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RECORDS AND DISTRIBUTION PROBLEMS OF FISHES OF THE NORTH, MIDDLE, AND SOUTH FORKS OF THE HOLSTON RIVER, VIRGINIA

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RECORDS AND DISTRIBUTION PROBLEMS OF THE FISHES OF THE NORTH, MIDDLE, AND SOUTH FORKS OF THE HOLSTON RIVER, VIRGINIA

INTRODUCTION

Since 1953 a survey has been made of fishes of the North, Middle, and South Forks of Holston River, Tennessee River system, Virginia. This paper gives records of fishes obtained, notes on drainage history, and distribution problems of Holston River fishes.

THE HOLSTON RIVER BASIN IN VIRGINIA

The North, Middle, and South Forks of Holston River rise in Smyth, Tazewell, and Bland counties, Virginia. The 3 forks flow to the southwest on roughly parallel courses and drain the western portion of the Great Valley.

The North and South Forks join about 5 miles south of the Virginia-Tennessee state line in the vicinity of Kingsport, Tennessee to form the Holston River proper. The Middle Fork is a tributary of the South Fork and joins it about 5 miles southeast of Abingdon, Virginia. The Holston River falls into the Tennessee River 142.2 rivermiles below the junction of the North and South Forks at Kingsport.

Two other great headwater tributaries of the Tennessee River flank the Holston River basin on the north and south. The Clinch-Powell River borders the North Fork of Holston on the north and northwest; in the southeast the Nolichucky River parallels the South Fork of Holston River. To the east and southeast the Holston River heads against the New River system (upper Kanawha River).

HYDROGRAPHY OF NORTH FORK OF HOLSTON RIVER

The North Fork of Holston River drains 729 square miles and is 135.5 rivermiles in length (personal communication, Albert S. Fry). Of this, all but the lower 10 rivermiles is in Virginia.

Since 1930, when gauging station records were kept, there have been major floods. They occurred when discharge at Gate City, Scott County, Virginia exceeded 20,000 cubic feet per second (c.f.s.). These damaging floods came at irregular intervals, some 2, some 11 years apart. The flood peaks were

August 14, 1940	23,700 c.f.s.
February 18, 1944	22,700 c.f.s.
January 8, 1946	21,000 c.f.s.
January 30, 1957	26,200 c.f.s.

The 1957 flood peak exceeded the all-time average flow by 31 times (data from U.S.G.S. Water Supply Papers 1306 for 1958 and 1506 for 1959).

Annual minimum flow ranges from 6 to 15% of the average rate of flow, and the yearly maximum ranges from 6 to 31 times the average rate of discharge (Table 1).

TABLE 1.—Rates of flow in cubic feet per second at 3 gauging stations on the North Fork Holston River in Virginia under average, maximal, and minimal conditions (Wallace, 1944 and 1953; Holmes, 1957; U.S.G.S. Water Supply Papers 1436 and 1506).

Station	Average discharge	Maximum	Minimum discharge	Average annual flood	Average annual minimum flow
Saltville.....	289(1)	10,300(2)	1(3)	5,961(4)	29(5)
Mendota.....	684(6)	19,600(7)	28(8)	10,409(9)	62(10)
Gate City.....	841(11)	26,200(12)	37(13)	14,648(14)	77(15)

(1)1921-57; (2)Jan. 29, 1957; (3)Oct. 15, 16, 1947 (mine cave-in); (4)1921-57; (5)1921-57; (6)1920-31; (7)Feb. 3, 1923; (8)Oct. 3, 1930; (9)1920-31; (10)1920-31; (11)1932-57; (12)Jan. 30, 1957; (13)Dec. 24, 1943 (freeze-up); (14)1932-57; (15)1932-57.

HYDROGRAPHY OF SOUTH AND MIDDLE FORKS OF HOLSTON RIVER

The South and Middle Forks of Holston River together drain an area of 244 square miles. The South Fork extends for 112.6 rivermiles; the Middle Fork for 56.4 rivermiles. The Middle Fork joins the South Fork 62 rivermiles above the union of North and South Forks of Holston River at Kingsport, Tennessee (personal communication, Albert S. Fry).

Flow on the South Fork is controlled at 3 dams, all in Tennessee. These are, in order upstream: Fort Patrick Henry, 2.5 miles upstream from Kingsport; Boone Dam, 10 miles southeast of Kingsport; and South Holston Dam, 7 miles southeast of Bristol, Tennessee-Virginia. The latter dam is the only one which impounds South Fork of Holston River in Virginia, where about half of its 24.3 mile reservoir is north of the Virginia-Tennessee state line.

Prior to erection of these dams, the South Fork of Holston River would occasionally flood to levels of 20,000 to more than 30,000 c.f.s. at Bluff City, Tennessee. The three highest peaks occurred early in the twentieth century:

May 22, 1901	30,700 c.f.s.*
February 28, 1902	24,500 c.f.s.*
June 14, 1907	21,400 c.f.s.*

The flood of May 22, 1901 exceeded the 50-year average rate of flow by a factor of 26. Yearly minimum discharge ranges from 10 to 45% of the all-time average rate of flow (Table 2).

*Data from U.S.G.S. Water Supply Paper 1306 for 1958.

TABLE 2.—Rates of flow in cubic feet per second at gauging stations at Middle and South Forks of Holston River (Wallace, 1944 and 1953; Holmes, 1957; U.S.G.S. Papers 1436, 1506, and 1306).

Station	Average discharge	Maximum	Minimum discharge	Average annual flood	Average annual minimum flow
MIDDLE FORK:					
Groseclose.....	9.04(1)	813(2)	1.8(3)	280(4)	3.2(5)
Sevenmile Ford	160(6)	5,020(7)	9(8)	3,788(9)	29(10)
Meadowview.....	231(11)	6,650(12)	6(13)	4,049(14)	29(15)
SOUTH FORK:					
Riverside.....	107(16)	6,000(17)	2(18)	2,014(19)	21(20)
Vestal.....	455(21)	15,000(22)	30(23)	7,461(24)	850(25)

(1)1947-57; (2)July 6, 1953; (3)Jan. 24, 1948 (result of freeze-up); (4)1947-57; (5)1947-57; (6)1942-57; (7)Jan. 29, 1957; (8)Sept. 26, 1944; (9)1942-57; (10)1942-57; (11)1931-53; (12)Feb. 18, 1944; (13)Times 1933, 36, 40, 42, 43; (14)1931-53; (15)1931-53; (16)1920-31, 1942-50; (17)June 12, 1923; (18)Aug. 26, Oct. 15, 1943; August 9, 11, 1944; Oct. 19, 1945; (19)1921-57; (20)1921-57; (21)1931-59; (22)March 18, 1955; (23)Oct. 14, 1941, Dec. 24, 1943; (24)1932-57; (25)1932-57.

