A **Crayfish Inventory of Six Bodies of Water**

Prepared for Montana Department of Fish. Wildlife. and Parks

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July 29, 1988

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Introduction

In July. 1988. the Montana Department of Fish. Wildlife. and Parks. (Department) contracted OEA Research. a Helena. Montana. consulting company. to provide information on crayfish in 6 bodies of water in Montana. These were Seeley Lake. the Clark Fork River near Superior. Lake Mary Ronan. and Echo Lake on the west slope of the continental divide. On the east slope, the lakes selected were Pisp~kun Reservoir and La...1.ce Elwell (Tiber Reservoir). The basic biological .information gathered on thesepoptilations included species. length. and numbers of crayfish trapped during one night. Additional information included a review. of literature and consultation with experts on crayfish. and a report presenting the findings. The information was gathered to assist the Department in determining whether or not crayfish are non-game species in need of management in Montana. The Department. presently has no regulations on harvesting of crayfish and there are no seasons. There is a. concern among many sportsmen that a commercial crayfishery will have a negative impact on the sport fishery. At present. there is little information available on crayfish. in Montana upon which to make any recommendations or to create any regulations.

Literature Review and Consultation

Crayfish are found worldwide. and over 250 species and subspecies are known to occur in North America (Avault 1973; Hobbs 1972). In the taxonomic world of crayfish there has been a certain amount of lumping and splitting. There doesn't seem to be a very recent body of literature pertaining to taxonomy of crayfish, but in the early 1970's. several authors seemed to agree that in North America most crayfish can be placed in one of five to nine genera. Avault (1973) lists five genera: P acifas ticus. Procambarus, Cambarus. Orconectes, and Cambarellus. Hobbs (1972) adds

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In Hobbs' crayfish key prepared for the Environmental Protection Agency (1972), he suggests that in Montana, crayfish fall into either the genus Pacifasticus or genus Orconectes. There seems to be some question as to the species found in Montana. Hobbs' key (1972) indicates that there is one species of Pacifastacus (gambellill, and one species of Orconectes (virilis) found in Montana. However. in identification of some collections from Montana (Gould 1988), it is suggested that Hobbs found O. virills. O. immunis. and P. leniusculus.

There seems to be an understanding among the experts (Hobbs 1972; Abrahamsson 1973; Goldman 1973; Pennak 1953; Momot 1988) that although there are many environmental factors influencing the survival, health. and growth rate of crayfish. temperature. food supply, high oxygen

level, lack of pollution, and population density may be the most important.

In the northern latitudes (such as Sweden), production' aIld weight gain in crayfish increas'ed in waters where the temperature averaged over 15 degrees centigrade for the sumniermo~1?s (Abrahamsson 1973).

Crayfish are omnivorous and will consume a variety of organic materials (Goldman 1973). They are seldom predatory and eat an abundfu'"1Ce of
, succulent aquatic vegetation. Meat is usually only a minor portion of the diet, and when it is eaten, it is preferred fresh rather than stale or rotten (Pennak 1953) .

,Crayfish prefer oligotrophic to mesotrophic waters because of their low tolerance to decreased Levels of oxygen (Goldman 1973). 'Where eutrophication has begun to occur at a level which serVes to fertilize waters and create richer habitats without too much oxygen depletipn, crayfish abound.

In the northern latitudes where lake temperatures may be too cold at depths below 20 or 30 feet, or where vegetation doesn't get enough light below those depths, crayfish probably won't exist in great numbers. Forage availability, temperature, and oxygen levels, are probably too low at the greater depths to be ideal habitat. On the other hand, in water which is too warm, too fertile, too shallow, and consequently too low in oxygen, crayfish 'will also not do well.

