Zoogeography of Catostomus sp. in the Columbia River System
by Leon Colborn

The families Catostomidae and Cyprinidae are closely related, and it is questionable whether the cyprinids were derived from the catostomids or if they had a common ancestor. Fossil sucker remains have been recovered from Eocene deposits in Asia and the family is believed to have originated in the southern part of that country. The catostomids migrated northward, crossed the Bearing land bridge into North America, and a relic was left in China which developed into the genus Myxocyprinus. Today Myxocyprinus has a small range in China and it is widely separated from the other existing catostomids. The family has become widespread in North America and it is found as far south as Guatamala; however, only two species occur on the European continent.

The earliest fossil remains in North America are from Miocene deposits in British Columbia, Nevada, and Colorado and are placed in the extinct genus Amyzon. It resembles the genus Ictobus but comparison with Myxocyprinus may show it to be more closely related to the later. According to Hubbs (1958) the genus Cycleptus, which developed in the Mississippi River system, is also closely related to Myxocyprinus. It seems probable that Catostomus sp. was present on both sides of what is now the continental divide during the Jurasic peroid; 15 species of the genus have developed in the United States.

Catostomus catostomus (Forster) probably originated in the Mississippi drainage and crossed the continental divide during Pleistocene glaciation. Its range expanded northward as the glaciers retreated and it crossed the Bearing land bridge into eastern Siberia. Walters (1955) stated that the Siberian subspecies is tolerant to brackish water and is abundant at times around the mouths of rivers. This tolerance to salinity was an asset to its crossing the land bridge.

Catostomus commersoni (Lacepede) also developed in the Mississippi drainage, migrated in the same manner as C. catostomus, but did not cross the bearing land bridge. Mayr (1963) stated that five hybrids from a collection of 2,000 C. commersoni and C. catostomus were caught in the Platte River; undoubtedly, the two are closely related. The range of C. commersoni has expanded in a southern direction during recent times. Smith (1954) suggested that the presence of suitable gravel for spawning is probably the limiting factor in its distribution. It is said to be more tolerant to turbidity, siltation, and other organic and inorganic pollutants, dense aquatic vegetation, and waters that are deficient in disolved oxygen than any of the other suckers.

Catostomus macrocheilus and C. occidentalis are closely related according to La Force (1962), and they are confined to the costal streams of the western part of the United States and British Columbia. These two fish occupy a low land type of habitat, feeding on plants, insect larvae, copepods, crustaceans, and molluscs. When the glacial ice melted the ancestor of these fish was capable of coastwise movement from the Columbia River. C. occidentalis developed after the ocean became more saline which forbid further costal movement of the ancestor. In the Columbia River C. macrocheilus is present as far upstream as Flathead Lake in Montana.

Catostomus columbianus is endemic to the Columbia River drainage and is found in the middle and lower sections of that river. In contrast to C. macrocheilus this species prefers the more swiftly flowing portions of streams (, La Rivers (1962). When first described it was placed in the mountain sucker genus Pantosteus; however, it does not occur in the upper most streams.