STREAM CAPTURES BETWEEN THE NEW AND HOLSTON RIVERS

Although the Watauga River is a tributary of the Holston River in Tennessee, the writers have made no careful study of its fishes, nor of possible cases of stream capture between the Watauga and New rivers. Elsewhere, stream capture is suspected at 2 places: in the Holston River basin wherein New River gained drainage at the expense of Holston River (Burkes Garden, Virginia); and where the Holston River was the pirate (Sugar Grove, Virginia) and New River lost a certain amount of drainage.

Cooper (1944: 227) gave evidence that Roaring Fork of Laurel Fork of the North Fork of Holston River once drained Burkes Garden, Tazewell County, Virginia. The headwaters of Roaring Fork were captured, however, by Wolf Creek of the New River, which now drains Burkes Garden through Mill Gap at Gose Mills on the north side of the valley. Roaring Fork formerly drained through Heninger Gap, now a wind gap, on the west side of the valley. Figures 1a and 1b illustrate the probable changes involved.

The Middle Fork of Holston River is separated by a low divide from the New River drainage on the Wythe-Smyth county line. There is little evidence of stream capture here. This divide appears to have been stable with little or no migration for some time, as present stream gradients on both sides of the divide are about equal.

The South Fork of Holston River heads against Cripple Creek of New River in the vicinity of Sugar Grove, Smyth County, Virginia. Most headwater tributaries of the South Fork show abrupt changes in direction of flow before assuming courses to the southwest. These appear to be barbed tributaries, suggesting that flow once went eastward to Cripple Creek. The headwaters of the South Fork at Sugar Grove lie in a wide, flat-bottomed valley which shows characteristics of mature erosion. The shape of the valley, however, is unusual in that it widens toward Cripple Creek, but narrows to the southwest in the direction of flow of the South Fork. About 2½ miles south-

(8)

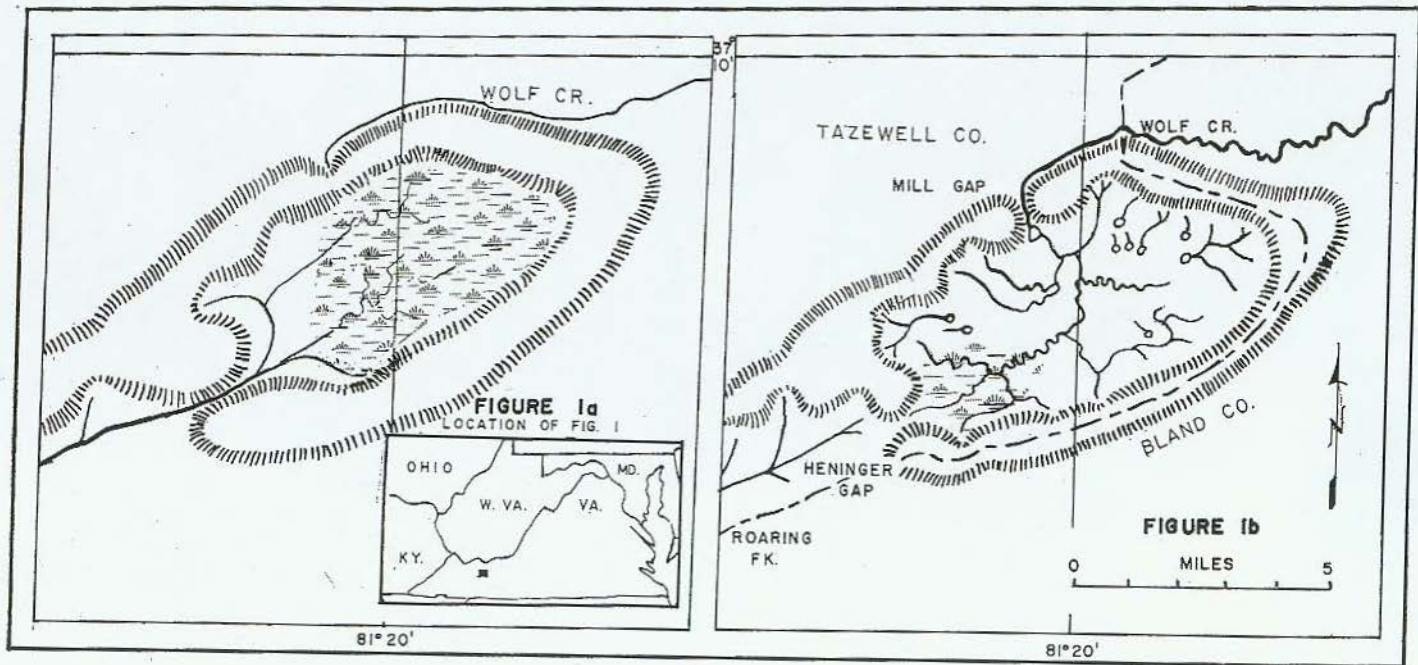


Fig. 1. Stream capture at Burkes Garden, Tazewell County, Virginia. Fig. 1a: Prior to capture, drainage by Roaring Fork of Holston River. Fig. 1b: Present drainage by Wolf Creek of New River.

east of Adwolf, Smyth County, the South Fork of Holston passes a narrow watergap between Rich and Barton mountains. This watergap appears to be more youthful than the valley at Sugar Grove. It appears that Cripple Creek once drained the eastern slopes of Rich and Barton mountains and the Sugar Grove valley east to New River. The youthful South Fork of Holston River then penetrated its watergap in these mountains, and, by a series of headwater captures, pirated the upper part of Cripple Creek and diverted flow to the southwest. Figures 2a and 2b show these postulated drainage changes.

Biological evidence adds weight to these findings. The New River piracy at Burkes Gardens involved perhaps a 2-way, certainly a 1-way, transfer of fishes. Two species of fishes native to New River were found in the North Fork of Holston River. *Noturus insignis atrovus* (heretofore unrecorded from any part of the Tennessee River system) was found in the North Fork 1.8 miles east of Broadford, Smyth County, on July 17, 1954 and again at Chatham Hill, Smyth County, August 5, 1954.

Another New River fish, *Chrosomus oreas* was taken from a small tributary of North Fork of Holston River 1 mile north of Pine Grove, Washington County, Virginia on July 2, 1955. Subsequent search has failed, however, to relocate either of these 2 species in the Holston drainage at any point, and it may be that these were introduced by human agency. The record of *Chrosomus oreas* bears no relation to discovery of an apparently new subspecies of *Chrosomus oreas* found in Great Smoky Mountains National Park (reported herein, page 12). *C. oreas* specimens of the Holston River conformed closely to New River populations, and were in no way distinct from them.

Another species, the whitetail shiner, *Notropis galacturus*, widespread in the Holston-Tennessee drainage and elsewhere, is now well established in Wolf and Big Walker creeks, tributary to New River. This species was not formerly known from the New River drainage. Apparently this is a case of transfer through the Burkes Garden capture. Ross and Perkins (1959: 30, 33) gave several records of the whitetail shiner from Walker and Wolf creeks of the New River system in Bland, Giles and Pulaski counties, Virginia. Gibbs (1955) studied the cyprinellid minnows to which *Notropis galacturus* is related, but did not report on the whitetail shiner from the New River system.