Population growth of crayfish seems to be self-regulatihg and density dependent. When harvest of crayfish occurs (even without regard to size class) production is stimulated (Momot 1988).. In a 7 -generation study on lakes in Ontario, where as many traps as 200/hectare have been used and all s.izeclasses .were removed~ Maillot found that the populaUon of crayfish
tripled:, He discovered that ,it .'Yas.. not possible '. to overfish.. the population,
-ana-tliatkilTIiig females '(smaller 'size crasses) , sfiriiulafed" pr6diiCtion among" the remaining females. The net result ofa no-size harvest limit was not only an increase in population, but a slight decrease in overall size of crayfish. This may not sound good to a commercial crayfisher, but because most bass and trout prey on the smaller (1 inch t02 inch) size classes, more are available of this size;

Dr. Momot (personal communication) recommended that if regulations are imposed, the season should be timed to coincide with post-hatching of young crayfish, and trapping should be limited to stationary traps. Momot suggested that commercial fishing for crayfish could not have a negative
impact on the sport fishing as long as trapping (and not trawling) is the technique employed. This evaluation is based on the premise that as the larger, commercially marketable sizes become harder to find, the fishermen

will move on and rest the water.

Field Methods

Prior to initiating the field effort, 6 crayfish traps were borrowed from Montana Department of Health and Environmental Sciences - Water Quality Bureau. Fifteen additional traps were constructed at OEA Research. The traps. were made from 1/2 inch mesh hardware cloth held together by small hog rings in the form of a cylinder 2 feet long and 1 foot in diameter.
Open-topped cones were attached to each end of the cylinder with the cone tops pointing inward. A door on the side of each trap permitted access to remove crayfish.

Ten traps were baited and placed in each body of water for one night and pulled the following day (16 to 20 hours after setting). The bait used was kokanee salmon, rainbow, or brown trout provided by the Department. Salmonids were used at the recommendation of Mr. Tim Swant who is conducting trapping efforts on Noxon Reservoir for Washington Water and Power Company. Twenty-five feet of nylon rope was attached to each trap.
Traps were tied to shore or weed beds and dropped in water from 12 inches to 8 feet deep. Locations of traps were generally at least 50 yards apart, and usually based upon availability of a tie-off.

Traps were placed in Seeley Lake on the east shore within 1/2 mile of the Big Larch Campground boat access at 4:00 p.m. on July 23, 1988. The water varied from 18 inches to 4 feet deep and was very turbid because of a muddy bottom and a great deal of motor boat acti"!ty.

Traps at Echo Lake were set at 8:00 p.m. on July 23, 1988, along the northwest shore within 1/2 mile of the Echo Lake Resort boat access. The water varied from 1 foot to 7 feet deep over a mud and weed bottom.

Traps at Lake Mary Ronan were set at 4:30 p.m. on July 24, 1988, on the east shore within 1/2 mile of the Department boat access. The water was between 5 and 8 feet deep over a cobble bottom and was fairly clear.

Traps in the Clark Fork River were set at 8:00 p.m. on July 24, 1988, along the right bank approximately 1.5 miles downstream from the Dry Creek boat access and about 6 miles downstream from Superior. Water depth ranged from about 1 foot deep in riffled areas to 4 feet deep in a backwater. The river substrate was cobble. The water was fairly clear with the exception of a

large amount of floating periphyton.

Traps in Pishkun Reservoir were set at 4:00 p.m. on July 26, 1988, along the northeast shore within about 1/2 mile of where the road from Choteau first approaches the lake. Water depth ranged from 4 feet to 7 feet over a cobble and gravel bottom. The water was clear and free of vegetation.
Traps in Tiber Reservoir were set at 7: 00 p.m. on July 26, 1988, along the southeast shore of the lake within 1/2 mile of the VFWCampground boat access, and adjacent to the south edge of the dam. Water depth ranged from about 2 feet to 8 feet over a mud bottom. Vegetative growth on the bottom occurred in several trap locations, and the water was fairly turbid.

Results

Table 1 displays the traping results for each body of water by size class of crayfish. Not enough crayfish were trapped in the Clark Fork and Seeley
Lake to indicate a size class trend. In the other locations, however, most crayfish trapped ranged in the 3 inch to 3 3/4 inch category. Most of these were shorter than the commercial cutoff of35/8inches. Tiber and Pishkun Reservoirs had significant populations in the 2 3/4 inch t03 1/4 inch categories, and not many in the commercially harvestable size range.

It should be noted that (according to Dr. Momot) trapping .generally selects the larger, more aggressive size class in whatever body of water is trapped.

