Biological Sciences

DISTRIBUTIONAL NOTES ON SOME NORTH FLORIDA FRESHWATER FISHES

GEORGE H. BURGESS (1), CARTER R. GILBERT (1), VINCENT GUILLORY (2), AND DONALD C. TAPHORN (1)

(1) Florida State Museum and Department of Zoology, University of Florida, Gainesville, Florida 32611; and
(2) Florida Game and Fresh Water Fish Commission, 5950 West Colonial Drive, Orlando, Florida 32807

ABSTRACT: *Recent captures of* Notropis cummingsae, Notropis welaka, Ictalurus brunneus, *and* Etheostoma olmstedi *from waters of the St. Johns River drainage are reported, and the disjunct distributions of these species in Florida are discussed. Freshwater distribution of* Lucania parva *in the St. Johns River system is summarized, with a new locality included. Establishment of two exotic fish species.* Xiphophorus variatus *and* Sarotherodon aureus (=Tilapia aurea), *in Gainesville is documented. Known range of* Enneacanthus chaetodon *is extended to Pasco county.*

EXTENSIVE field collections were recently made in the St. Johns River system as part of a survey along the proposed route of the Cross-Florida Barge Canal. The object of the survey was to determine the status of five possibly "rare and endangered" fish species, whose occurrence in the drainage is widely disjunct from their next closest populations: *Notropis cummingsae*, *Notropis welaka*, *Ictalurus brunneus*, *Enneacanthus chaetodon*, and *Etheostoma olmstedi*. This note is a report on the results of this survey and several unrelated collections in the Gainesville area, and also includes previously unpublished locality records of these species and of *Lucania parva* that were listed by McLane (1955) in his doctoral dissertation.

The tessellated darter, *Etheostoma olmstedi* Storer, is found in eastern United States from eastern Massachusetts and southern New Hampshire to the St. Johns River system in Florida (Cole, 1967). Cole considered the St. Johns population to be the subspecies *maculaticeps*. It is abundant throughout its range, except in the St. Johns drainage. Until our survey only 23 specimens had been collected from this drainage, all from a single locality in the Oklawaha River (Davenport Landing, Marion County), with the last known capture on 2 October 1949. We collected 7 specimens of this species from two tributaries of the Oklawaha River: 6 from Orange Creek at state route 315 bridge, Putnam County (5 October 1975, 23 January 1976 and 22 May 1976); and one from Eaton Creek, Marion County, approximately 0.5 mile south of its junction with the Oklawaha River (31 January 1976). *Etheostoma edwini*, *E. fusiforme*, and *Percina nigrofasciata* were also collected at both sites; *E. olmstedi* is now known from 30 specimens and 3 localities in the St. Johns system (Fig. 1).

The systematics of the snail bullhead, *Ictalurus brunneus* (Jordan), were recently clarified by Yerger and Relyea (1968). They gave its range from the Cape Fear River in North Carolina southward to the St. Johns River and west-

Fig. 1. Florida distribution of *Etheostoma olmstedi*.

ward into Alabama in the Apalachicola River system. In the St. Johns drainage, *I. brunneus* was reported from 7 localities. Collections of this species at 6 new localities during our recent investigations reveal that it is widespread throughout the system (Fig. 2). New capture data are as follows: Oklawaha River, at state route 19 bridge, Putnam County, 25 February 1975 and 15 June 1975 (1 and 1 specimens); Oklawaha River, 1.5 mi. south of Eureka, Marion County, 26 February 1975 and 20 August 1975 (1 and 1 specimens); Eaton Creek, 0.5 mi. south of junction with Oklawaha River, Marion County, 20 July 1975 and 31 January 1976 (2 and 3 specimens); branch of Oklawaha River, 0.5 mi. north of state route 40 bridge, Marion County, 30 January 1976 (1 specimen); Juniper Springs Run, 0.3 mi. east of state route 19 bridge, Marion County, 21 February 1976 (1 specimen); Wekiva River, 1.8 mi. south of state route 46 bridge, Orange-Seminole counties, 20 February 1976 (1 specimen). In addition, Kenneth Relyea (personal communication) collected this species in the St. Johns River at Green Cove

Fig. 2. Florida distribution of *Ictalurus brunneus*. Proximate localities are often represented by a single dot.

