THE LONGNOSED DACE, RHINICHTHYS CATARACTAE, IN WISCONSIN AND WYOMING WATERS

--Dr. Robert R. Miller

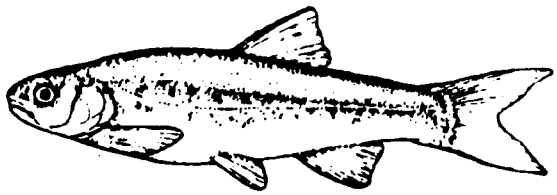
The longnose dace ranges from British Columbia in the west to Newfoundland in the east, south to Pennsylvania and Oregon, and down the Appalachian Mountains to South Carolina and the Rockies to New Mexico and west Texas (Trautman, 1957). The longnose dace is present on both sides of the Continental Divide in Wyoming and is one of the most widely distributed of the western fishes (Simon, 1951). The longnose dace is confined to the streams in the northern half of Wisconsin (Green, 1935).

The longnose dace was the third most abundant cyprinid collected in this study. It is considered an excellent forage fish in waters which contain game fish. Life history studies of this species have been conducted by Becker (1962) in Wisconsin, Kuehn (1949) in Minnesota, and Reed (1959) in Pennsylvania. Gee and Northcote (1963) and Gerald (1966) investigated the feeding habits of the longnose dace.

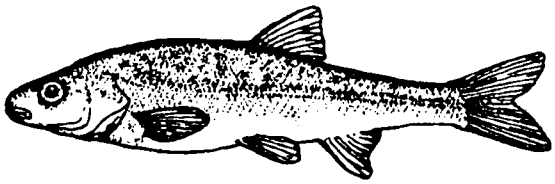
Area of Study

As part of the field investigations reported here, intensive studies of longnose dace were conducted from December 1967 to August 1970, and in July 1975, in Sand Creek and Laramie River, Albany County, Wyoming. Additional studies in Wisconsin were conducted from March 1971 through July 1979 in Mill Creek and Plover River, Portage County; Tomorrow River, Portage and Waupaca Counties; Marengo River, Bayfield and Ashland Counties. Laboratory aquaria investigations were conducted periodically from 1967 through 1978.

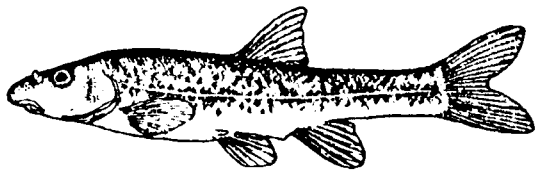
MIDDLE COLORADO SPINEDACE,
Lepidomeda mollispinis Miller and Hubbs.



MOAPA DACE, *Moapa coriacea* Hubbs and Miller.



LONGNOSE DACE, *Rhinichthys cataractae* (Valenciennes).



Habitat and Behavior

The longnose dace was found in Sand Creek and Marengo River, and was considered abundant in both streams. It made up 20% of the estimated total fish population and 7.1% of the total fish biomass in Sand Creek, and 15.1% of the estimated total fish population and 3.4% of the total fish biomass in Marengo River. There were 82 longnose dace per 100 feet of stream in Sand Creek and 44 per 100 feet of stream in Marengo River. Sample areas varied from a predominantly fast current, gravel bottom section which was the type of habitat described by Baxter (1970), Becker (1962), Gee and Northcote (1963), Beckman (1952), Kuehn (1949), and Reed (1959) as the preferred habitat of the longnose dace, to a sluggish mud-bottomed section of stream which had a greater population of longnose dace. The fish collections made in this study indicated that the longnose dace preferred sheltered areas in runs and riffles regardless of bottom type. Green (1935) wrote that where competition was not very keen, longnose dace

were commonly found in habitats with a moderate current. The longnose dace was collected at 10% of the stations in the tributaries of the Red River in North Dakota and was found in sand and gravel riffles (Copes and Tubb, 1966).

The longnose dace is primarily a schooling species and the schools were generally found in sheltered areas, but were observed in all types of habitats. The school had no apparent leader, but larger fish were usually observed at the head and in the middle of the schools and smaller fish in the edges and near the rear of the school. Schools of longnose dace were observed to be very active when the stream flow or turbidity was increasing, on dark cloudy days, and at dusk. Larger longnose dace tended to avoid direct sunlight. The schools of longnose dace generally contained from 5 to over 100 fish. Spacing of individual fish in schools varied greatly.