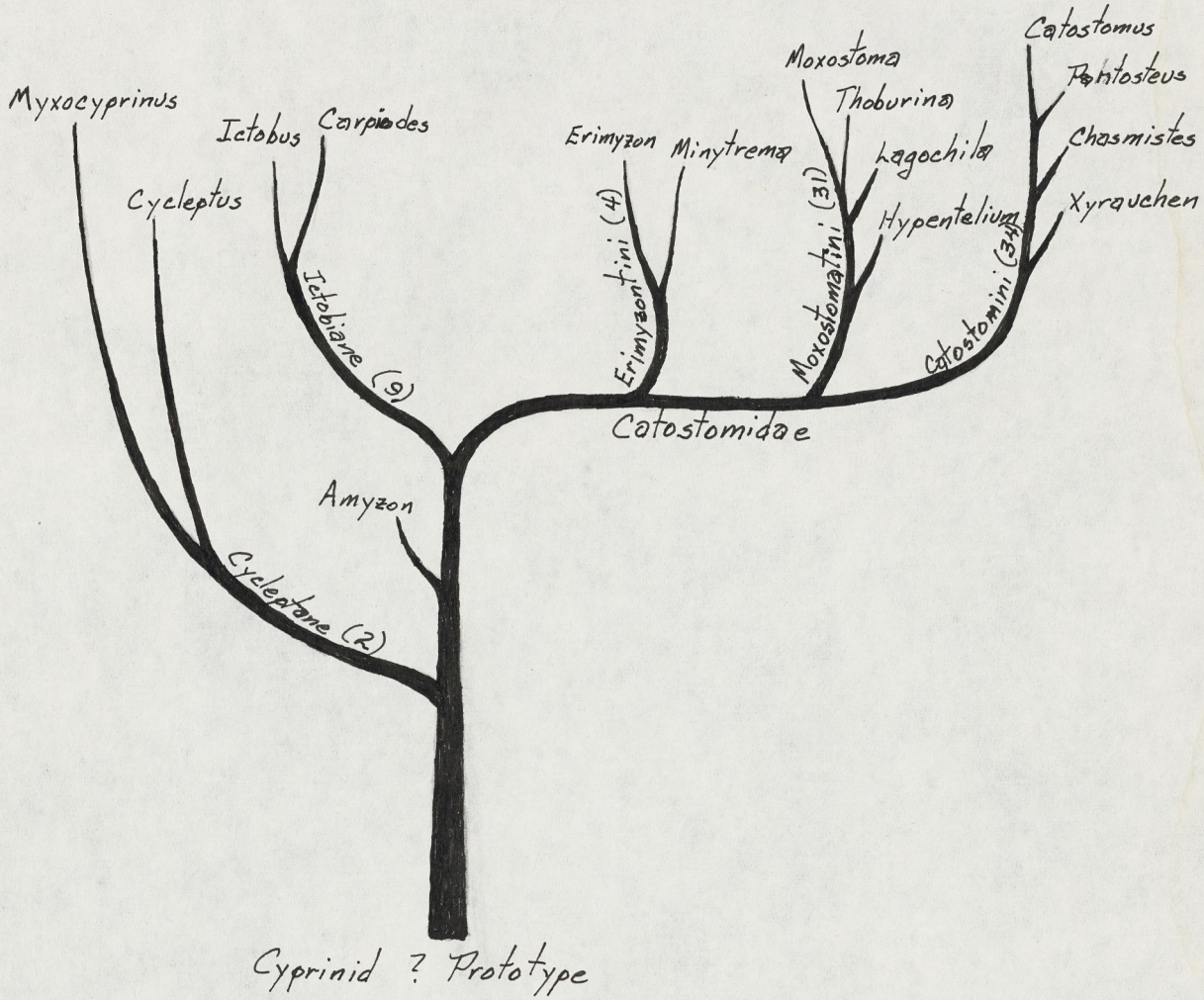
Catostomus fecundus originated in the Bear Lake basin and was transported north into the upper Snake River in Utah and Wyoming ~~by glaciers.~~ Specimens have been recorded in rivers and creeks having temperatures that range from very cold to well above 80 F. It is found in slow to swift currents, and in areas of variable bottom types. According to La Rivers (1962) it runs well upstream from Lake Utah to spawn. Suitable gravel in headwater areas has probably restricted its distribution.

Cartocraft Desk Outline Map, North America No. 7005

Range of C. columbianus
is included in that
shown for C. macrocheilus

Published by DENOYER-GEPPERT CO., Chicago

From Erhard Rostlund 1952



Hypothetical phylogeny of the Catostomidae. Approximate number of species in each subfamily and tribe is shown in parenthesis.

Taken from: Hubbs 1958.

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Boord

Taxonomic Position of Catostomid Fishes from the Gunnison River of Colorado

Systematic Ichthyology

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Robert A. Leasure

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ABSTRACT

This study was undertaken to examine the taxonomic position of the sucker population within the Gunnison River of Colorado. It stemmed from an earlier study by Brian Kinnear of the Colorado Cooperative Fishery Unit. Due to time limitations there could be no work done on the sucker population within the scope of this earlier study.

Several characteristics were examined, and a program was set up to utilize a computerized method of separating groups of fishes.

Results of the study showed that the Population is made up of Catostomus discobolus, Catostomus latipinnis, and Catostomus commersoni. Several groups of fishes were also found which were concluded to be hybrids among Catostomus commersoni, C. latipinnis, and C. discobolus. One group was found which did not fit into this hybrid scheme.

Further study with a wider range of characters will be necessary to further evaluate these digressive groups of fishes.

LIST OF TABLES AND ILLUSTRATIONS

TAXONOMIC POSITION OF CATOSTOMID FISHES FROM THE GUNNISON RIVER OF COLORADO

INTRODUCTION

Background

This study was originated in response to a previous study on the Gunnison River. Brian Kinnear, of the Colorado Cooperative Fishery Unit, did a pre-impoundment study in the Black Canyon National Monument. The purpose was to enable future workers to discern any ecological changes in the river, after the Curecanti project is completed.

In the course of his study, Mr. Kinnear came upon several specimens of Catostomid fishes which did not fit any species known to be present in the river. Due to time limitations, he was unable to do any intensive work with these fishes. The specimens collected were then stored at the Colorado Coop Unit in Fort Collins.

The writer undertook this project as part of Dr. Robert Behnke's class in systematic ichthyology.

Species Known to be Present in the Gunnison River

Two species of Catostomid fishes are native to the Gunnison River; they are: Catostomus latipinnis, the flannelmouth sucker; and Catostomus discobolus,

formerly Pantosteus delphinus (Smith 1966), the Northern bluehead mountain-sucker.

