

A FISH COMMUNITY IN A THERMAL DISCHARGE

by William R. Kenney

Thermal discharges due to the operation of power plants and other facilities are becoming a common component of the aquatic ecosystem. Studies of the effects of such discharges on fish populations abound in the scientific literature, and these effects need no further documentation here; however, these sites often provide unique habitat situations and therefore are of potential interest to the native-fish enthusiast. A description of the fish community of one such site with which I am familiar therefore seems warranted.

New England Site

The discharge point of the Western Massachusetts Electric Company has been the location of many of my collection trips over the past five years. During this period of time, I have collected twenty-six species of fish there, and have had reliably reported to me at least two more. To the native-fish enthusiast familiar with more southern waters, this may not seem like so many; but to put this figure into perspective, let me point out that only fifty-one species have been recently reported from the Connecticut River drainage in Massachusetts. Included in this total are many restricted by their habitat requirements to smaller bodies of water; others are of extremely limited distribution in Massachusetts.

The site is located on the west bank of the Connecticut River at the boundary between West Springfield and Agawam, Mass. A local sportsmen's club owns it. The club maintains a large parking lot and a boat-launching ramp, both of which are kept open to the public. Despite its proximity to a major population center, and its ease of access via a major highway, the site is remarkably little used.

The Connecticut River at this point flows from north to south and is about 400 meters wide. The channel, about four or five meters deep, is located adjacent to the opposite bank. Upstream of the discharge point, there is an extensive shallow mudflat which is unsuitable for wading. An extensive shallow gravel bed occupies the river bottom for the next 150 meters downstream, starting at the discharge point. Water level over this gravelly area varies with the height of the river, but in all but flood stage this area is accessible to a person in waders. Immediately downstream from this gravel bed is the launching ramp for the convenience of people launching boats. Below the ramp, the river bottom again becomes muddy, and is somewhat deeper than the mudflat above the discharge point. Thus, a number of diverse habitats

THERMAL DISCHARGES, cont'd

is available to the fish community in a very limited geographical area.

The composition of the fish population here varies drastically in numbers of species and of individuals--with water level, water temperature, season, and time of day. Other, unidentified variables also cause fluctuation in the fish population. Whereas I have on occasion collected as many as twelve species of fish in a single seine haul, on other days not a single species could be brought to hand. On some occasions, so many fish were taken that it was necessary to release over two-thirds of the catch before the thousands remaining could be sorted.

Cyprinids

The most abundant resident species in the river is the Spottail Shiner (Notropis hudsonius). This species moves inshore to the collectable portions of the site in winter, apparently responding to rising water levels. It remains there until its breeding season in spring. The adults subsequently abandon the collection site for some unknown locality. They are rarely seen again until the next winter, except during periods of rapidly rising water after heavy rains. Their offspring, however, become visible in large schools beginning in May or so; by June, I have seen them in schools a quarter of a mile long, containing millions of individuals; by July and August, these schools have broken up into smaller groups; and by September, the young--by now almost two inches long--have abandoned the shallows. Spottail Shiner movement seems to be controlled by season and by water level, rather than by time of day or by temperature.

When Spottails are most numerous, they may be accompanied by a few individuals of other cyprinid species, such as Common Shiners (Notropis cornutus), Golden Shiners (Notemigonus chrysoleucas), and Fallfish (Semotilus corporalis). Superficially, the discharge point is not ideal habitat for these species; they do not occur there in the numbers that the Spottails do.

One large introduced cyprinid, the Common Carp (Cyprinus carpio), seems attracted to the warm waters of the discharge, especially in winter. This is a favorite locality of those few area anglers who purposely seek carp, and carp are often snagged by anglers seeking other species. The fact that small carp are rarely seen here suggests that this species probably breeds elsewhere.