Springs, Clay County. All *I. brunneus* here reported were captured using rotenone, electrofishing gear, or fish traps. Snail bullheads are difficult to collect using seines, since they apparently prefer deep holes in channels (McLane, 1955).

Hubbs and Raney (1951) gave the distribution of the dusky shiner, *Notropis cummingsae* Myers, as from the Neuse River in North Carolina southward to the St. Johns River and westward to the Apalachicola River in western Florida and eastern Alabama. Although *N. cummingsae* has been reported from 6 localities in the St. Johns system, it has been found only rarely in recent yr, last being collected on 2 September 1962. We collected 28 dusky shiners in Little Orange Creek, 0.4 mi. east of state route 21, Putnam County, on 13 February 1976 and 22 May 1976; and Robert B. Juul took 80 individuals from two nearby localities in Little Rice Creek, about 5 mi. west of Palatka, Putnam County, on 5 April

Fig. 3. Florida distribution of *Notropis cummingsae*. Proximate localities are often represented by a single dot.

1976. These localities are shown in Fig. 3. *Notropis hypselopterus* and *N. petersoni* were also taken at the former collection site, and *N. hypselopterus* and *N. chalybaeus* at the latter.

We sampled nearly all localities where the bluenose shiner, *Notropis welaka* Evermann and Kendall, had previously been reported in the St. Johns drainage (Fig. 4), but did not collect this species. However, we have examined six specimens (20.3-29.2 mm SL) of the bluenose shiner collected subsequently by T. J. Timmons and K. J. Foote in Alexander Spring Run on 25 September 1976. These specimens, like nearly all others collected from the St. Johns drainage, are juveniles. This suggests that the bulk of the St. Johns *Notropis welaka* population inhabit deep, often congested backwater areas (as noted by Douglas, 1974), and that the few known captures are based on young individuals straying into the main channels. The Alexander Spring Run collection is the first capture of this species in the St. Johns system since 7 April 1956.

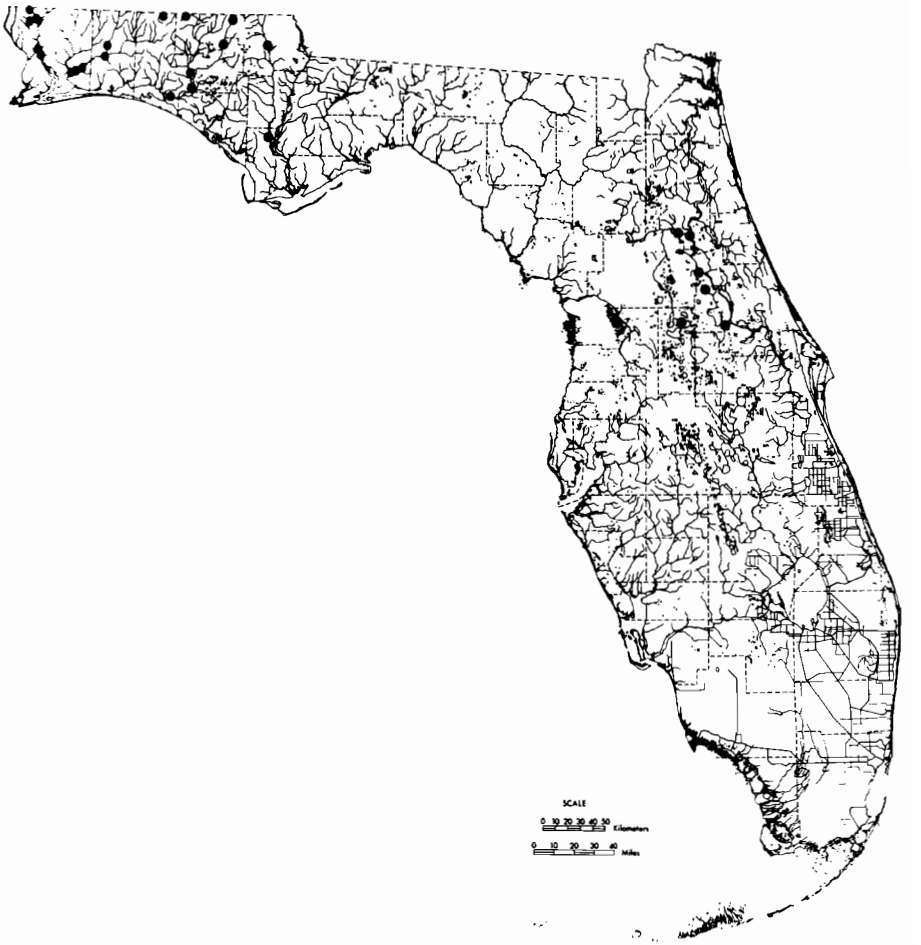

Fig. 4. Florida distribution of *Notropis welaka*. Proximate localities are often represented by a single dot.