Catostomus commersoni, the Western white sucker, has been introduce to these waters; and it is believed that Catostomus catostomus, the longnose sucker, has also been imported.

It was hypothesized at the start of this program that the mystery fish in the Gunnison River were most probably hybrids between those species already present.

Hybridization in the Family Catostomidae

According to Hubbs (1955), catostomid fishes display a great deal of hybridization in nature. In western streams, Hubbs estimated that one out of one hundred specimens are interspecific hybrids. Hybrids are known to occur within the genus Catostomus, and between Catostomus and the subgenus Pantosteus.

Some conditions must be present to make hydridization feasible. Two of these are: the introduction of one species into the native range of another, and an abundance of one species combined with the relative scarcity of another. In the first case, even species which have lived sympatrically without hybridizing in many areas will tend to hybridize. In the second case, the relatively rare species will have

difficulty finding the proper mate, and will often breed with another species. If there are no reproductive isolating factors present, these crosses will produce young.

METHODS AND MATERIALS

Description of Collection

The collection examined consisted of 64 specimens from the Black Canyon National Monument. Examples of good Catostomus latipinnis, C. commersoni, and C. discobolus were present as well as the mystery specimens.

Condition of specimens was very poor. Preservation had not been performed well, and the specimens were badily decomposed internally. Many specimens were missing large areas of scales. The specimens were not fixed properly, and were in various contorted positions. This made making scale counts and measurements difficult.

Characters used in Analysis

It was decided to use eleven characters in the analysis of these specimens. They are:

1. Lateral line scales

Map of Collection Area

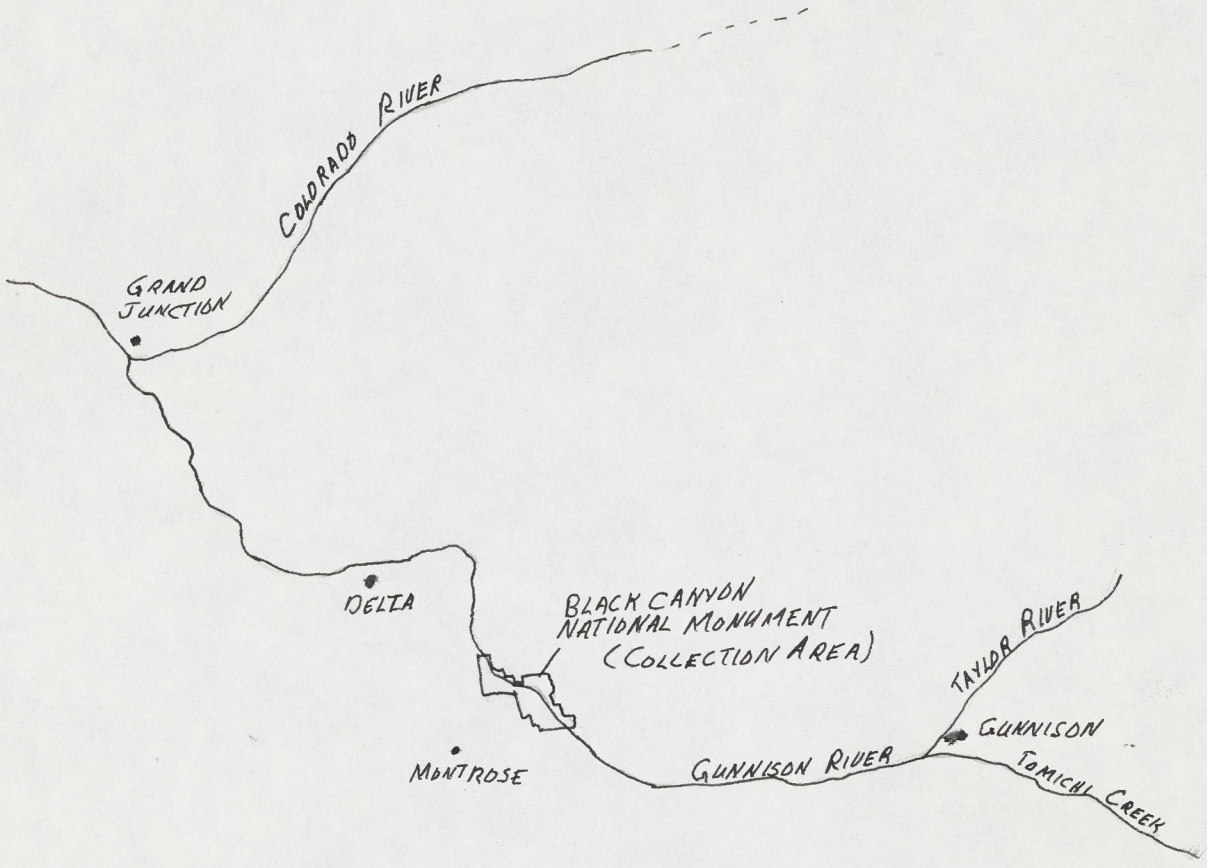

Figure 1

2. Scales above the lateral line
3. Dorsal rays
4. Pectoral rays
5. Ventral rays
6. Anal rays
7. Gill rakers
8. Vertebrae counts
9. Standard length
10. Length of dorsal base
11. Mouth shape

The anal ray count was later dropped, due to the constancy of this character between species; and the vertebrae counts were taken only on the first twenty-five specimens.

