A DESCRIPTION OF THE CYPRINID FISH HYBRID, *Clinostomus elongatus* x *Notropis cornutus*

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INTRODUCTION

The spawning habits of the common shiner, *Notropis cornutus* (Mitchill), are well documented (Raney, 1940). Once considered subspecifically distinct from the closely related *Notropis chrysocephalus*, Gilbert (1964) elevated the two taxa to species level. While some have contested Gilbert's (1964) classification (Menzel, 1976; Miller, 1968), it is currently accepted (Robins et al., 1980; Dowling and Moore, 1984). Life history aspects of the redside dace, *Clinostomus elongatus* (Kirkland), are documented by Koster (1939). Hybridization between *N. cornutus* and *C. elongatus* is common (Greene, 1935; Greeley, 1938; Koster, 1939; and Raney, 1940; Schwartz, 1981), but no description has been published.

Koster (1939) observed *N. cornutus* and *C. elongatus* spawning at the same time over the same nests of other minnows, and recorded them as spawning from late May until the first week of June, when occurrences of spawning began to decline. Raney (1940) reported similar spawning dates for *N. cornutus*. Both species are known to spawn over the nests of other fishes, such as *Nocomis micropogon*.

A survey of the fishes of Crooked Creek in the Allegheny River system yielded several specimens which we hypothesized to be hybrids between *N. cornutus* and *C. elongatus*. Both of the parental species are found throughout the Allegheny River system. The purposes of this paper are to provide morphometric, meristic, and descriptive analyses of these specimens. Through these analyses we can determine the parental forms and provide data needed to identify these forms.

MATERIALS AND METHODS

The fishes used were collected in the Allegheny River system in 1980 by Edwin L. Cooper and in 1985 by us, and are stored in The Pennsylvania State University Fish Museum. Morphometric and meristic characters were determined by methods outlined by Hubbs and Lagler (1964). Measurements were made with dial calipers to the nearest 0.1 mm. The mean of each character was determined for each parental species and compared to the mean hybrid value. A hybrid index was then calculated following Hubbs, Hubbs, and Johnson (1943):

$$H = (X_h - U_1/U_2 - U_1) \times 100$$

where H is the hybrid index, X_h is the hybrid value, U_1 is the value for *C. elongatus*, and U_2 is the value for *N. cornutus*. A hybrid index of 50 indicates exact intermediacy; an index value greater than fifty indicates closer affinity to *N. cornutus;* and an index of less than fifty indicates closer affinity to *C. elongatus*. The characters chosen for the hybrid index were significantly different ($P \leq 0.05$) between *C. elongatus* and *N. cornutus* as shown by the Wilcoxon Rank Sum Test.

RESULTS

Table 1 summarizes data for the 14 morphometric and meristic characters used in the analysis. The following characters are intermediate (hybrid index between 30 and 70): number of lateral-line scales, scales

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below the lateral line, predorsal length, pectoral-fin length, and snout length. Three characters are closer to the mean value for *N. cornutus* and six are closer to the mean value for *C. elongatus*. The mean values of five characters are outside the means for either parent. The development of these latter character states is attributed to luxuriance or hybrid vigor (e.g. Mayr, 1971). The following characters were examined but were not significally ($P \leq .05$) different between the parental species: postorbital head length, caudal peduncle depth, caudal peduncle length, and anal, dorsal, pelvic, pectoral-fin rays. The average hybrid index for all characters that were within the range of the parental species is 36.9. When all characters are averaged the hybrid index is 51.7. Since there was individual variation among the hybrids, the hybrid value was calculated for each individual using all of the characters. The individual hybrid indices ranged from 54.3 – 70.7, x = 59.4.

The hybrids are clearly intermediate, although there is moderate variation among individual hybrids (Table 1). The hybrids were determined to be *C. elongatus* x *N. cornutus* rather than *C. elongatus* x *N. chrysocephalus* based on the scale pattern between the head and dorsal fin (i.e. see Gilbert 1964, Cooper 1983). *N. cornutus* in the Allegheny River system has crowded and poorly defined scales in the area between the head and dorsal fin, whereas those of *N. chrysocephalus* are uncrowded and well defined. This hybrid identification is also supported by the fact that no *N. chrysocephalus* were collected in this area.

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Table 1. Comparison of morphometric and meristic characteristics of the hybrid *Notropis cornutus* x *Clinostomus elongatus* with its putative parents.

Character	*C. elongatus* n = 10 Range	X	*N. cornutus* n = 10 Range	X	Hybrid n = 4 Range	X	Hybrid Index X
Standard Length	58.2-66.35	61.46	49.2-70.8	60.5	63.95-69.8	67.06	----
Lateral Line Scales	59-68	63.9	38-41	39.5	49-52	50.5	55.0
Scales above lateral line	10-13	10.9	7-8	7.5	8-9	8.5	70.6
Scales below lateral line	6-7	6.8	5-6	5.1	5-7	6.25	32.3
Caudal Peduncle Scales	10-12	11.2	7-9	8.0	10-11	10.25	29.7
Thousandths of Std. Length							
Head Length	258-284	274	245-273	253	262-282	271.5	11.9
Body Depth	202-235	216	92-274	231	234-256	247	206.7*
Preanal length	677-738	704	660-707	686	678-694	682.8	116.7*
Predorsal length	534-574	552	504-539	514	518-550	531.8	52
Pectoral Fin Length	170-229	197	140-177	160	173-198	184	34.5
Pelvic Fin Length	139-157	150	109-160	133	143-164	151.3	-7.4*
Dorsal Fin Base Length	101-115	107	97-128	116	114-117	116.3	102.8*
Thousandths of Head Length							
Head Depth	350-407	390	390-478	442	336-399	375.5	-27.9*
Snout length	305-337	321	250-304	275	287-311	302.8	39.7
Horizontal Eye Diameter	268-301	282	301-364	327	270-320	384.8	6.6

* Hybrid value outside the range of the parental values.