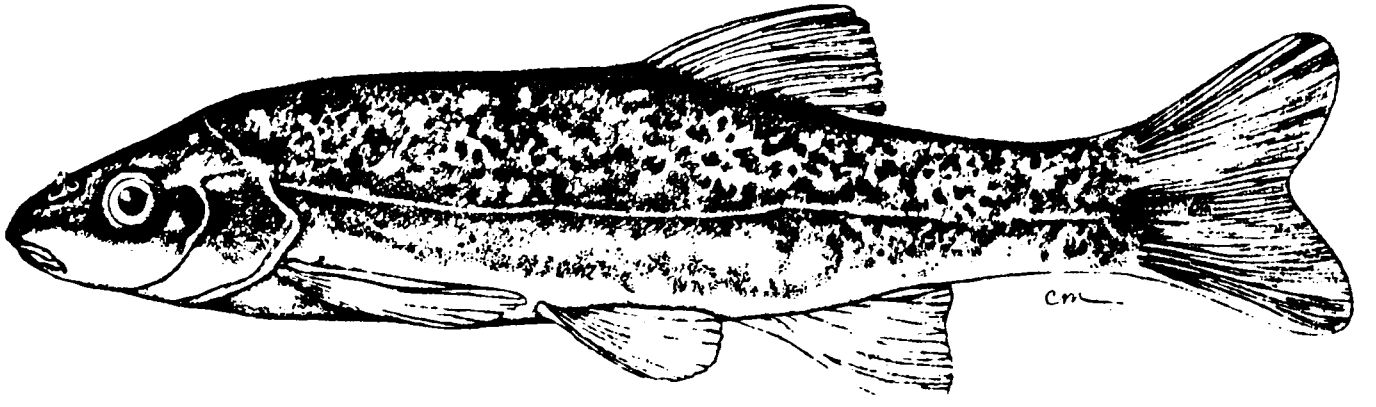
In Sand Creek, age-class 0 longnose dace were observed in open areas of shallow riffles and runs, and they avoided deeper areas where larger fish were found. Schools of age-class 0 fish were found with schools of young creek chubs and they often formed mixed schools. In Marengo River, schools of age-class 0 longnose dace were found in areas of reduced current and shallow runs.

Schools of adult longnose dace were observed in open areas of runs and riffles at night. They appeared to be active during the early hours of darkness. Longnose dace were not found in any abundance in fast runs and riffles in November. They wintered in large schools and pods under shelter in heavily shaded slow runs and pools. Several hundred longnose dace were found in November among the beaver cuttings in the face of an old beaver dam.

When alarmed, schools of longnose dace swam quickly to shelter or undercut banks and attempted to hide.

Feeding Habits and Food

Longnose dace fed both in schools and individually. Stomaches of larger longnose dace collected from dawn to 10 AM contained food items, while stomachs of fish collected from 10 AM to 3 PM were generally empty, and stomachs of fish collected between 4 and 9 PM generally contained food. The stomach contents indicate some nocturnal or early morning feeding. Schools of larger longnose dace were observed feeding in open cobble and gravel bottom runs and riffles in the late afternoon in Sand Creek, and in the gravel of runs in the late afternoon in Marengo River. Adult longnose dace were observed feeding on drift throughout the day in heavily shaded areas. On several occasions schools and individual longnose dace were observed feeding with their nose in the gravel and vibrating their body as if trying to dislodge food organisms. The fish appeared to have touched their nose and mouth to the.....



Speckled Dace (Rhinichthys osculus, Girard) illustration by Carol Mortenson, courtesy of the Natural History Museum of Los Angeles County.

cobble or gravel and then suddenly vibrated their caudal region very intensely while the mouth and nose were still in contact with the bottom, as if attempting to scrape or jar loose food organisms. Individuals were observed stripping algae from cobble by pushing off sheets with their snout. They did not consume the algae sheets so stipped off. They were apparently searching for invertebrates. The fish appeared to feed heavily on aquatic invertebrates stirred up by their feeding behavior. Feeding behavior similar to the method described above was mentioned by Becker (1962). Longnose dace were seen pursuing drift organisms on several occasions.