Methods of Taking Counts

All counts and measure ments except the vertebrae counts were made either with the naked eye, or under a binocular dissecting microscope. Vertebrae counts were made with an x-ray machine belonging to the Colorado Cooperative Fishery Unit. Where scale were found to be missing, an estimate was made and entered. This technique was also used on gill raker counts.

Counts Taken

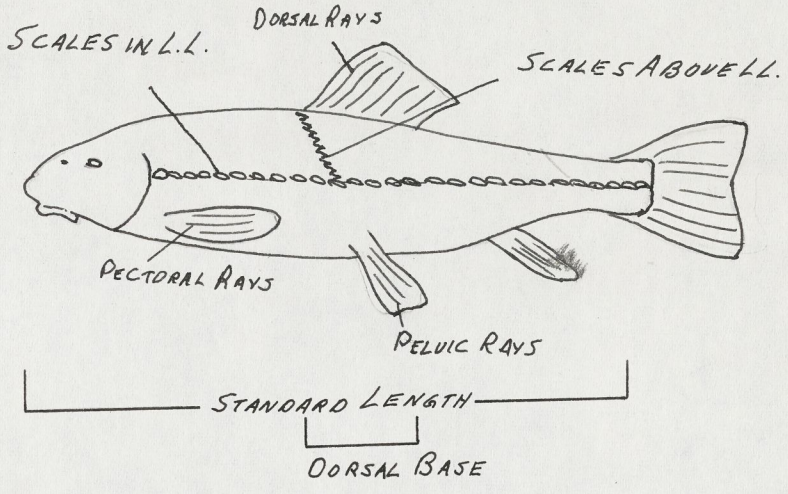

Figure 2

Computer Taxometrics Method

After all data on the first twentyfive specimens was collected, it was coded by Dr. Behnke and a computer program was set up. The standard length and dorsal base were combined into a ration of D.B./S.L. With the dropping of the anal ray count this made a total of nine characters used in the computer analysis.

Characters were broken down into states, and the computer determined percentages of relationship based on similarities and differences in the nine characters.

Data Taken From Specimens

Spec.	LL	A.LL	D	P	V	GR	Vt	SL	DB	D/L	M*
1	85	19	12	16	10	26	42	426	69	.162	C
2	99	19	10	14	8	32	42	209	29	.139	P
3	114	25	13	14	10	23	41	258	46	.179	C
4	105	18	10	13	8	33	44	268	37	.178	P
5	81	18	11	15	10	25	42	374	44	.118	C
6	111	24	13	16	11	24	44	332	59	.178	C
7	98	22	12	15	10	23	43	320	54	.169	C
8	66	15	10	15	9	26	43	212	32	.151	C
9	93	19	10	14	9	32	44	308	43	.140	P
10	93	19	11	14	9	36	44	287	43	.150	P
11	73	15	11	15	10	27	41	277	42	.152	C
12	101	28	12	15	10	24	44	254	47	.185	C
13	103	23	13	15	10	22	--	366	65	.178	C
14	117	25	12	17	12	25	44	387	57	.147	C
15	62	10	11	16	10	17	44	184	28	.152	C
16	66	12	11	16	10	24	42	224	34	.152	C
17	69	10	11	16	9	25	44	252	35	.139	C
18	64	12	12	16	10	23	43	236	38	.161	C
19	64	13	11	15	9	20	43	225	32	.142	C
20	63	12	12	16	10	25	43	240	30	.125	C
21	68	13	11	16	9	22	41	247	38	.154	C

* C-Catostomus
P-Pantosteus

(Continued)

Spec.	LL	A.LL	D	P	V	GR	Vt	SL	DB	D/L	M
22	121	21	10	17	10	23	43	221	29	.131	C
23	80	15	10	16	10	27	43	229	27	.118	C
24	59	12	11	16	10	22	43	212	35	.165	C
25	107	19	11	16	10	23	43	259	31	.120	C
26	59	12	12	16	9	22		273	47	.172	C
27	88	22	11	14	10	33		222	32	.135	P
28	58	11	10	14	9	24		185	27	.146	C
29	65	12	11	15	10	21		218	36	.165	C
30	60	13	11	16	10	25		305	43	.141	C
31	108	19	10	15	9	29		257	33	.128	P
32	105	21	13	17	10	21		322	59	.183	C
33	88	18	11	16	11	26		310	51	.164	C *
34	98	21	12	16	11	23		378	63	.166	C
35	102	24	12	16	10	22		347	56	.162	C
36	68	11	11	16	10	27		215	30	.139	C
37	114	19	10	16	10	24		247	31	.126	C
38	65	11	11	14	9	23		180	24	.133	C
39	117	20	10	15	10	24		215	26	.121	C
40	98	20	10	15	9	34		233	32	.137	P
41	118	22	11	15	8	33		239	33	.138	P
42	127	25	12	16	10	27		422	64	.152	C