The 4 species discussed above are at the southern limits of their ranges in the St. Johns River system. Examination of the Florida distributions of these species (Fig. 1-4) reveals that the St. Johns populations are disjunct relicts that presumably became isolated as a result of Plio-Pleistocene sea level fluctuations described by Alt and Brooks (1965). None of the 4 species is found in the major adjacent river systems (the Suwannee, St. Marys, and Satilla), and only *N. cummingsae* is found in the Aucilla and Ochlocknee rivers.

Parallel distribution patterns are known in other groups of animals, including the mayfly *Baetisca gibberi* (Berner, 1955), and the geminate crayfish species *Procambarus pictus* and *P. youngi* (Hobbs, 1942). Isolation of the *Procambarus* populations has resulted in differentiation to the species level, whereas the mayfly and fish populations have not even reached subspecific levels. These situations do not seem to be exactly comparable to those involving the pugnose

minnow (*Notropis emiliae*) and the largemouth bass (*Micropterus salmoides*), both of which have differentiated into well-defined subspecies in peninsular Florida and are widely distributed throughout the southern part of the state (Gilbert and Bailey, 1972; Bailey and Hubbs, 1949). In contrast to the situation involving the 4 fish species being considered, intergrading populations of *Notropis emiliae* and *Micropterus salmoides* occur in the intervening systems, apparently as a result of isolation and subsequent recolonization. The differences in distribution and degree of differentiation suggest that the peninsular populations of the last 2 species became isolated at an earlier time than did those of the other 4 fish species.

The absence of *E. olmstedi*, *N. cummingsae*, and *N. welaka* from numerous seemingly favorable collecting sites, as well as their unexplained absence from areas where they formerly were found, suggest that these species possibly are undergoing natural extirpation in the St. Johns River drainage. In addition, the abundance and distribution of these fish have been influenced by environmental changes resulting from the partial construction of the Cross-Florida Barge Canal. Several localities (e.g. Deep Creek, part of Orange Creek, and parts of the lower Oklawaha River) formerly inhabited by these species have subsequently been flooded. Such major alterations, as well as subtle changes in water quality, siltation, and seasonal flow regimes that accompany flooding, have certainly affected these organisms.

Previous Florida records of the blackbanded sunfish, *Enneacanthus chaetodon* (Baird), have been limited to 8 Marion County localities, mostly within the boundaries of the Ocala National Forest (Bailey, 1941; Chable, 1947; Reid, 1950; McLane, 1955). We may now report this species from 5 additional Florida sites, plus 2 localities in nearby Georgia waters: unnamed pond on Bexley property, approximately 3.5 mi. southwest of Gowers Corner, R18E, T25S, Sec. 29 (SW quarter), Pasco County, 12 May 1973 (3 specimens); unnamed pond, about 8 mi. south of Leesburg, Lake County, May 1956 (10 specimens); Niggertown Lake, 0.25 mi. south of Ocala National Forest, Marion County, 9 October 1954 (1 specimen); North Prairie, 13.4 air mi. ESE of Silver Springs and about 1.0 mi. north of state route 40, Marion County, 9 May 1973 (17 specimens); borrow pit, 2.5 mi. west of Baxter on state route 2, Baker County, March 1968 (1 specimen); Linton Lake, just west of Aucilla River and approximately 1.0 mi. north of the Florida-Georgia state line, Thomas County, Georgia, 9 September 1967 (2 specimens); and a site adjacent to state route 133, about 4.0 mi. north of Florida-Georgia state line, Thomas County, Georgia, 1974 (1 specimen).