Schools of age-class 0 longnose dace appeared to feed continually throughout the day. Age-class 0 fish were seen searching in gravel and on rocks for food organisms. Age-class 0 longnose dace were seen feeding on drift. On several occasions they appeared to be searching for invertebrates in the vegetation of runs.

The contents of stomachs from 100 age-class 1 and older longnose dace and from 20 age-class 0 longnose dace were examined. Immature aquatic insects made up 70.5% and insects remains 11.1% of the total volume of food consumed (Table I). Vegetation was found in 8% of the stomachs and made up only 2.5% of the total food volume of food. Fish eggs were found in only 2 specimens which were collected in early July. Twenty per cent of the stomachs examined were empty (Table I). The stomach contents of age-class 0 fish averaged 2 items per stomach.

Age-class 1 and older fish averaged 3.2 food items per stomach in Sand Creek, and 2.4 in Marengo River. The composition of the stomach contents was not the same for fish collected in Sand Creek and Marengo River (Table II). The difference in the composition of stomach contents of fish collected in Sand Creek and Marengo R. was believed due to the

differences in abundance of various aquatic organisms in the two waters.

Forage ratios and feeding selectivity were not determined because drift food items in the stomachs could not be distinguished from benthic food items.

The food items consumed by age-class 0 longnose dace were very similar to those consumed by older longnose dace. The main difference was age-class 0 fish consumed the smaller organisms (earlier instars) and older fish the larger organisms. On the basis of observations and stomach samples the longnose dace was considered an insectivorous drift and benthic feeder.

The contribution each food item made to the diet of the longnose dace varied throughout the year. The changes in diet composition, the frequency of occurrence, and per cent contributed by each food item can be seen in Table I. Changes in the composition of the diet were believed to have represented changes in the abundance and availability of food items.

Very little difference between food items utilized and the degree to which they were taken was found in comparison with the findings of Becker (1962), Kuehn (1949), Reed (1959), and Simpson (1941) and the present study. The findings of this study do not support the statement of Simon (1951) and Beckman (1952) that the longnose dace feed to a considerable extent on plant material, algae, and slime.

No surface feeding was observed in Sand Creek, but specimens living in an aquarium fed at the surface on mosquito larvae. Aquarium specimens also fed on sucker fry. Organisms which were too large for the longnose dace to swallow were taken into the mouth and then ejected. Insects in the stomachs were intact and generally not mutilated.

Reproduction

The length of the spawning season was determined from the dates on

which collections of longnose dace that contained sexually mature males and females were made. The spawning season was believed to have occurred from June 1 to July 10. Spawning was believed to occur in gravel bottom runs and riffles. Spawning was not actually observed, but most collections of sexually mature dace were taken from sand and gravel runs and riffles.

When larger male and female longnose dace approach sexual maturity, both sexes undergo a color change. Their upper and lower lip, breast, and bases of the fins turn red or orange. The females' colors were not as intense as those of the males. Becker (1962) reported finding similar coloration in males and females. Trautman (1957), Sigler and Miller (1963), Simon (1951), and Beckman (1952) mentioned that the males exhibit a color change prior to the spawning period. Sexually mature males were collected from May 17 to July 10. The sexually mature males collected on May 17 and July 10 were only 64 to 67 mm in length. Most of the larger sexually mature males (70-96 mm) were collected from June 10 to July 7. The smaller sexually mature males did not have the red and orange spawning coloration.

No age-class 1 females or males were found to have been sexually mature, but 15 age-class 2 specimens all showed gonad development in May. Kuehn (1949), Reed (1959), and Becker (1962) reported that longnose dace did not breed until they were two years old. The eggs flowed from ripe females when they were being handled. Ripe females were collected from May 21 through July 11. Spent females were first collected on June 11.

Mixed schools of sexually immature and mature males and females were collected and observed over gravel-bottom runs and in sand-bottom runs during the last week of June and the first week of July when water temperatures were 55 to 68 degrees F. They were believed to be spawning schools, but the actual spawning act was not observed.

Kuehn (1949) reported that the longnose dace spawned from June to

August and Becker (1962) reported that they spawned in April and May. Longnose dace were reported as early spawners by Hubbs and Cooper (1936), and spring and early summer spawners by Simon (1951) and Beckman (1962).