(Continued)

Spec.	LL	A.LL	D	P	V	GR	Vt	SL	DB	D/L	M
43	108	22	12	16	10	36		234	37	.158	P
44	96	23	11	14	10	34		212	29	.137	P
45	69	14	12	16	11	23		268	42	.157	C
46	73	14	12	16	10	27		229	33	.144	P *
47	97	20	10	15	9	36		220	29	.132	P
48	70	12	11	16	10	20		258	35	.131	C
49	100	19	11	14	9	23		200	28	.140	P *
50	109	23	12	16	10	25		369	67	.181	C
51	105	21	11	14	9	35		269	46	.171	P
52	111	20	11	14	9	32		258	42	.157	P
53	98	21	11	14	9	31		210	33	.157	P
54	63	11	11	16	10	19		217	33	.152	C
55	89	21	10	15	10	29		226	30	.133	P
56	102	24	12	15	10	25		388	57	.147	C
57	109	21	11	15	9	36		258	39	.145	P
58	80	19	12	16	10	25		277	47	.169	C
59	90	22	11	14	9	37		340	37	.119	P
60	77	16	10	16	10	28		247	28	.114	P *
61	96	24	11	16	10	23		315	53	.168	C
62	64	11	11	15	10	22		309	45	.146	C
66	94	20	11	14	8	26		190	29	.153	P
67	98	19	10	17	8	21		190	24	.126	C

Table 1

Dr. David Rogers, of the Botany department at Colorado State University, made available the use of the computer taxometrics laboratory for this phase of the study.

RESULTS

Grouping of Specimens

Computer taxometrics was used on the first twenty-five specimens, as was stated earlier. When results of this program were studied it was found that there were four distinct groups present. Three groups were closely related within themselves, they were: *Catostomus discobolus*, *C. latipinnis*, and *C. commersoni*. The fourth group was only loosely connected; these were the mystery specimens.

The remaining specimens were not run through the computer due to time limitations. Inferences as to the identity of these specimens was made using results from the first twentyfive specimens.

Unknown Specimens

Several specimens displayed characteristics which did not correlate with known species. Variances were

noted primarily in scale counts and gill raker counts. Several specimens with general Pantosteus features had indistinct notches at the side of the mouth, low gill raker counts, and low scale counts. Several examples with general flannelmouth characteristics had scale counts lower than normal. The scales also did not have typical flannel mouth shape.

Specimen Breakdown

Catostomus discobolus

Specimen No. 2, 4, 9, 10, 27, 31, 40, 41, 43, 44, 47, 51, 52, 53, 55, 57, 66.

Catostomus latipinnis

Specimen No. 3, 6, 7, 12, 13, 31, 32, 35, 37, 39, 41, 42, 43, 50, 51, 52, 56, 57.

Catostomus commersoni

Specimen No. 8, 15, 16, 17, 18, 19, 20, 21, 24, 26, 29, 30, 36, 65, 45, 46, 48, 54, 62.

Unknown Catostomus

Specimen No. 1, 5, 14, 22, 23, 25, 28, 34, 58, 61, 67.

(Continued)

Unknown Pantosteus

Specimen No. 33, 46, 49, 60,

Table 2

DISCUSSION

Scales in Unknown Catostomus Specimens

Scale samples were taken from several of the intermediate flannelmouth types and examined with a dissecting microscope. It was found that the scales of these fish exhibited characteristics which closely matched those of Catostomus commersoni. Scales were shaped much as those of C. commersoni, and they had radii and circuli which showed these same influences.

Mouth Shape in Unknown Pantosteus Specimens

Pantosteus (genus Catostomus) specimens were examined which had very indistinct notches at the side of the mouth. These fish also had mouth characteristics in the papilli and shape which superficially resembled Catostomus commersoni.

CONCLUSIONS

At the end of this study the following conclucions were reached:

1. Catostomus commersoni, C. latipinnis, and Catostomus discobolus are present in significant numbers.

2. No specimens of Catostomus catostomus were examined.

3. Hybrids between Catostomus commersoni and Catostomus latipinnis are present.

4. Hybrids between Catostomus commersoni and Catostomus discobolus are present.

5. There is still another group of specimens which do not seem to be hybrids. These fish could be simply extreme variations of Catostomus latipinnis.