Gibbs showed (1955: 231-233) that in *N. galacturus* lateral line scales and pectoral ray counts varied more than all other characteristics studied throughout the range of the whitetail shiner. Data for Tennessee River populations (Holston River) of *N. galacturus* compiled by the writers agree closely with those of Gibbs. In lateral line scales, New River (Big Walker Creek population) whitetail shiner overlap Holston River populations broadly with no significant difference of means. In pectoral rays, however, there is a small but significant difference between means of the 2 populations. (Table 3).

If the whitetail shiner had been introduced into the New River drainage by minnow bucket, and if a population became established after such introduction, we might expect: (1) less range of variation than in the parent population, and (2) no significant differences between the parent and the introduced populations in any count or measurement. This, plus the fact that *N. galacturus* occurs in the New River drainage in Wolf Creek, which appears to have been the pirate stream in Burkes Garden, is assumed to be good evidence of transfer across a divide by stream capture.

Piracy of Cripple Creek by the South Fork is supported by discovery of the reddsie dace, *Clinostomus f. funduloides*, widely distributed in New River in

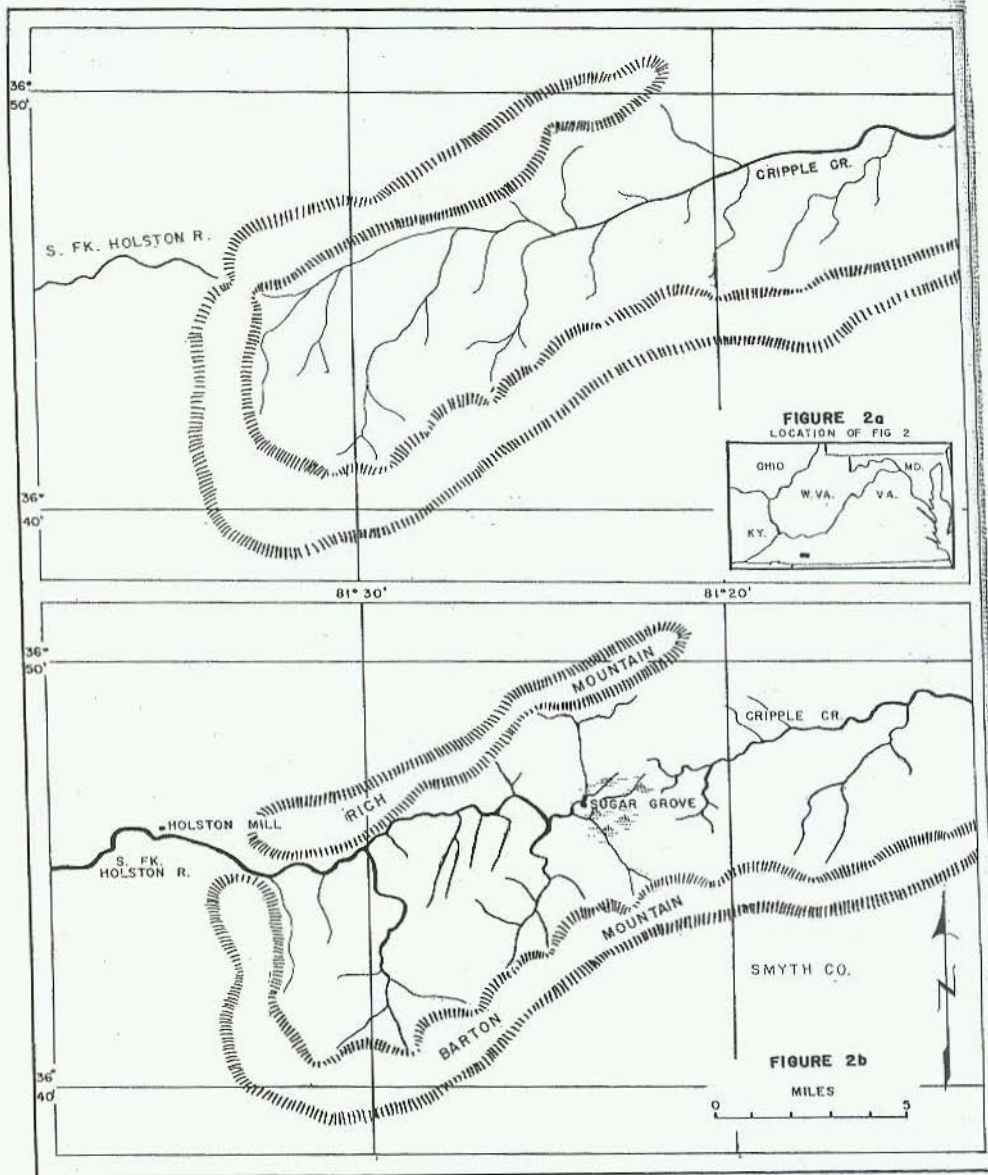


Fig. 2. Stream capture at Sugar Grove, Smyth County, Virginia. Fig. 2a: Prior to capture, drainage to Cripple Creek of New River. Fig. 2b: Present drainage to South Fork of Holston River after beheading of upper Cripple Creek.

TABLE 3.—Comparison of pectoral ray counts and scales in lateral line in populations of *Notropis galacturus* in North Fork of Holston River and Big Walker Creek, New River drainage, Virginia.

	Scales in lateral line												
	35	36	37	38	39	40	41	42	43	N	M	S	E
Holston River.....	—	2	2	7	28	95	62	11	4	211	40.2	1.13	0.07
New River.....	1	3	2	4	11	41	20	9	3	94	40.1	1.74	0.18

	Rays in pectoral fin												
	13	14	15	16	17	18	—	—	—	N	M	S	E
Holston River.....	—	10	121	72	8	1	—	—	—	212	15.4	0.66	0.01
New River.....	3	25	40	6	6	2	—	—	—	82	14.9	1.43	0.16

N—number in sample; M—mean; S—standard deviation; E—standard error.

Dicky Creek, 2.1 miles south of Sugar Grove on Rt. 16, Smyth County, August 15, 1957. Dicky Creek is a tributary of the South Fork of Holston River, and this appears to be a new record for the Tennessee River system.

With this record, 3 subspecies of *Clinostomus funduloides* are now known from the Tennessee River system. Aside from *C. f. funduloides*, there is an undescribed subspecies in the upper Little Tennessee River drainage in and near Great Smoky Mountains National Park (Deubler, 1955: 90-91) and *C. f. estor* in the lower Tennessee drainage (Deubler, 1955: 91-92). Deubler lacked fresh materials of the undescribed subspecies from Little Tennessee River drainage. The following notes are from collections taken from Anthony Creek (or upper Abrams Creek), Cades Cove, Great Smoky Mountains National Park, Blount County, Tennessee, August 2, 1961.

