

Cochran, 1967) was used to determine if the observed values departed significantly from this expected 50:50 ratio. For example, of 73 collections of *N. b. bellus* containing mature adults of both sexes, the largest male was one millimeter or more longer than the largest female in 57; and the reverse was true in 16. The Chi-square analysis shows that the observed data depart significantly from expected values, suggesting that males are usually larger than females.

The species of *Lythrurus* are sexually dimorphic in several proportional measurements. Samples for direct sexual comparison were drawn from a relatively small geographic area (a single drainage when possible) in order to eliminate confounding geographic variation. Only breeding adults in 10-mm size classes were measured, thereby minimizing problems of allometry. Means for each measurement were compared statistically with Student's *t*-test (Snedecor and Cochran, 1967).

Results of these analyses are summarized in Table 2. As in many cyprinids, males tend to have significantly larger fins than females; the pectoral fin is the only exception in *Lythrurus*. Body depth and width measurements are usually greater in breeding females because enlarged ovaries distend their body cavities. Males of most species have deeper and/or longer caudal peduncles than do females, and the orbit is always larger in females than in males.

In *Clinostomus funduloides* Girard the fins are placed more posteriorly in females than in males (i.e., females have greater predorsal, pre-pelvic, and preanal lengths) (Deubler, 1955). Miller (1963:24) found the dorsal fin of female *Gila crassicauda* (Baird and Girard) to be located more posteriorly than that of males, and he further stated that this is generally the case in American cyprinids. Subsequently, this matter has been given little attention. Jenkins and Zorach (1970) found no sexual difference in relative dorsal fin position of *Notropis bifrenatus*. Of the eight forms included in Table 2, females of four have the dorsal fin located more posteriorly than that of males; and females of all have greater pre-pelvic and preanal lengths.

The significance, if any, of isolated instances of sexual dimorphism in proportions (e.g., the longer head of female *N. fumeus*) (Table 2) is enigmatic. Perusal of the data indicates that most of these differences probably are not maintained throughout the range of the species involved.

#### MATERIAL EXAMINED

The institutions from which material was examined are noted in the Acknowledgments section. Specimens studied are listed at the end of the account of each form treated. Collections are recorded by museum number and are arranged according to drainage (and occasionally subsystem), state, and county. Complete locality