RECOMMENDATIONS

For future work it is recommended that:

1. More specimens of suspicious looking Catostomid fishes be collected from the Gunnison River, if possible.

2. All collectors be thoroughly briefed in the proper method of preserving specimens.

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Observations on the Hybridization of Catostomid Fish in the Black Canyon of the Gunnison

by

Darryl Hammons
Systematic Ichthyology
June 5, 1967

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INTRODUCTION

By its very nature, hybridization is probably the most significant drawback to the biological species concept. The same also applies necessarily to taxonomy as well. Certainly, no rule which implies reproductive isolation in the explicit sense can remain unshaken in the face of so much evidence to the contrary. Only with great reservation can such a rule be applied at all as a standard criterium for speciation in nature.

The connection between the inadequacies of the biological species concept and the problems of the taxonomist are obvious. Since probably no-one has an exact concept of speciation, taxonomists are left to their own devices and opinions as to what a species should be. Thus, the door is left wide open to contradiction, controversy, and general confusion in the field of systematics.

The fishes, because of their great numbers and wide range of variation, are by no means the least problematic branch of the animal kingdom in the taxonomic sense. They can and very often do interbreed across racial, generic and specific boundaries. The resultants of these crosses have long been the bain of the systematic ichthyologist.

Fish interbreeding, in general, represents the classic hybrid situation. In the great majority of cases, a fish hybrid is defined in its characters as the average or at least an intermediate between the parent stocks. The hybrid may

have a tendency to lean more heavily toward one parent type, but its individual characters generally lie somewhere between the parent species' corresponding features. Such were the findings of works by Hubbs (1955), Shwartz (1962), Smitherman and Hester (1962), and a great number of others. There is certainly no problem in identifying hybrids in cases where both parent stocks and the hybrid offspring are available for close examination in the laboratory, especially since the actual crosses are done artificially under such conditions. The problem of separating hybrids from well defined species in natural populations is somewhat more challenging.

The Catostomidae, the suckers, like their other watery relatives show a considerable tendency toward natural hybridization. The major portion of this hybridization , according to Hubbs(1955), occurs in the tribe Catostomini which includes the genera Pantosteus, Catostomus and Xyrauchen. Hubbs(1955) noted the occurance of at least nine naturally interbreeding interspecific and partially intergeneric crosses within this group. It is, then, not at all bold to assume that hybridization can occur and probably does where various combinations of different species within this tribe occur together in a given area. Unless ther is some minature geological barrier preventing intermixing of populations, hybridization is much more likely to be the rule rather than the exception.

The following work is an analysis of the sucker population of an area where Pantosteus and Catostomus species occur together naturally, the Gunnison River in the Black Canyon of the Gunnison National Monument. The initial objective of the research done here is to explore the possibility of the existance of naturally occuring hybrids and/or unnamed species in that area.

METHODS AND MATERIALS

The Black Canyon of the Gunnison in one of the most truely isolated areas in the state of Colorado. Its shear rock walls dropping some three thousnad feet to the river's channel necessarily represents and imposing barrier to the enroads of man. Fish living in this area are wild and reproduce naturally with no interference from man. Thus, any hybrids observed in these conditions are the works of nature and not of human beings.

Just as they represent a barrier to civilization, the canyon walls pose an enormous problem for the taxonomist in that good preservation techniques are rendered essentially impossible. This fact is evident in the condition of the fish employed in this analysis. Their insides were in an advanced stage of decomposition preventing any examination of enternal characters which could have proven helpful in increased accuracy of the final results. Only external features could be used with any degree of assurance, with the possible exception of gill-raker counts which may or may not be included in internal characters.

The major characters used in this analysis were as follows: number of scales in the lateral line, number of scales above thelateral line, number of dorsal fin rays, number of anal fin rays, number of pectoral fin rays, number of pelvic fin rays, number of gill-rakers, number of vertebrae, standard

length, length of the dorsal fin base, the ratio dorsal base to standard length, and mouth shape. Each was selected for its particular applicability and ease of use in examining members of the sucker family.

After the major operation of gathering the raw data from an examination of each individual specimen, the analysis was split into two separate phases, the first making use of numerical taxonomyand the computer, the second using only hand groupingandjudgement on the part of the observer. The chief objective of both courses of action was to separate the specimens into their major groupings probably, in this case, representing species, and through closer examination, to point out certain individuals which failed to fit properly into the major categories, in this case probably representing either separate species or hybrids between the dominant stocks.

The computer phase is based, as previously mentioned, on the newly founded science of numerical taxonomy. This system of classifying is essentially a method of showing comparitive similarities between individuals and groups through theuse of so-called simple, ordered and matrix characters, each range in the particular character being assigned a letter value which can be translated into the computer. The result of this process is a picture of the formation and strength of groupings of individuals at successively lower levels of over-all

similarity. Any distinct individuals will stand out as a weak bond in a grouping, or as a very late joining member of a group, or as an entirely separate entity from any of the main groups. The final decisions as to the exact origin of these fish still rests, however, with the biologist.