Unlike the 4 previously discussed species, the present disjunct distribution of the blackbanded sunfish in Florida apparently does not directly reflect the effects of Plio-Pleistocene sea level fluctuations (Fig. 5). *Enneacanthus chaetodon* characteristically occupies coastal acid-water areas (Bailey, 1941; Smith, 1953) and would seem entirely capable of recolonizing most lowland areas following a lowering in sea level. However, the distribution of the species is very spotty throughout its range (see map in Jenkins et al., 1975), as well as in Florida, which suggests that some unknown ecological factor(s) may be limiting its dis-

Fig. 5. Florida distribution of *Enneacanthus chaetodon*. Proximate localities are often represented by a single dot.

tribution. Although the blackbanded sunfish has been collected from the Aucilla and Suwannee river drainages in Georgia, it has not been recorded from the Florida portions of these drainages, despite recent collecting efforts by personnel from Florida State University. This may be the manifestation of ecological preferences of the species. Until these critical habitat parameters have been more specifically determined, the distribution of *Enneacanthus chaetodon* will remain an enigma.

The rainwater killifish, *Lucania parva* (Baird), is normally found in brackish waters from Massachusetts to northeastern Mexico (Hubbs and Miller, 1965). Freshwater populations of this species were reported from 3 widely separated localities in the upper St. Johns system by Hubbs and Miller (1965). Relyea (1975) also reported it from Alexander Springs and suggested these populations were "possibly isolated." However, McLane (1955), in his unpublished doctoral disser-

tation, had earlier reported it from 8 other localities in this system, and we hav since found it at one additional locality (Okalawaha River, 0.2 mi. north of stat route 40 bridge, Marion County). The known freshwater distribution of this spe cies in the St. Johns system now extends from Doctors Lake, near Orange Par Clay County, south to Lake Poinsett, west of Cocoa, Brevard County. Thes records suggest that *Lucania parva* probably is distributed throughout much o the St. Johns drainage.

Two species of exotic fishes have recently become established in the Gaines ville region. The variable platyfish, *Xiphophorus variatus* (Meek), is now found in several ponds and sinkholes on the University of Florida campus. The Graham Pond population has been reproducing for at least 6 yr, and some individuals have reverted from bright red and yellow to the somewhat drab natural colo morph. Courtenay et al. (1974) reported establishment of this common aquarium species in Palm Beach, Brevard, Hillsborough, and Manatee counties. Alachua County may now be added to this list.

The blue tilapia, *Sarotherodon aureus* (Steindachner) (= *Tilapia aurea* o many authors) has been established in Lake Alice, also on the University of Flor ida campus, at least since 1969. Males defending their distinctive circular nest were observed in late winter and spring. Blue tilapia have the most extensive distribution of all exotic fishes in Florida (Courtenay et al., 1974) but have not been reported in the St. Johns River System until recently. Holcomb (1974, 1975) reported captures of *S. aureus* (as *T. aurea*) from Lake Apopka, Lake and Orange counties. Florida Game and Fresh Water Fish Commission personnel recently collected *S. aureus* from Lake Jessup, Seminole County, and Lake Monroe, Semi nole, and Volusia counties (William Johnson, personal communication). Tilapia nests, presumably of *S. aureus*, were observed by one of us (C. R. Gilbert) in Blue Springs, Volusia County, in February 1976. A species of tilapia is reportedly established in the St. Johns River not far from Lake George, Volusia County (Waldner and Courtenay, 1974). The disjunct distribution of blue tilapia created by the Lake Alice population suggests local introduction rather than the natural spread of this species that is occurring farther south in central Florida.

It is significant that both Alachua County introductions have occurred in bodies of water receiving heated water effluents or constant temperature spring water. Establishment of exotics (including *S. aureus*) in such artesian springs as Eureka Springs and those that supply Six Mile Creek, Hillsborough County (Waldner and Courtenay, 1974) further indicates that thermostatic springs in the Gainesville area could act as refuges for exotic species possibly unable to survive north Florida winters.

ACKNOWLEDGMENTS—We thank D. Gray Bass, who was instrumental in obtaining support for the project and offered helpful suggestions. Reeve M. Bailey, Mondell Beach, Walter R. Courtenay, Karen J. Foote, Dennis E. Holcomb, William E. Johnson, Robert B. Juul, Kenneth Relyea, Thomas J. Timmons and Ralph W. Yerger kindly shared information. Eugene C. Beckham lent museum specimens for study. This work was supported by U. S. Army Corps of Engineers Con-

tract No. DACW17-75-C-0030 and U. S. Fish and Wildlife Service Contract No. 14-16-0008-950, under the auspices of the Florida Game and Fresh Water Fish Commission.

LITERATURE CITED

ALT, D., AND H. K. BROOKS. 1965. Age of the Florida marine terraces. J. Geology 73:406-411.

