous rockfish, white perch in our rivers spawn in fresh water but do not always migrate to salt water. Large individuals sometimes weighing a pound or more migrate downstream, but seldom venture into Chesapeake Bay. White perch have been stocked in many inland lakes where they reproduce successfully—in some cases so successfully that these lakes are soon overcrowded with large populations of stunted fish.

From the anglers' point of view, the rockfish, or striped bass, is king of anadromous fishes. The rockfish is a fighter that sometimes exceeds 50 pounds in weight. Although some rockfish undertake long migrations in Atlantic coastal waters,

most generally remain near the river in which they were hatched. The James, Rappahannock, Mattaponi and Pamunkey rivers include some of the most important rockfish spawning areas along the entire Atlantic coast.

Although dams are generally a serious problem for anadromous fishes, in some cases they have benefited rockfish and rockfish anglers. A dam constructed in the Santee-Cooper River, South Carolina, blocked rockfish from access to the sea. The fish trapped above the dam survived as a landlocked population, reproduced and afforded spectacular sport fishing. Biologists of the Virginia Commission of Game and Inland Fisheries have succeeded in establishing a population of landlocked rockfish in Kerr Reservoir where they have reproduced successfully for several years. These fish provide good fishing at present and the fishing should improve as the stocks increase.

There is now considerable demand for live rockfish to be stocked in other large reservoirs. Last summer several hundred small individuals captured in the Pamunkey River were airlifted to Kentucky Lake in Kentucky and Tennessee. It is hoped that these fish, along with others from North and South Carolina, will become established as another self-perpetuating, landlocked population. Should plants of this type meet with success, the great dams built on inland waters may be as helpful to rockfish and fishermen as those near coastal waters have been harmful.

The biology of shad, river herrings, striped bass and other anadromous fishes of such great importance for food and sport is still shrouded in mystery. We have yet to learn what forces impel them to make their migrations and how they are able to return to the streams in which they were born. We have learned, however, some of the harmful effects of civilization and must strive to take reasonable corrective action. In other cases we do not know what to do because possible effects of such contaminants as heat, radioactive wastes, detergents, herbicides and pesticides and of sublethal concentrations of industrial and domestic wastes are as yet not well known. Clearly what is needed is greater information on which to base future management activities. We must also attempt to adapt these fishes to great environmental changes that we are now making or vice versa. Fortunately life is tenacious and the fish have sometimes demonstrated an ability to help themselves.

# The Shad in Virginia Waters

By

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**S**UDDEN splashing shattered reflections of spring bloom in the still waters of the Chickahominy as large silvery fish streaked wildly near the surface, then stopped and broke the surface. A roe shad accompanied by several bucks was engaged in courtship and spawning. Driven from unknown ocean depths, the shad had arrived at their destination to deposit eggs in the same river in which they had been born.

The shad run in Virginia tidal rivers has persisted for centuries. Even before primitive man inhabited the

coastal plains these splendid fish were returning to the fresh waters annually to lay their eggs. And now, though great stretches of the headwaters of these rivers have been blocked by dams and portions of the remaining areas are rendered uninhabitable by pollution, shad still return to favorable locations in great numbers. Though generations of fishermen have harvested vast quantities, the shad still enter Chesapeake Bay by the hundreds of thousands each year.

Angling for shad, an unusual sport in the past, has