Insects and Their Relationship With Fish

V.P. Uniyal
High Altitude Zoology Field Station
Solan (H.P.)
173 212 INDIA

By virtue of great diversity in structure, habits and distribution, insects come in contact with almost all groups of organisms (except those which inhabit the sea). Many relationships between insects and fish have arisen over time, and it is worth considering the important economic implications of these associations. A vast majority of the fish could hardly exist without the benifit of abundant insect forage to feed them.

Fish inhabiting the oceans do not utilize insects as primary components of their diets as insects are poorly represented there. Anadromus fish which live in fresh water during a part of their life cycle depend almost entirely on insects as food. Some estuarine fish also devour insects. However, it is the freshwater fish which make the maximum utilization of insects in their diets. The relationship between a population of insects and a population of fish may be direct or indirect. Aquatic insects may be utilized as food by certain fish during the early part of their lives; as they get older their dietary requirements may change. For example, the large-mouth black bass eats insects until it is about 4 inches in length. After that, small fish are sought as a food source.

Streams have a variety and abundance of aquatic insects. Trout subsist on these; however they also depend on terrestrial insects that fall into the water. The stomach contents of such stream-inhabiting fish usually contain stoneflies, beetles, bugs, mayflies, caddisflies, and nymphs of dragonflies and damselflies.

The stomach contents of forage fish (like minnows, dace, roaches, chubs, blackfish, squawfish and shiners) include insect matter as the primary component. A few other non-game fish (such as suckers, sticklebacks and sculpins) also feed upon insects to a varying degree. Bluegills, at times, have had 90% of their stomach contents composed of insect matter. Other spiney-rayed fish like the black crappie, long-eared sunfish, rockbass, and large-mouthed bass feed voraciously on insects. Other stream-dwelling fish such as sturgeon, suckers, whitefish and cisco use insects as a dietary staple. These diets vary from place to place and from time to time, but almost any given population of freshwater fish would starve or be forced to adapt to other types of food if they were deprived of insects as a food source.

Some insects, especially members of Coleoptera, Hemiptera and Odonata have habits of viciously attacking and feeding upon fish. Among the best known of the fish feeding insects are certain aquatic beetles and giant water bugs. Some carnivorous beetles in the families Dytiscidae, Hydrophilidae

and Gyrinidae are destructive by feeding on fish spawn. Cybister confusus, C. rufipes and Eretes stictus pose a special threat to fish spawn and fry. Larvae of Sternolophus rufipes, a scavenger beetle of the family Hydrophilidae, habitually feeds on fish spawn. Members of the genus Dinuetes (Gyrinidae) are known to surround and subdue fish, even when there is an abundance of other more easily obtained food. Fish culturists attempt to keep their ponds free of these predators.

The true water bugs also rank high in their predation of fish. These insects attack their prey and use their piercing-sucking mouthparts to remove the body fluids. Fifth instar nymphs of the backswimmer Anisops bouveri are renowned for their attacks on young fish. Their relatives, the "toe-biters", are also well known for thier ability to overpower young fish. Four inch giant water bugs have been known to feed upon 12 inch trout. The attacks of Belostomata and Lethocerus account for the mortality of numerous fish species in nature. The waterscorpion, Laccotrephes griseus, eats fish fry. Similarly, Ranatra elongata is a predator of carp spawn and fry. The water bugs secrete a toxic saliva that kills the prey.

The dragonflies and damselflies have also been incriminated as predators of small fish. The nymphs of large Aeschna spp. and Anax spp. are notorious. Certain immature caddisflies attack fish and kill them. The net-spinning larvae of these predaceous insects snare and entangle the fry of trout and salmon. Not until the fish have attained a size large enough to prevent entanglement do they get relief from these larvae.

Growth of obnoxious aquatic insects can be checked by the introduction of certain fish into waters in which the insects breed. Mosquitoes have been, and continue to be, controlled in the larval and pupal stages by this method. Gnats have been controlled by the introduction of fish into the infested waters. This procedure is an indispensible part of mosquito abatement programs in many tropical areas of the world.

Two families of fish, Poeciliidae and Cyprinodontidae, are well adapted for this purpose and have been extensively used for control of mosquito larvae. Gambusia rates foremost amongst these and there is probably no area of the world where this fish has not been tried for abatement purposes. Some other fish of importance in this connection are Lebistes, Molliensia, Poecilia and Heterandria. Fundulus, Rivulus and Cyprinodon, members of the family Cyprinodontidae (killi-fishes), have also been used extensively for killing mosquito larvae. Other fish of comparatively less importance in this respect are Oryzias, Aplocheilus, Aphanius, Horaichthys, Pygidium and Carassius. All these fish have short life cycles, small adult size, large fecundity and surface feeding habits. Also, the ease in their distribution makes them readily useable. Some other fish species like Dania, Rasbora, Esomus and Amblypharyngodon can also be utilized for mosquito control because of their larvivorous habits.