The only available description of the breeding behavior of the longnose dace came from Greeley and Bishop (1933), who observed spawning in a small cold stream (55 degrees F) in New York state. They stated that observations were being made on July 16, 1932 when several schools of breeding longnose dace were seen:

> "....A school of at least 25 fishes was watched at close range, about 3 feet, in this small stream where they were swimming over an area of fine gravel in strong current. The water was only 2 to 4 inches deep and the fishes could be seen plainly. Evidently there were several females present and those which could be identified as females were larger than the attending males, which were several times more numerous than females. A single spawning act was seen. The female stopped on the bottom and a dense group of at least six males, individuals which had been following her closely, hid the female from view for a brief second or two as they crowded against her sides and dorsal area. Following this, several males were seen to thrust their noses downward in an evident search for eggs. A handful of the gravel was picked up and found to be well supplied with eggs distributed between the pebbles...."

Age and Growth

Longnose dace fry, 6 to 7 mm in length, were collected from a run at the lower end of Sand Creek 2 on July 19. The fry were swimming in schools of 10-15 individuals less than one inch above the sand bottom and they periodically rested on the sand bottom.

Scales were laid down by the time the longnose dace had grown to 25 mm in length. The scales of specimens 30 mm in length, had 4 circuli.

No scales from longnose dace examined for age in September, 1968 and 1969, and 1978, and October or November, 1968 had more than three annuli, and the fish were ranked in age-classes 0, 1, 2, and 3. Apparently few, if any, longnose dace live longer than through five summers

in the study areas.

There was a large amount of overlap in the ranges of lengths of the different age-classes. Reed (1959) reported that the lengths of age-class 1 longnose dace collected in Pennsylvania were 48 to 68 mm, age-class 2 were 64 to 84 mm, age-class 3 were 79 to 92mm, and age-class 4 were 82 to 100 mm. Data obtained from longnose dace collected in October, 1968 and April and May, 1969 indicated that little or no growth occurred after the first of September. Therefore, the ranges of lengths in Table III for September age-classes 0, 1, 2, and 3 longnose dace also applied to age-classes 1, 2, 3, and 4 longnose dace respectively in April and May. The increments of length and weight calculated for the September fish sample, then, represent the annual increment of weight increased with age, while the annual increment of length decreased with age (Table III). Kuehn (1949) reported calculated annual increments in length of 46, 15, 13, and 10 mm for age 1, 2, 3, and 4 longnose dace respectively collected in Minnesota.

None of the scales of longnose dace collected in May showed the new annulus. The new annulus showed on the scales of 10 specimens collected on July 1. (Copes, 1970)

Population Structure

Age-class 0 made up 46.9% of the longnose dace collected in September, 1969 from Sand Creek, while age-classes 1, 2, and 3 made up 43.8, 8.6, and .6% respectively (Table III). Age-classes 0 and 1 were almost equally represented in the sample. Age-class 1 fish made up 52.6% of the total longnose dace biomass in September, 1969. Age-class 0 made up 38.2% of the longnose dace population in the Marengo River, while age classes 1, 2, and 3 made up 56.3, 5.1, and 0.4% respectively.

A general weight-length relationship was calculated for a combined

sample of 200 fish collected for Sand Creek on September 4 and 5, 1969. The longnose dace ranged in size from 23 to 116 mm in length and from .21 to 13.3 grams on weight. The weight-length equation was Log W = -1.9642 + 2.94 Log L. The correlation coefficient between the weight and length was .99. (Copes, 1970)

Coefficient of Condition

The coefficient of condition (K_{TL}) was computed for each age-class of longnose dace in the September, 1969 Sand Creek sample and July 1978 Marengo River sample. The K values ranged from .85 to .89 with an average of .875. There was no consistent difference in K values between males and females. Becker (1962) listed K values of .97 to 1.0 for longnose dace collected in September in Wisconsin.