Pharyngeal teeth 2,4/4,2 (*C. f. funduloides* 2,5/4,2, a 5th tooth loose or represented by a scar). Pigment on skin covering premaxillae and maxillae dusky; pigment on tongue dense, covering anterior portion only; peritoneal pigment dark or dusky, large melanophores scattered among finer melanophores giving a "dappled" appearance; dorsum olive brown, a dark middorsal stripe before and behind dorsal fin; a dusky brown dorsolateral stripe above a yellow or golden lateral stripe. A bright blood red band on sides below the yellow stripe, originating as a more or less vertical crescent behind gill opening, tapering abruptly to a narrow band, the margins of which are sharply defined, and terminating at base of caudal fin. Ventrolateral sides and belly white, with many scales flecked with small black melanophores, especially ventrolaterally. Dark deciduous scales scattered over body, more numerous than in *C. elongatus*, but less numerous than in *C. f. funduloides*. Dark band on opercle, head, and snout terminating anteriorly below nostril. Rays of dorsal, caudal, and anal fins dark or dusky edged, the anal lightest of these.

Several other fishes may have used the Burkes Garden and/or Sugar Grove capture, or some other unsuspected theater of piracy between the upper Tennessee and New rivers. *Camptostoma anomalum michauxi*, for example, was once thought to be a synonym of a race of *C. a. anomalum* (Ross, 1952: 127) but now appears to be a fairly wide-ranging subspecies of the Southern Appalachians. This subspecies is represented by more or less distinctive local races in the upper Santee River (Fowler, 1945: 108; Ross, 1952: 127-134); upper

Tennessee River (Ross, 1952: 118-126); upper New, James and Roanoke rivers (Ross, 1952: 190-223; Davis, 1953); and upper Yadkin River (Abbott, 1959: 177-180). The Ohio logperch, *Percina c. caprodes*, which occurs in the Tennessee and Ohio rivers, is another species whose ancestors must certainly have passed from the upper Tennessee through the New River (where it is now extinct) to Roanoke River. There it differentiated to the form known as *Percina rex*, the Roanoke logperch.

Another minnow, apparently an undescribed subspecies of *Chrosomus oreas*, was taken from Cosby Creek Ranger Station, near Cosby entrance to Great Smoky Mountains National Park, Cocke County, Tennessee August 16, 1960 by Dr. Irl D. Wilson, Donald E. Hallinger, Roger Z. Thurman, and R. D. Ross. This subspecies differs from the typical *C. oreas* in that the anterior dark lateral stripe does not decurve towards anal fin, but is straight and terminates above the bases of pelvic fins. This band is also thinner, less heavily pigmented than in *C. oreas*, and does not extend to base of caudal fin as in *C. erythrogaster*.

The fantail darters, *Etheostoma flabellare*, of New River are others which appear to have gained access through the Tennessee River (in part at least). This problem can hardly be understood completely from this statement alone. The senior author's interpretation of the fantail problem (subgenus *Catonotus*) follows.

Catonotus has differentiated into 2 sections. The first—and probably the more primitive—may be called the *cumberlandicum* section, which includes *Etheostoma flabellare cumberlandicum* (Jordan and Swain), *Etheostoma kennicotti* (Putnam), *Etheostoma virgatum*, *Etheostoma obeyense* (Kirsch) and *Etheostoma squamiceps* (Jordan). Members of the *cumberlandicum* section are marked by diffuse or irregular blotches, sometimes by horizontal lines (*E. virgatum*). These darters occur in the lower Tennessee and Cumberland rivers of Alabama, Tennessee, and Kentucky, and are also found in tributaries of the lower Ohio and Mississippi rivers of Illinois and Indiana.

The central Mississippi River valley may have been the ancestral center of differentiation. The subgenus *Catonotus* appears to have evolved from ancestral etheostomines which had 2 anal spines, short first dorsal spines, protrusible premaxillae, an incomplete supratemporal canal (although sometimes complete in some fantail darters), an incomplete infraorbital canal (the pores of which are variable, however, in certain species), an incomplete lateral line system on body, and closely spaced pelvic fins. Color patterns consisted primarily of browns, blacks, yellows or oranges, and (rarely) red pigments (no greens or blues). The head may acquire a slaty or bluish cast in breeding males.

Of these, the most primitive catonotids may be the spottail darters, *Etheostoma squamiceps*, which retain a scaly opercle. Loss of opercular scales followed, as in the barcheek darter, *E. obeyense*, *E. virgatum*, and other catonotids. A still later evolutionary change may have been the bifurcation of the tips of first dorsal spines, as in the stripetail darter *E. kennicotti*, and others listed below. Bifurcated first dorsal spines and a distinctive anal papilla mark the typical catonotids, so that *E. squamiceps*, *E. obeyense*, and *E. virgatum* may represent transitional types.

The second section may be called the *flabellare* section, which includes forms having the characters listed above in *E. kennicotti*, but with a distinctive pat-

tern of dark horizontal stripes or dark vertical bars or both. The *flabellare* section has differentiated into 2 groups.

The first of these is the so-called *barred fantail darters*, which are marked by a series of well defined, vertical, dark bars on sides of body. There are no horizontal stripes. Barred fantail darters have further differentiated into at least 2 subspecies. The typical form is *Etheostoma f. flabellare* Rafinesque, which is distinguished by 9-14 bars. Races of this form occur in the Kentucky River, Kentucky and eastward in the Ohio-Allegheny rivers, the drainages of lakes Erie and Ontario and St. Lawrence River from Ohio eastward to New York, and Ontario and Quebec Provinces, Canada. Other races occur in the Susquehanna, Oswegatchie-Black, and Mohawk-Hudson rivers of New York and south on the Atlantic coast to the James River, Virginia.

Another subspecies of fantail darter is *Etheostoma flabellare brevispinna* (Coker) characterized by 0-10 bars on the sides. Races of *brevispinna* are found in the Saluda-Catawba rivers of North and South Carolina, the Yadkin and Neuse rivers of North Carolina, and the Tennessee River of Tennessee, North Carolina, and Virginia.

Still other populations of barred fantail darters occur in the New (upper Kanawha) and Roanoke rivers of North Carolina and Virginia. These apparently represent intergrades between *E. f. flabellare* and *E. f. brevispinna*, which entered these rivers from the north and south respectively. Parental types and intergrades in New River fantail darters resemble *brevispinna* forms more closely than typical *flabellare* types, whereas the reverse is true of the Roanoke River.

The second member of the flabellare group is *Etheostoma flabellare lineolatum*, which does not occur in Holston River.

RECORDS OF FISHES OF THE NORTH FORK HOLSTON RIVER

Records of the main channel are listed under the counties from which they were taken. Numbers refer to collection numbers of the Virginia Polytechnic Institute Fish Collection.

Bland County, Virginia

(Three collections from 3 locations)

657. 0.5 mile NE of Ceres on Rt. 42. April 20, 1956, F. Burleson and R. D. Ross.
676. Tillson's Mill. April 20, 1956, F. Burleson and R. D. Ross.
678. 0.5 mile from the junction of Rt. 621 and Rt. 622. April 20, 1956, F. Burleson and R. D. Ross.