Several specimens of crayfish from each body of water were saved for identification. Species identification will be accomplished during the summer of 1988. Alcohol preserved specimens will be sent to an expert acceptable to .the Department.

Table 1. Size distribution of crayfish caught at 6 locations in Montana during July, 1988 *

Size in inches	Clark Fork	Seeley Lake	Tiber Res.	Echo Lake	Pishkun Res.	Lake Mary Ronan
2	0	0	0	0	0	0
2 1/8	0	0	0	0	0	9«1)
2 1/4	0	0	1«1)	0	0	19(3)
23/8	0	0	2(1)	0	1«1)	25(5)
2 1/2	0	0	7(4)	0	8(5)	58 (11)
25/8	0	0	6(7)	1(2)	9(9)	62(17)
23/4	0	0	17(14)	0(2)	14 (1 7)	65(24)
27/8	0	0	25(24)	0(2)	20 (2 7)	55 (29)
3	0	1 (20)	45(43)	1(5)	60(58)	69(36)
3 1/8	0	0	33(57)	1 (7)	31(75)	69(43)
3 1/4	0	1(40)	28(69)	2(12)	19(85)	89(52)
33/8	0	0	23(79)	2(1 6)	19(95)	118(64)
3 1/2	1(25)*'* 1(60)		24(89)	16(53)	7(98)	164(80)
	this line marks the commerciallv marketable cutoff.					\
						133(931
35/8	0	0	16(95)	6(67)	2 (99)	
33/4	0	1(80)	9(99)	11 (93)	1{l00)	60
37/8	1 (50)	1 (100)	1 (99)	3(100)	0	6(99)
4	0	0	1(1 00)	0	0	1 (100)
4 1/8	0	0	0	0	0	0
4: *17Ll*-.-	..T(7Sr-- 0----		0	0.....-	0	0.-
43/8	0	0	0	0	0	0
4 1/2	0	0	0	0	0	0
45/8	0	0	0	0	0	0
43/4	0	0	0	0	0	0
47/8	1(1 00)	0	0	0	0	0
Totals	4	5	**238**	**43**	**191 *****	**1002**

* Ten traps at each location for one night except at Echo Lake, where only 5 traps were pulled and counted (five were vandalized)

** numbers in parentheses indicate cummulative percentages

*** 191 crayfish were measured out of 579 which were caught

Discussion

The results of the trapping effort show an incredible range of success. Not all of the differences are necessarily due to quality of crayfish habitat or presence of crayfish in the bodies of water trapped. It is important to remember that only ten traps were placed out for one night. Also,these traps were placed within 1/2 mile of easy access at a public boat ramp, which may have inadvertently put the traps in some of the best or worst habitat available in a given body of water. Five traps in Echo Lake were vandalized. Several traps in the Clark Fork River were clogged with floating periphyton.

Based on the literature descriptions of ideal habitat (mixed-size cobble substrate, clear water over 15 degrees C with aquatic vegetation), Lake Mary Ronan appeared to rank the highest, followed by Pishkun, the. Clark Fork River, Echo Lake, Seeley Lake, and Tiber.

Reports from Seeley Lake and the Clark Fork River by fishermen indicate that these waters may be better for crayfish than the results of this inventory show. Portions of the west shore of Seeley Lake appeared to be rockier, and may have a bottom surface (substrate) more acceptable to crayfish than on the east shore where trapping took place. Selection of trapping locations in the Clark Fork where current and periphyton don't interfere with trapping
may enhance the results.

Other areas of Pishkun and Tiber should be trapped to better assess the size classes of crayfish in these waters. If there are more crayfish available in the large size classes in other portions of these reservoirs, these bodies of water could be good for commercial crayfishing.

Further studies should be done to determine the presence of a marketable
volume arid .sizeelass ofcrayffsh-ln Montana waters. Basedonlliisvery preliminary glance at 6 bodies of water, there seem to be good numbers in some areas, but not very many in the large size classes.

If it is determined that commercial fishing is here to stay in Montana, limited regulations should probably be imposed. As Dr. MOillot suggested, the most critical elements of a regulatory system may be to set a season and restrict trapping to stationary traps.

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