The second, manual phase is left entirely to human judgement. In this process, the fish are first separated by lip shape which serves to key out the Pantosteus group from the more numerous Catostomus varieties. Secondly, the fish in both groups are arranged in order of increasing numbers of scales in the lateral line, this to separate out any radically different members of the Pantosteus group and to separate the coarse-scaled White-suckers from the Flannelmouths. In addition, this serves to point out any individuals which appear to be intermediate between the major groups. As in numerical taxonomy, the final decisions as to whether odd individuals represent separate species or hybrids is left to the judgement of the observer.

RESULTS

Of the total of sixty-four specimens examined, the majority of individuals fell into one of three general classifications or groups. Using Beckman's (1963) as a reference, these groups appear to represent three well-known species of the Rocky Mountain region; Catostomus commersoni, the White sucker; Catostomus latipinnis, the Flannelmouth sucker; and Pantosteus delphinus, the Northern Bluehead sucker. Using these as the basis for identifying the remaining fish, the work continued.

For the computer, the first twenty-five specimens were chosen to provide the data (See Table I). Out of this group there were four Pantosteus and twenty-one Catostomus species with the Pantosteus fitted rather closely together in the majority of their characters. The Catostomus, however, were sharply divided into two major groups, mainly on the basis of lateral line scale counts. These two groups were, of course, the White-sucker with their scale counts ranging from fifty-two to sixty-eight, and the Flannelmouths with their much higher scale count range of ninety-seven to one hundred twenty-one.

The computer singled out one particular group of fish (1,5,11,23) which appeared to be intermediate between the White sucker and Flannelmouth in scale counts ranging from seventy-three to eighty-five along the lateral line.

This group poses somewhat of a problem because of the fact that it only partially follows the trends of the hybrid. Many of its characters are not intermediate as one would hope, leaving a considerable amount of suspision that its origin lies somewhere other than through the process of hybridization. (see Table II) Further doubt is added to the matter by the fact that the individual specimens seem to all intents and purposes good Flannelmouths in general appearance except for their coarse scalation.

Other fish which were singled out as differing from the norm were numbers fourteen, twenty-two, and twenty five. Refering to Table I, these three fish appear to group with the Flannelmouths in characters. Their scalation, while generally higher than usual, do not appear to be excessively so. No outstanding reason for their differentiation from the Flannelmouth group is immediately apparent.

During the second phase using the entire list as the raw data, the same three major groupings were in evidence as were at least two more representatives of the coarse-scaled Flannelmouths. In addition to these, a second group which fails to fit in with one of the major classifications makes its appearance (Specimens 46, 49, and 60). These were noted by their lips which bore an indistinct notch on either side of the mouth, much like but not nearly so pronounced as that of the Pantosteus group.

Number sixty is a small exception to this in that it does not possess the indistinct notch. It, however, does exhibit a hard cartilagenous ridge in its lower jaw, a feature of the genus Pantosteus but absent in the genus Catostomus. Whem the various ranges of characters were established for these specimens (See Table III), it appeared that they were generally intermediate between the White sucker, Catostomus commersoni and the Northern Bluehead, Pantoseus delphinus.

In a further attempt to determine whether the coarse-scaled Flannelmouths were hybrids or previously undescribed species, scales were taken from various areas of the body from these fish and from known White and Flannelmouth suckers. These were then compared for trends in scale shape, number of radii and circuli etc in order toestablish any possible connection between the three. Also added to the test for the purpose of exploring the possibility of the existance of other well-known but previously unrecorded species in the area was the long-nose sucker, Catostomus catostomus.

Attempts to prove any valid connection between the coarse-scaled Flannelmouths and the Long-nose were fruitless. There appeared to be no obvious similarity of scale shape or structure between the two. The second attempt with the White sucker proved to be much more successful. There was an obvious trend toward the same scale shapes and patterns in this instance. Both exhibited the same tendencies in shape

progression, and both were of comparable size in reference to body demensions.

While the scales of the true Flannelmouth were much smaller than those of the coarsed-scaled puzzle fish, they too exhibited the same general shape and structure patterns. In general they tended to be less pointed than the coarse-scaled fish,but otherwise they had the same overall appearance at various body areas.

DISCUSSION

From the given information, it becomes evident that there are only three major species of suckers present in the Black Canyon of the Gunnison; Catostomus latipinnis, and Pantosteus delphinus, both native to the area; and Catostomus commersoni probably introduced by either birds or fishermen. No evidence of suspected species such as the long-nose was found during the course of the study, It remains, then, to make some final statements about the two intermediate groups found to be present in this locale.

The so-called coarse-scaled Flannelmouth suckers present a considerable problem as far as making any definitive statement of ~~its~~ their origin. Their intermediacy between the White and Flannelmouth suckers as far as scale counts and shapes strongly suggests that these individuals represent a simple hybrid between the White and Flannelmouth suckers. The fact that the majority of the remaining characters do not follow the general rule of hybrid intermediacy, however, tends to contradict this belief. In addition, there is the strong resemblance between the coarse-scaled and true Flannelmouths in overall appearance other than scalation. The choice, then, must fall between classifying these fish as new species, as subspecies, or as hybrids.