Smyth County, Virginia

(Twelve collections at 8 locations)

566. 1.8 miles E. of Broadford. July 17, 1954, W. Keeton and R. D. Ross.
568. Bridge 6 miles E. of Saltville; 1 mile E. of North Holston 1.9 miles E. of McCrady. July 17, 1954, W. Keeton and R. D. Ross.
569. Saltville, at bridge just E. of town cemetery. July 17, 1954, W. Keeton and R. D. Ross.
587. 1.2 miles from Chatham Hill on azimuth 77.5°. Aug. 5, 1954, T. M. Smith and R. D. Ross.

588. Chatham Hill. Aug. 5, 1954, T. M. Smith and R. D. Ross.
 589. Riverside, 6 miles from Chatham Hill on azimuth 249°. Aug. 5, 1954, T. M. Smith and R. D. Ross.
 590. At bridge 1.5 miles from Chatham Hill on azimuth 239°. Aug. 5, 1954, T. M. Smith and R. D. Ross.
 591. Location of coll. 569. Aug. 5, 1954, T. M. Smith and R. D. Ross.
 637. Location of coll. 588. July 1, 1955. F. Burleson and R. D. Ross.
 688. 1 mile below Chatham Hill. June 1, 1956, R. Hoffman, F. Burleson, D. Robinson, and R. D. Ross.
 689. Location of coll. 568. June 1, 1956, R. Hoffman, F. Burleson, D. Robinson, and R. D. Ross.
 1024. Location of coll. 589. Sept. 10, 1958, J. T. Wakeman, I. K. Cook, and R. D. Ross.

Washington County, Virginia
 (Thirty-five collections at 15 locations)

382. Holston. Sept. (?), 1955, F. Burleson and R. D. Ross.
 384. Mendota at steel bridge near BM 13-1348. Sept. (?), 1955, F. Burleson and R. D. Ross.
 522. Location of coll. 384. Oct. 8, 1953, T. M. Smith and R. D. Ross.
 523. Location of coll. 384. (Oct. 8); and at Barker Mill, Mendota (Oct. 9). Oct. 8-9, 1953, T. M. Smith and R. D. Ross.
 524. Holston, 1.4 miles E (above) Holston bridge on Rt. 58 crossing, formerly Rt. 19. Oct. 9, 1953, T. M. Smith and R. D. Ross.
 556. Location of coll. 384. June 13, 1954, T. M. Smith and R. D. Ross.
 560. Hayter's Gap and Rt. 80 crossing. July 18, 1954, R. D. Ross.
 562. Location of coll. 384. July 10, 1954, T. M. Smith and R. D. Ross.
 563. 1.7 miles east of Holston at the ford, 0.3 mile W of Mongel Spring. July 10, 1954, T. M. Smith and R. D. Ross.
 593. 6 rivermiles above Hayter's Gap; 6.5 miles below Hertytown bridge W of Saltville. Aug. 6, 1954, R. D. Ross.
 594. 3 rivermiles above Hayter's Gap; 2.3 miles from Hayter's Gap on azimuth 89°. Aug. 6, 1954, T. M. Smith and R. D. Ross.
 595. 2 rivermiles above Hayter's Gap; 2 miles from Hayter's Gap on azimuth 99°. Aug. 6, 1954, T. M. Smith and R. D. Ross.
 596. 1 rivermile above Hayter's Gap; 1 mile from Hayter's Gap on azimuth 123.5°. Aug. 16, 1954, T. M. Smith and R. D. Ross.
 598. Location of coll. 560. Aug. 6, 1954, T. M. Smith and R. D. Ross.
 600. 2.1 miles W of Holston at W end of Hines Island; 1.9 miles from Holston on azimuth 264°. Aug. 6, 1954, T. M. Smith and R. D. Ross.
 601. Location of coll. 384. Aug. 16, 1954, T. M. Smith and R. D. Ross.
 616. Location of coll. 384. Sept. 10, 1954, T. M. Smith and R. D. Ross.
 617. Nordyke bridge. Sept. 10, 1954, T. M. Smith and R. D. Ross.
 618. Fleenor Mill Pond and Ford. Sept. 10, 1954, T. M. Smith and R. D. Ross.
 619. Location of coll. 600. Sept. 10, 1954, T. M. Smith and R. D. Ross.
 620. Location of coll. 563. Sept. 11, 1954, T. M. Smith and R. D. Ross.
 621. Mendota, at the Mill Dam. Sept. 11, 1954, T. M. Smith and R. D. Ross.
 629. Location of coll. 384. June 18, 1955, F. Burleson and R. D. Ross.

634. Location of coll. 384. Aug. 3, 1955, F. Burleson and R. D. Ross.
 639. Location of coll. 384. Oct. 9, 1954, T. M. Smith and R. D. Ross.
 641. 2 miles below Saltville. July 1, 1955, F. Burleson and R. D. Ross.
 647. Location of coll. 563. Aug. 3, 1955, F. Burleson and R. D. Ross.
 648. Location of coll. 560. July 2, 1955, F. Burleson and R. D. Ross.
 653. Location of coll. 560. Aug. 3, 1955, F. Burleson and R. D. Ross.
 659. Location of coll. 384. May 19, 1956, R. D. Ross.
 674. Location of coll. 384. June 2, 1956, R. D. Ross.
 677. Location of coll. 382. June 2, 1956, R. D. Ross.
 743. Location of coll. 384. Aug. 25, 1956, D. Robinson and R. D. Ross.
 922. Location of coll. 560. Oct. 5, 1957, P. C. Holt, B. Abbott, and R. D. Ross.
 923. Near Mongel Spring; 2 miles above Rt. 58 alternate crossing. Oct. 5, 1957, P. C. Holt, B. Abbott, and R. D. Ross.

Scott County, Virginia

(Fourteen collections from 6 locations)

555. 1.2 miles SE of Hilton at the bridge E of Otter House Bluff. June 12, 1954, T. M. Smith and R. D. Ross.
 571. Hilton at steel bridge at Rt. 58 crossing. July 18, 1954, W. Keeton and R. D. Ross.
 603. Holston Mill, above Hilton. Aug. 7, 1954, T. M. Smith and R. D. Ross.
 604. Tenn.-Va. state line. Aug. 7, 1954, T. M. Smith and R. D. Ross.
 613. Foust Ford, below Hilton. Aug. 18, 1954, T. M. Smith and R. D. Ross.
 614. Location of coll. 603. Aug. 31, 1954, T. M. Smith and R. D. Ross.
 630. Location of coll. 604. Aug. 4, 1955, F. Burleson and R. D. Ross.
 638. Location of coll. 604. June 17, 1955, F. Burleson and R. D. Ross.
 640. Location of coll. 571. Oct. 9, 1955, F. Burleson and R. D. Ross.
 642. Location of coll. 603. July 2, 1955, F. Burleson and R. D. Ross.
 645. Location of coll. 603. June 18, 1955, F. Burleson and R. D. Ross.
 656. Location of coll. 604. July 1, 1955, F. Burleson and R. D. Ross.
 660. U. S. Rt. 23 crossing. May 19, 1956, F. Burleson and R. D. Ross.
 673. Location of coll. 660. June 2, 1956, R. D. Ross.