The Game Fish

THERMAL DISCHARGES, cont'd

Following the cyprinids are a host of predatory species such as the Yellow Perch (Perca flavescens), the White Perch (Morone americana), and seven species of centrarchids. Half-grown Largemouth Bass (Micropterus salmoides) and Smallmouth Bass (M. dolomieu) hover about the discharge point during summer to feed upon juvenile Spottails which have been immobilized by the thermal shock of entering the heated effluent. These predators are more immune to such temperature changes. The Yellow Perch, the White Perch, and Black Crappie (Pomoxis nigromaculatus) may follow the schools of adult Spottails into the pit at the base of the ramp during the winter, and may be abundant during periods when the Spottails are most numerous. On one occasion, several White Crappies (Pomoxis annularis), rare in Massachusetts, were found mixed with a large school of Black Crappies. White Perch tend to be seen during morning hours. Young White Perch and Black Crappies may be seen, but young Yellow Perch seldom are, indicating that the young of this species are not syntopic with the adults.

Three species of the genus Lepomis, or sunfishes, seem to breed in this area. These are the Bluegill (Lepomis macrochirus), the Pumpkinseed (L. gibbosus), and the Redbreast Sunfish (L. auritus). Nests are not generally seen, but the young are increasingly visible through the summer and into early fall, as are those of the Largemouth and Smallmouth Bass. Sunfish adults may remain in the area all summer to feed on young shiners. On one occasion, a juvenile Rock Bass (Ambloplites rupestris) was taken along with the sunfishes, but I have seen no adults of this species within a mile or so of this spot.

Herrings

Three species of herrings--the American Shad (Alosa sapidissima), the Alewife (A. pseudoharengus), and the Blueback Herring (A. aestivalis) are anadromous in the river. Young of these are found as larvae as early as June, and take a more recognizable form by late summer. They make their downstream migration in September and October. While in the area of the discharge, the fragile young avoid the hot surface layers. Adults, too, avoid the area of the plume during their migration, by keeping to the channel at the far edge of the river.

Other Species

Another forage species which may be nearly as abundant at times as the Spottail Shiner is the White Sucker (Catostomus commersoni). Adult suckers may accompany carp in seeking the warmer waters of the discharge in winter, or young suckers may be present with the larger Spottails during periods of high water.

THERMAL DISCHARGES, cont'd

In winter, large Northern Pike (Esox lucius) may be found in the pit at the launching ramp. Here they await larger prey species. The pike are not seen at other times of the year.

At night, two catfishes--the Channel Catfish (Ictalurus punctatus) and the Brown Bullhead (I. nebulosus) make their appearance, frequently accompanied by the American Eel (Anguilla rostrata). These are readily caught by anglers downstream of the boat-launching ramp. The eel may in fact be encountered during the day as well, but bites more readily at night. The catfishes are rarely active during daylight except during periods of very turbid water. The catfishes seem most active during the warmer months, whereas the eel can be brought to hand at almost any time of year.

Perhaps the most unusual fish--or fishlike vertebrate, if you prefer--to use this site is the Sea Lamprey (Petromyzon marinus). I have found its larvae here but do not know whether they were on their feeding grounds or merely in migration

Many of the above species can be successfully maintained in the home aquarium, but the two that follow are my favorite local species. These are the Banded Killifish (Fundulus diaphanus) and the Tesselated Darter (Etheostoma olmstedii). The killifish occurs here sporadically, mixed with schools of Spottail Shiners, but is more numerous in some of the area ponds. The darter can be collected here almost predictably, but never in abundance. It is a bleak collecting trip that fails to yield a darter. Such trips usually fail to yield a single fish of any species.

Worth Checking Out

From the above discussion, the reader can see that a thermal discharge is not necessarily detrimental to local fish populations; in fact, it may create an "edge effect" or act as an attractant to fishes. Take the time to check out any thermal effluent in your locality; you may find an equally interesting fish community. If you don't on the first try, persist. Remember the fluctuating nature of fish populations in such an environment.