BAILEY, R. M. 1941. Geographic variation in *Mesogonistius chaetodon* (Baird), with description of a new subspecies from Georgia and Florida. Occ. Pap. Mus. Zool. Univ. Michigan 454:1-7; 1 pl.

———, AND C. L. HUBBS. 1949. The black basses (*Micropterus*) of Florida with description of a new species. Occ. Pap. Mus. Zool. Univ. Michigan 516:1-40.

BERNER, L. 1955. The southeastern species of *Baetisca* (Ephemeroptera: Baetiscidae). Quart. J. Florida Acad. Sci. 18:1-19.

CHABLE, A. C. 1947. A study of the food habits and ecological relationships of the sunfishes of northern Florida. Master's thesis. Univ. Florida. Gainesville.

COLE, C. F. 1967. A study of the eastern johnny darter, *Etheostoma olmstedi* Storer (Teleostei, Percidae). Chesapeake Sci. 8:28-51.

COURTENAY, W. R., H. F. SAHLMAN, W. W. MILEY AND D. J. HERREMA. 1974. Exotic fishes in fresh and brackish waters of Florida. Biol. Cons. 6:292-302.

DOUGLAS, N. H. 1974. Freshwater Fishes of Louisiana. Claitor's Publ. Div. Baton Rouge.

GILBERT, C. R., AND R. M. BAILEY. 1972. Systematics and zoogeography of the American cyprinid fish *Notropis (Opsopoedus) emiliae*. Occ. Pap. Mus. Zool. Univ. Michigan 664:1-35; 2 pl.

HOBBS, H. H., JR. 1942. The crayfishes of Florida. Univ. Florida Publ. Biol. Sci. Ser. 3(2):1-179.

HOLCOMB, D. E. 1974. Fish population studies. *In* Oklawaha Basin Fisheries Investigations, Florida Game and Fresh Water Fish Comm., First Ann. Perf. Rept., Dingell-Johnson Proj. F-30-1. (Mimeographed). *In FAS Library.*

———. 1975. Fish population studies. *In* Oklawaha Basin Fisheries Investigations, Florida Game and Fresh Water Fish Comm., Second Ann. Perf. Rept., Dingell-Johnson Proj. F-30-2. (Mimeographed). *In FAS Library.*

HUBBS, C. L., AND R. R. MILLER. 1965. Studies of the cyprinodont fishes. XXII. Variation in *Lucania parva*, its establishment in western United States, and description of a new species from an interior basin in Coahuila, Mexico. Misc. Publ. Mus. Zool. Univ. Michigan 127:1-104; 3 pl.

———, AND E. C. RANEY. 1951. Status, subspecies, and variation of *Notropis cummingsae*, a cyprinid fish of the southeastern United States. Occ. Pap. Mus. Zool. Univ. Michigan 535: 1-25; 1 pl.

JENKINS, R. E., L. A. REVELLE, AND T. ZORACH. 1975. Records of the blackbanded sunfish, *Enneacanthus chaetodon*, and comments on the southeastern Virginia ichthyofauna. Virginia J. Sci. 26(3):128-134.

MCLANE, W. M. 1955. The fishes of the St. Johns River system. Ph.D. dissert. Univ. Florida. Gainesville.

REID, G. K. 1950. Notes on the centrarchid fish *Mesogonistius chaetodon elizabethae* in peninsular Florida. Copeia 1950:239-240.

RELYEA, K. 1975. The distribution of the oviparous killifishes of Florida. Sci. of Biol. J. 1(2):49-52.

SMITH, R. F. 1953. Some observations on the distribution of fishes in New Jersey. New Jersey Dept. Conser. Econ. Develop., Div. Fish Game, Fisheries Surv. Rept. 2:165-174.

WALDNER, R. E., AND W. R. COURTENAY. 1974. Correlation of distributions of native and exotic species with oligotrophic and eutropic habitats. *In* Exotic fish investigations, Florida Game and Fresh Water Fish Comm. and Florida Atlantic Univ., Job Final Rept., Dingell-Johnson Proj. F-28. *In FAS Library.*

YERGER, R. W. AND K. RELYEA. 1968. The flat-headed bullheads (Pisces: Ictaluridae) of the southeastern United States, with a new species of *Ictalurus* from the Gulf Coast. Copeia 1968(2): 361-384.