Hawkins-Sullivan County Line, Tennessee

(Five collections from 4 locations)

554. Above the mouth, about 0.3 mile N of Rt. 11 crossing. June 12, 1954, T. M. Smith and R. D. Ross.
 558. Above the mouth, about 0.2 mile N of Rt. 11 crossing. July 9, 1954, T. M. Smith and R. D. Ross.
 559. $\frac{1}{4}$ mile S of Va.-Tenn. state line, above cantilever bridge on Cleveland-Morrison City road. July 9, 1954, T. M. Smith and R. D. Ross.
 611. 0.5 mile above the mouth. Aug. 31, 1954, T. M. Smith and R. D. Ross.
 612. Location of coll. 559. August 31, 1954, T. M. Smith and R. D. Ross.

These collections are summarized together:

Lamprey family, Petromyzontidae.

American brook lamprey, *Lampetra lamottei*, 1024.

Herring family, Clupeidae.

Gizzard shad, *Dorosoma cepedianum*, 558, 559.

Sucker family, Catostomidae.

Northern hog sucker, *Hypentelium nigricans*, 382, 588, 604, 616, 639, 656, 676, 678, 688, 689, 743, 1024.

Black redbhorse, *Moxostoma duquesnei* subsp., 568, 588, 590, 688, 689, 1024.

Minnow family, Cyprinidae.

Stoneroller, *Campositoma anomalum michauxi*, 556, 559, 562, 566, 569, 588, 589, 591, 630, 638, 645, 656, 676, 678, 688, 689, 922, 1024.

Carp, *Cyprinus carpio*, 923.

Bigeye chub, *Hybopsis a. amblops*, 382, 522, 523, 524, 559, 566, 568, 569, 587, 588, 589, 590, 591, 600, 603, 604, 613, 619, 630, 638, 642, 647, 656, 688, 922, 1024.

River chub, *Hybopsis micropogon*, 522, 559, 587, 588, 589, 590, 604, 611, 612, 678, 688, 689, 1024.

Spotfin chub, *Hybopsis monacha*, 554, 558, 559.

Streamline chub, *Hybopsis dissimilis*, 559, 566, 630, 1024.

Popeye shiner, *Notropis ariommus telescopus*, 522, 523, 559, 587, 588, 589, 618, 642, 648, 656, 743.

Warpaint shiner, *Notropis coccogenis*, 382, 384, 555, 556, 558, 559, 562, 566, 587, 588, 589, 590, 591, 604, 630, 638, 653, 678, 688, 1024.

Central common shiner, *Notropis cornutus crysocephalus*, 523, 524, 556, 559, 563, 566, 568, 587, 588, 589, 590, 591, 600, 601, 604, 630, 634, 647, 656, 659, 676, 688, 743, 1024.

Whitetail shiner, *Notropis galacturus*, 382, 384, 522, 523, 524, 556, 559, 562, 563, 566, 568, 569, 587, 588, 589, 590, 591, 600, 601, 603, 604, 612, 613, 614, 618, 620, 629, 634, 639, 640, 647, 653, 688, 743, 1024.

Tennessee shiner, *Notropis leuciodus*, 522, 523, 556, 559, 566, 568, 588, 590, 600, 604, 614, 619, 630, 1024.

Rosyface shiner, *Notropis rubellus* subsp., 382, 522, 523, 558, 559, 562, 563, 600, 618, 689.

Silver shiner, *Notropis photogenis*, 1024.

Saffron shiner, *Notropis rubricroceus*, 619, 676, 678, 688.

Mirror shiner, *Notropis spectrunculus*, 688.

Stargazing minnow, *Phenacobius uranops*, 588, 590, 603, 630, 689, 1024.

Bluntnose minnow, *Pimephales notatus*, 588.

Western blacknose dace, *Rhinichthys atratulus obtusus*, 657.

North American freshwater catfish family, Ictaluridae.

Blackbordered eastern madtom, *Noturus insignis atrorus*, 566, 588.

Killifish family, Cyprinodontidae.

Northern studdfish, *Fundulus catenatus*, 382, 523, 563, 590, 593, 594, 595, 596, 598, 600, 603, 612, 614, 619, 620, 621, 639, 641, 645, 647, 648, 656, 743, 922, 923.

Sunfish family, Centrarchidae.

Northern rock bass, *Ambloplites r. rupestris*, 382, 522, 523, 556, 559, 562, 563, 568, 588, 590, 600, 601, 614, 619, 620, 629, 638, 639, 642, 645, 648, 653, 656, 677, 688, 689, 922, 923, 1024.

Longear sunfish, *Lepomis m. megalotis*, 384, 523, 554, 556, 559, 562, 571, 588, 590, 600, 601, 603, 611, 612, 613, 616, 619, 629, 630, 634, 639, 640, 641, 642, 647, 653, 656, 659, 660, 673, 674, 743, 923, 1024.

Northern smallmouth bass, *Micropterus d. dolomieu*, 382, 384, 523, 556, 559, 560, 562, 563, 568, 569, 587, 588, 589, 590, 591, 600, 601, 611, 612, 613, 616, 617, 619, 620, 629, 630, 634, 638, 639, 641, 642, 645, 647, 648, 653, 656, 689, 743, 922, 923, 1024.

Perch family, Percidae.

Greenside darter, *Etheostoma blennioides* subsp., 382, 522, 523, 555, 559, 588, 630, 640, 656, 1024.

Redline darter, *Etheostoma rufilineatum*, 382, 522, 523, 524, 555, 556, 559, 588, 590, 601, 604, 612, 639, 656, 678, 688, 922, 1024.

Tennessee snubnose darter, *Etheostoma simoterum*, 522, 523, 524, 556, 558, 559, 587, 600, 604, 612, 620, 642, 656, 678, 743.

Yellow darter, *Percina aurantiaca*, 614.

Logperch, *Percina caprodes* subsp., 574.

Sculpin family, Cottidae.

Banded sculpin, *Cottus carolinae* subsp., 522, 589, 657, 678, 688, 1024.

Records of the tributaries are listed under the streams from which they were taken:

Possum Creek (Smyth Co.)

675. At Rt. 42 crossing, 1 mile E of mouth of Lick Creek. April 20, 1956, F. Burleson and R. D. Ross.

Laurel Creek (Smyth and Tazewell Cos.)

561. 4.4 miles NE of Broadford; $\frac{1}{4}$ mile SE of Tannersville. July 17, 1954, W. Keeton and R. D. Ross.
564. 11.8 miles NE of Broadford on Rt. 16 crossing. July 17, 1954, W. Keeton and R. D. Ross.
567. 0.5 mile N of Broadford on Rt. 91, just S of Tazewell-Smyth Co. line, 1.5 miles above mouth of the creek. July 17, 1954, W. Keeton and R. D. Ross.
668. Location of Coll. 567. May 20, 1956, F. Burleson and R. D. Ross.