The occurance of a subspecies with such a radically different scale pattern seems to be the least likely of the possibilities listed above. True, there are striking

similarities between the coarse-scaled and true Flannelmouths. However, the gap between the two in scalation seems easily wide enough to rule this out. The other two possibilities are much less easily discounted.

The idea that the coarse-scaled Flannelmouths represent a previously undescribed species is a very definite possibility. Certainly, as mentioned above, the gap is wide enough to provide some basis for this argument. Many cases exist wherein fish living in the same locale and differing to a comparable degree have been recognized as distinct species. However, the fact remains that the coarse-scaled Flannelmouth is very much an intermediate between the White and true Flannelmouth suckers in scalation. There also remains the possibility that the sample size was too small to provide an acceptably accurate picture of character ranges in some of the other features examined. This writer choses to believe the later possibility, and the assumption that the coarse-scaled Flannelmouths are the result of a hybrid cross between Catostomus commersoni and Catostomus latipinnis. This statement is made with considerable reservation, however, with the purpose of expressing an opinion on the matter, and with the ultimate aim that this serve as a ground work for further study and final resolution of the question.

About the intermediates between Pantosteus delphinus and Catostomus commersoni, there can be little question that they

represent an intergeneric hybrid between these species. Every bit of available evidence points toward this conclusion while little or anything is offered as a sound basis for some alternate argument. It can therefore be said definitely and safely that this group of fishes is the product of hybridization between the White sucker, Catostomus commersomi and the Northern Bluehead sucker, Pantosteus delphinus.

CONCLUSIONS

1. Three basic species of suckers are present in the Black Canyon of the Gunnison River; Catostomus commersoni, the White sucker; Catostomus latipinnis, the Flannelmouth sucker; and Pantosteus delphinus, the Northern Bluehead sucker.
2. A hybrid cross between Catostomus commersoni and Pantosteus delphinus! definitely exists in the area.
3. Intergeneric hybridization between Pantosteus and Catostomus is definitely fact.
4. There is a considerable possibility that a second hybrid group, Catostomus commersoni X Catostomus latipinnis also exists in the area.
5. Catostomus commersoni and Catostomus latipinnis have similar scale structures and shapes except for the considerable difference in their relative size.

APPENDIX

Table I

Speciman	scales l.l.	scales above	dorsal rays	pect. rays	pelvic rays	gill rakers	stnd length	dorsal base	mouth shape
1	85	19	12	16	10	26	426	69	C
2	97	19	10	14	8	32	209	29	P
3	113	25	13	15	10	23	258	46	C
4	108	20	10	13	8	33	268	37	P
5	82	18	12	15	10	26	374	44	C
6	109	23	13	15	10	24	332	59	C
7	98	21	12	15	10	23	320	54	C
8	67	15	10	15	9	26	212	32	C
9	93	19	10	14	9	31	308	43	P
10	94	20	11	14	9	35	287	43	P
11	73	15	10	15	10	27	277	42	C
12	105	28	12	15	10	24	254	47	C
13	103	23	12	15	10	24	366	65	C
14	117	25	12	16	11	25	387	57	C
15	62	10	11	16	10	17	184	28	C
16	66	12	11	16	10	24	224	34	C
17	69	10	11	16	9	25	252	35	C
18	64	12	12	16	10	23	250	38	C
19	64	13	11	15	9	20	225	32	C
20	63	12	12	16	10	25	240	30	C
21	68	13	11	16	9	22	247	58	C

Table I continued

Speciman	l.l.	above	D	P	V	rakers	S.L.	D.B.	mouth
22	121	21	10	17	10	23	221	29	c
23	80	15	10	16	10	27	229	27	c
24	59	12	11	16	10	22	212	35	c
25	107	19	11	16	10	23	259	31	c

Table II

	White sucker		Coarse-Scaled Flannelmouth		Flannelmouth	
	Ave	range	Ave	range	Ave	range
l.l.	65.7	59-68	80.0	73-85	109.1	98-121
above	12.1	10-15	16.8	15-19	23.1	19-28
D	11.1	10-12	10.8	10-12	11.9	10-13
P	15.8	15-16	15.5	15-16	15.4	15-17
V	9.5	9-10	10.0	10	10.1	10-11
rakers	22.7	17-26	26.5	25-26	23.6	23-27

Table III

	White sucker		Notch-lip Group		Blue Head	
	Ave	range	Ave	range	Ave	range
l.l.	65.7	59-68	83.3	73-100	100.6	88-118
	65.7	59-68				
above	12.1	10-15	16.3	14-19	20.7	19-23
D	11.1	10-12	11.0	10-12	10.7	10-12
P	15.8	15-16	15.3	14-16	14.4	13-16
V	9.5	9-10	9.3	9-10	9.0	8-10
rakers	22.7	17-26	26.0	23-28	32.9	26-36

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