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The Parasite *Clinostomum marginatum* in Four Centrarchids, in California Ranch Ponds

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The parasite *Clinostomum marginatum,* commonly called the "yellow grub" infection of fishes infested 45.3 percent of 2293 fish collected from six out of eight foothill ranch ponds in central California, Madera County. By species of fish, the occurrence of the parasite was as follows: Green sunfish (*Lepomis cyanellus*), 76.5 percent; largemouth bass (*Micropterus salmoides*) 50.7 percent; bluegill (*Lepomis macrochirus*), 33.9 percent; and redear sunfish (*Lepomis microlophus*), 0 percent. Thus, the parasite is common in central California as well as previously reported in northern and southern California.

Oxford: 145.1 Clinostomum marginatum (794): 151.352.
Retrieval Terms: sunfish; Madera County; California; parasitic infection.

In an effort to increase our understanding of the annual range ecosystem, study objectives were broadened in 1972 to include baseline estimates of fish production in foothill ranch ponds. In February 1973, we started field investigations to determine growth rates of several fish species commonly stocked in foothill ranch ponds, in Madera County, California. Growth rates are being compiled by using recapture data from tagged fish. Since a large number of fish were being handled in this study, we took advantage of the opportunity to quantify the infestation of several species of fish by the parasite *Clinostomum marginatum* (Trematoda:Clinostomatidae)[1] under central California foothill pond conditions. This parasite, the "yellow grub," infects many fish species in northern California[2] and southern California[3] including members of the Centrarchid, Ictalurid, Salmonid, Catostomid, Clupeid, and Cyprinid families. Information on the fish parasites found in central California is scant.

In the process of obtaining fish for tagging, we visually inspected fish from eight ponds for presence or absence of *Clinostomum marginatum*. Two ponds stocked initially in 1973 provided the opportunity to check largemouth bass (*Micropterus salmoides* Lacepede) and bluegill (*Lepomis macrochirus* Rafinesque) progeny for the incidence of yellow grub infection.

LIFE CYCLE

The life cycle of the yellow grub consists of two intermediate hosts and a definitive host. Eggs hatch in the water and the miracidium invades the foot of snails (*Helisoma* spp.). The cercaria leaves the snail and encysts in the muscle and connective tissue of many fresh-water fish species. The metacercarial stage

that is then formed is referred to as the yellow grub. The encysted metacercaria appears as a yellow, slightly oval spot generally 3 to 6 mm long. Common locations for metacercariae are in the caudal, dorsal, and pectoral fins; on the inside surface of the operculum; and in the flesh. The adult trematode is found in the mouth and esophagus of herons and other fish-eating birds.[4]

METHODS

As part of the tagging procedure, we visually inspected fish for the presence of the yellow grub. The inspection consisted of back-lighting the fish to inspect the fins and flesh; if no parasites were seen in these areas, the mouth and gills were searched. The time fish were out of the water for tagging purposes and parasite inspection obviously had to be minimal.

Poor light conditions existing at dusk or on cloudy days undoubtedly resulted in some parasites being missed; thus, the results reported here should be considered as the minimal incidence. The presence or absence of parasites was recorded for each fish.

RESULTS AND DISCUSSION

Green sunfish (*Lepomis cyanellus* Rafinesque) had the highest incidence of yellow grub infection of all species in this study. Fifty-one green sunfish from two ponds had an incidence of 76.5 percent (*table 1*). Our field observations at many different ponds in Madera County confirm the high incidence in this species.

The yellow grub was recorded in 778 of 1534 largemouth bass examined. The incidence in bass was 50.7 percent. The overall incidence of yellow grubs in 655 bluegills collected was 33.9 percent.

Yellow grubs were not detected in the 53 redear sunfish (*Lepomis microlophus* Gunther) examined. Although not reported in California, the yellow grub is known to infect redear in southern Florida.[5] These adult redear were tagged and released into a pond containing parasitized largemouth bass. Further observation will determine if and how rapidly the redear and their progeny become infested.

Two ponds that had gone dry in 1972 but had refilled were stocked from a common source with adult bass averaging 218 mm fork length in February and March of 1973. Young-of-the-year from these adult bass were first seen in late April and early May 1973. As the young fish were captured and tagged, the incidence of parasitism was recorded. In one pond, the young bass had a parasite incidence of 7.9 percent—far below that of adults (*table 2*). Young bass in the other pond had a parasite incidence slightly higher than that of adults.

Table 1. *Incidence of* Clinostomum marginatum *in four species of fish in ranch ponds, Madera County, California*

Fish species and pond	Fish examined	Fish infected	Incidence of parasitism
			(Percent)
Green sunfish (two ponds)	51	39	76.5
Largemouth Bass (six ponds)	1534	778	50.7
Bluegill (four ponds)	655	222	33.9
Redear Sunfish (two ponds)	53	0	0.0
Total (eight ponds)	2293	1039	45.3

Table 2. *Incidence of* Clinostomum marginatum *in adult largemouth bass and their progeny in two ranch ponds, Madera County, California*

Pond and age of fish	Fish examined	Fish infected	Incidence of parasitism
			(Percent)
Pond 1:			
Adult	66	25	37.9
Progeny	63	5	7.9
Pond 2:			
Adult	88	28	31.8
Progeny	174	74	42.5

Parasitized adult bluegill were stocked in one pond in 1973, and they reproduced abundantly the first year. More than 200 of the bluegill progeny were captured and tagged when they were about 1 year old. The incidence of yellow grub in the young bluegill (19.6 percent) was much less than for the adults (53.1 percent). Results from the two newly-stocked ponds in this study generally agree with Miller's findings[6] that young fish had a lower incidence of parasitism.

In checking for the parasites, we found no obvious effects of even a large number of yellow grubs on the condition of 2293 fish examined. Our observations are similar to those from a study on yellow perch

(*Perca flavescens*)[7] which showed no correlation between the large numbers of *C. marginatum* present on the fish and the condition factor of the fish.

The overall incidence of *Clinostomum marginatum* in 2293 fish inspected was 45.3 percent. Parasitized fish were collected from six out of eight ponds. These results document, for the first time, the widespread occurrence of yellow grub infection in fish found in ranch ponds in central California.

NOTES

[1] We are indebted to Dr. Wallace M. Harmon, California State University, Fresno, for his assistance in identifying the parasite.

[2] Haderlie, E. C. 1953. *Parasites of freshwater fishes of northern California.* Univ. Calif. Publ. Zool. 57:303-440.

[3] Miller, R. L., A. C. Olson, Jr., and L. W. Miller. 1973. *Fish parasites occurring in thirteen southern California reservoirs.* Calif. Fish and Game 59(3):196-206.

[4] Schell, S. C. 1970. *The trematodes.* 355 p. Wm. C. Brown Co., Dubuque, Iowa.

[5] Bangham, R. V. 1939. *Parasites of Centrachidae from southern Florida.* Trans. Amer. Fish. Soc. 68:263-268.

[6] Miller, L. W. 1967. *A heavy infestation of the Threadfin Shad, Dorsoma petenense, by the yellow grub, Clinostomum marginatum, in El Capitan Reservoir, San Diego County, California.* Calif. Fish and Game 53(4):293-295.

[7] Elliott, A. M., and L. R. Russert. 1949. *Some condition characteristics of a Yellow Perch population heavily parasitized by Clinostomum marginatum.* J. Parasitol. 35 (2): 183-190.

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