Robertson Creek (Smyth Co.)

672. A branch of Robertson Cr. 1.5 miles W. of Saltville. May 18, 1956, F. Burleson and R. D. Ross.

McHenry Creek (Washington Co.)

671. 1 mile SE Plasterco on Rt. 81. May 18, 1956, F. Burleson and R. D. Ross.

Tumbling Creek (Washington Co.)

592. Tumbling Cr. 6.2 miles from Glade Spring on azimuth 324.5°. Aug. 6, 1954, T. M. Smith, J. Cooper, and R. D. Ross.
649. Location of Coll. 592. Aug. 3, 1956, F. Burleson and R. D. Ross.
664. 6 miles W of Saltville; 3.2 airmiles NE of Clinchburg. May 18, 1956, F. Burleson and R. D. Ross.

Wolf Creek (Washington Co.)

597. Hayter's Gap, at small bridge over the creek just below town. Aug. 6, 1954, T. M. Smith and R. D. Ross.
665. West Fork of Wolf Creek 0.7 mile E of Hayter's Gap. May 18, 1956, F. Burleson and R. D. Ross.
666. East Fork of Wolf Creek 3 miles NE of Hayter's Gap near Henderson School at bridge. May 18, 1956, F. Burleson and R. D. Ross.
679. Small tributary of the East Fork of Wolf Creek near Hayter's Gap. April 21, 1956, F. Burleson and R. D. Ross.

Toole Creek (Washington Co.)

667. $\frac{1}{4}$ mile above mouth of the creek in North Fork Holston River. May 19, 1956, F. Burleson and R. D. Ross.

Brumley Creek (Washington Co.)

599. 3.7 miles from Holston on azimuth 72°. Aug. 6, 1954, T. M. Smith and R. D. Ross.

Smith Creek (Washington Co.)

622. 1 mile above mouth of creek. Sept. 11, 1954, T. M. Smith and R. D. Ross.
661. 2 miles above mouth of creek. May 19, 1956, F. Burleson and R. D. Ross.

Nordyke Creek (Washington Co.)

662. $\frac{1}{2}$ mile above mouth of creek. May 19, 1956, F. Burleson and R. D. Ross.
663. 1 mile above mouth of creek. June 2, 1956, F. Burleson and R. D. Ross.

Small Tributary (Washington Co.)

658. 1 mile N Pine Grove, above Fleenor Mill. July 2, 1955, F. Burleson and R. D. Ross.

Abram's Creek (Washington Co.)

602. At mouth of creek near Mendota. Aug. 7, 1954, T. M. Smith and R. D. Ross.

Cove Creek (Scott Co.)

570. 4.5 miles SW of Mendota on Rt. 58. July 18, 1954, W. Keeton and R. D. Ross.

Big Moccasin Creek (Scott and Russell Cos.)

565. 0.4 mile above mouth; 1.9 miles NE of Morrison City. July 9, 1954, T. M. Smith and R. D. Ross.
572. 1.5 miles E of Gate City on Rt. 23 at Southern Railroad bridge. July 18, 1954, W. Keeton and R. D. Ross.
573. 1.8 miles NE of Gate City on Rt. 71 crossing. July 18, 1954, W. Keeton and R. D. Ross.

574. Rt. 74-71 junction, 1 mile E of Snowflake; 2.6 miles N of Hilton.
July 18, 1954, W. Keeton and R. D. Ross.
910-913. McConnell Mill about 8 miles NE Gate City; 3 airmiles from
Hilton on azimuth 20°. Oct. 6, 1957, P. C. Holt, B. Abbott, and
R. D. Ross.

Possum Creek (Scott Co.)

742. Below Cleveland School. August 25, 1956, D. Robinson and R.
D. Ross.

These collections are summarized together:

Sucker family, Catostomidae.

- White sucker, *Catostomus c. commersoni*, 572, 597, 602, 663.
Northern Hog sucker, *Hypentelium nigricans*, 561, 602, 622, 649, 662,
663, 666, 668, 675, 910-13.
Black redhorse, *Moxstoma duquesnei*, 561, 565, 668, 910-13.

Minnow family, Cyprinidae.

- Stoneroller minnow, *Campostoma anomalum michauxi*, 561, 564, 565, 567,
572, 573, 592, 599, 602, 622, 649, 661, 662, 663, 664, 666, 668,
671, 672, 675, 679, 910-913.

Mountain redbelly dace, *Chrosomus oreas*, 658.

Bigeye chub, *Hybopsis a. amblops*, 561, 564, 567, 574, 597, 602, 622,
663, 665, 666, 668, 679, 910-913.

River chub, *Hybopsis micropogon*, 561, 564, 567, 572, 573, 597, 668,
675, 910-913.

Popeye shiner, *Notropis ariommus telescopus*, 561, 564, 567, 572, 592,
597, 664, 665, 679.

Warpaint shiner, *Notropis coccogenis*, 561, 564, 565, 567, 570, 572,
574, 597, 599, 622, 662, 668, 675, 679, 910-913.

Central common shiner, *Notropis cornutus chrysocephalus*, 561, 565, 567,
570, 572, 574, 597, 602, 622, 661, 662, 663, 665, 666, 667, 668,
675, 679, 910-913.

Whitetail shiner, *Notropis galacturus*, 561, 564, 565, 567, 570, 572,
573, 574, 592, 597, 599, 602, 622, 649, 662, 663, 666, 667, 668,
910-913.

Tennessee shiner, *Notropis leuciodus*, 561, 564, 565, 567, 572, 574, 649,
668.

Rosyface shiner, *Notropis rubellus* subsp., 602.

Saffron shiner, *Notropis rubricroceus*, 661, 664, 665, 675, 679.

Mirror shiner, *Notropis spectrunculus*, 910-913.

Bluntnose minnow, *Pimephales notatus*, 910-913.

Western blacknose dace, *Rhinichthys atratulus obtusus*, 565, 664, 666, 671,
672, 675.

Northern creek chub, *Semotilus a. atromaculatus*, 658, 664, 675.

Killifish family, Cyprinodontidae.

Northern studfish, *Fundulus catenatus*, 622, 665, 668, 679.

Sunfish family, Centrarchidae.

Northern rock bass, *Ambloplites r. rupestris*, 574, 592, 599, 602, 622,
663, 666, 671, 910-913.

Northern bluegill sunfish, *Lepomis m. macrochirus*, 599, 910-913.

Central longear sunfish, *Lepomis m. megalotis*, 597, 599, 602, 622, 658,
663.

- Northern smallmouth bass, *Micropterus d. dolomieu*, 564, 570, 572, 597, 602, 622, 649, 662, 663, 910-913.
- Northern largemouth bass, *Micropterus s. salmoides*, 910-913.
- Perch family, Percidae.
- Greenside darter, *Etheostoma blennioides* subsp., 572, 622.
- Fantail darter, *Etheostoma flabellare brevispinna*, 666, 668, 671, 675.
- Redline darter, *Etheostoma rufilineatum*, 561, 572, 602, 662, 663, 665, 667, 668, 675, 679.
- Tennessee snubnose darter, *Etheostoma simoterum*, 561, 564, 565, 572, 622, 664, 665, 667, 668, 679.
- Sculpin family, Cottidae.
- Banded sculpin, *Cottus carolinae* subsp., 564, 572, 602, 622, 661, 663, 675.