Survival

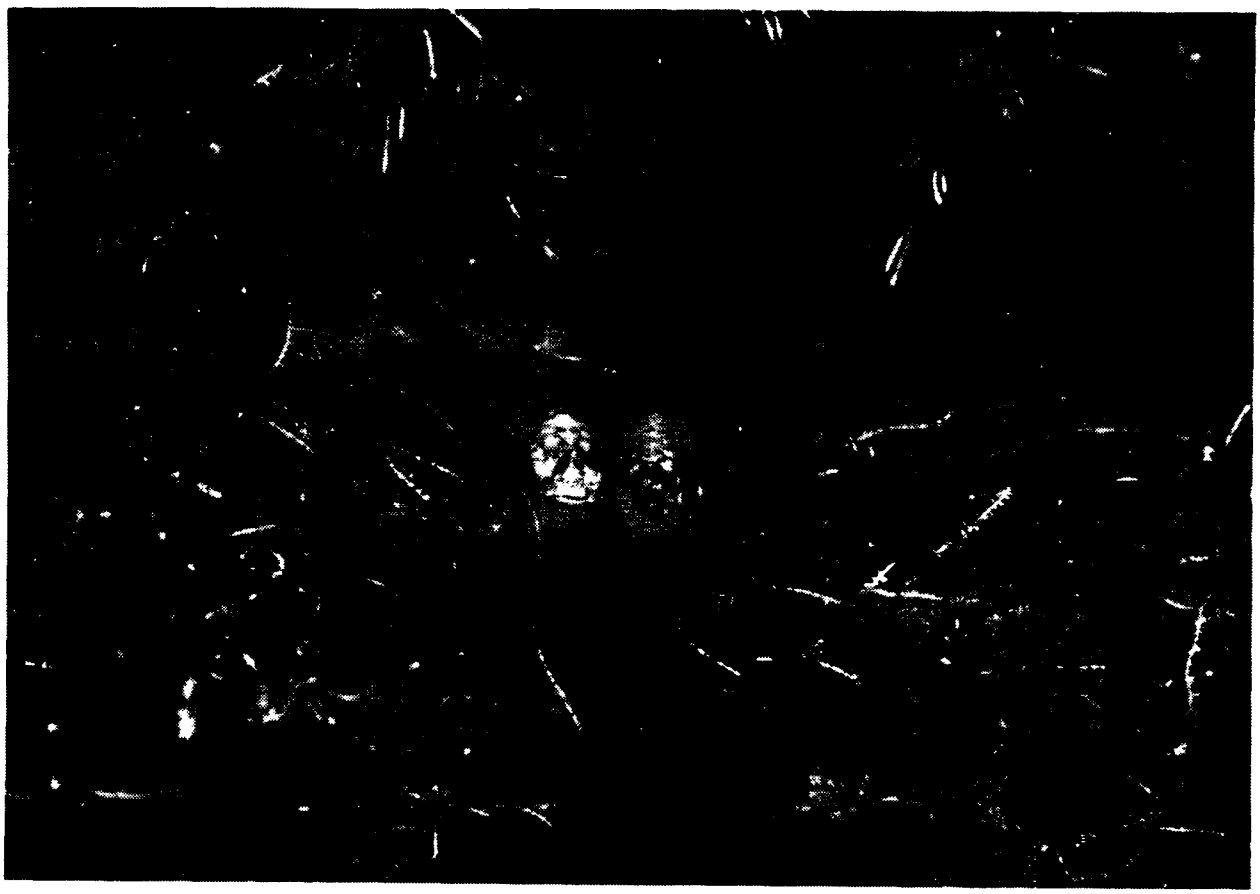
The rate of survival for longnose dace in Sand Creek and Marengo River was estimated from five samples of fish. All the survival estimates appear to be too high (.34 to .48). The almost equal numbers of age 0 to 1 longnose dace in three samples and age 1 and 2 fish in the other two samples were believed to have biased the estimates of the survival rate. The age structure of the longnose dace samples indicated a complete population turnover about every 4 years, which indicated a survival rate of about 0.2.

Predation and Disease

Longnose dace were found in the stomachs of two creek chubs, brook and brown trout, smallmouth bass, walleye, and northern pike. In certain sections of streams the longnose dace were heavily infected with *Neascus* sp. Light infections of the fluke, *Clinostomus* sp., were found.

Meristics

The population of longnose dace in Sand Creek and Marengo River were found to have an average of 64 pored scales in the lateral line, and a mode of 8 dorsal and 7 anal fin rays. All specimens examined had a small maxillary barbel. The pharyngeal tooth count was usually 2,4-4,2, but one specimen with 1,4-4,2 and one with 1,4-4,1 were found. The average lateral line scale count fell within the range reported by Simon (1951). The dorsal and anal fin ray counts and pharyngeal tooth formula agreed with Eddy and Surber (1960), Simon (1951), and Sigler and Miller (1963).



In the same family (Cypronidae) as the Longnosed Dace discussed above, is Profundulus punctatus, shown in a spawning sequence photograph by John Brill.