RECORDS OF FISHES OF THE MIDDLE FORK HOLSTON RIVER

Main channel was sampled 7 times at 6 places
(all collections taken from Smyth County, Virginia)

584. 0.3 mile W of Sevenmile Ford on Rt. 11. July 31, 1954, W. Keeton and R. D. Ross.
605. Mt. Zion Church, 4.5 miles from Marion railroad station on azimuth 265°. Aug. 11, 1954, M. H. Ross and R. D. Ross.
610. 1 mile W of Marion. Aug. 18, 1954, M. H. Ross and R. D. Ross.
741. 2.5 miles E of Marion on Rt. 11 just below Mt. Carmel Church near BM 2208. Aug. 24, 1956, D. Robinson and R. D. Ross.
744. Above Chilhowie, 1 mile below Sevenmile Ford. Aug. 26, 1956, D. Robinson and R. D. Ross.
892. Location of Coll. 744. Sept. 6, 1957, J. T. Wakeman, I. K. Cook, and R. D. Ross.
1026. Location of 584. Sept. 9, 1958, J. T. Wakeman, I. K. Cook, and R. D. Ross.

Hungry Mother creek was sampled 6 times in 2 places
(Smyth County, Virginia)

218. Hungry Mother Lake. Aug. 29, 1952, R. G. Martin.
223. Location of 218. Aug. 23, 1952, R. G. Martin.
225. Location of 218. Aug. 29, 1952, R. G. Martin.
284. Location of 218. July 28, 1952, R. G. Martin.
296. Location of 218. Aug. 29, 1952, R. G. Martin.
1008. 1.4 miles NW of Marion. Aug. 5, 1958, J. T. Wakeman, I. K. Cook, and R. D. Ross.

Bear Creek was sampled twice at 2 places (Smyth County)

583. 0.5 mile N of Rt. 11; 1.1 miles W of Atkins on County Road 622 to mouth of Bear creek. July 31, 1954, W. Keeton and R. D. Ross.
979. 0.8 mile NW of Atkins. Aug. 5, 1958, J. T. Wakeman, I. K. Cook, and R. D. Ross.

Nick's Creek was sampled once (Smyth County)

1007. 0.8 mile SSW, Atkins. Aug. 5, 1958, J. T. Wakeman, I. K. Cook, and R. D. Ross.

These collections are summarized together:

Sucker family, Catostomidae.

- White sucker, *Catostomus c. commersoni*, 583, 584, 979, 1026.
Northern hog sucker, *Hypentelium nigricans*, 583, 584, 605, 610, 979, 1007, 1026.
Black redhouse, *Moxostoma duquesnei*, 584, 605, 1026.

Minnow family, Cyprinidae.

- Stoneroller, *Campostoma anomalum michauxi*, 218, 583, 584, 605, 979, 1007, 1008, 1026.
Bigeye chub, *Hybopsis a. amblops*, 218, 583, 584, 605, 979, 1026.
River chub, *Hybopsis micropogon*, 218, 584, 605, 1026.
Streamline chub, *Hybopsis dissimilis*, 584, 605, 1026.
Popeye shiner, *Notropis ariommus telescopus*, 583, 979.
Warpaint shiner, *Notropis coccogenis*, 584, 605, 1008, 1026.
Central common shiner, *Notropis cornutus chrysocephalus*, 583, 584, 605, 979, 1008, 1026.
Sand shiner, *Notropis stramineus*, 605.
Whitetail shiner, *Notropis galacturus*, 218, 225, 296, 605, 1008, 1026.
Tennessee shiner, *Notropis leuciodus*, 584, 605, 1026.
Rosyface shiner, *Notropis rubellus* subsp., 584.
Silver shiner, *Notropis photogenis*, 1026.
Saffron shiner, *Notropis rubricroceus*, 583, 605, 979, 1007.
Mirror shiner, *Notropis spectrunculus*, 583, 979.
Stargazing minnow, *Phenacobius uranops*, 584, 1026.
Bluntnose minnow, *Pimephales notatus*, 584, 1026.
Western blacknose dace, *Rhinichthys atratulus obtusus*, 583, 979, 1007.

Sunfish family, Centrarchidae.

- Northern rock bass, *Ambloplites r. rupestris*, 284, 583, 584, 605, 979, 1008, 1026.
Redbreast sunfish, *Lepomis auritus*, 218, 225, 284, 296.
Pumpkinseed, *Lepomis gibbosus*, 218, 223, 225, 284, 296, 979, 1008.
Northern bluegill, *Lepomis m. macrochirus*, 284, 605, 1008.
Longear sunfish, *Lepomis m. megalotis*, 1008, 1026.
Northern smallmouth bass, *Micropterus d. dolomieu*, 225, 284, 296, 584, 1008, 1026.
Northern largemouth bass, *Micropterus s. salmoides*, 218, 225, 284, 296, 1008.

Perch family, Percidae.

- Greenside darter, *Etheostoma blennioides*, 584, 1026.
Fantail darter, *Etheostoma flabellare brevispinna*, 979, 1007.
Redline darter, *Etheostoma rufilineatum*, 584, 605.
Tennessee snubnose darter, *Etheostoma simotereum*, 583, 584, 605, 979, 1008, 1026.

Sculpin family, Cottidae.

- Banded sculpin, *Cottus carolinae*, 584, 605, 979, 1007, 1008.

RECORDS OF FISHES OF THE SOUTH FORK HOLSTON RIVER

Main channel was sampled 13 times at 6 places

(Smyth County, Virginia)

204. South Holston Reservoir. Sept. 1, 1951, R. G. Martin.
211. Location of coll. 204. Sept. 1, 1951, R. G. Martin.
286. South Holston Reservoir, near Wheeler's Dock. July 28, 1958, R. G. Martin.
287. Location of coll. 204. Aug. 28, 1952, R. G. Martin.
288. Location of coll. 204. Aug. 28, 1952, R. G. Martin.
289. Location of coll. 204. Sept. 1, 1951, R. G. Martin.
299. Location of coll. 204. August 27, 1952, R. G. Martin.
585. 0.8 mile W of Teas, 3 miles W of Sugar Grove. July 31, 1954, W. Keeton and R. D. Ross.
586. About 1 mile E of Holston Mill, 6 miles from Marion railroad station on azimuth 216° ; 3 miles S of McMullin on U. S. Highway 58. July 31, 1954, W. Keeton and R. D. Ross.
606. 3.3 miles from Chilhowie railroad station on azimuth 144.5° at St. Claire Bottom. Aug. 11, 1954, M. H. Ross and R. D. Ross.
607. 7.2 miles from Marion railroad station on azimuth 230° ; 2.1 miles SW of Adwolf on Rt. 58. Aug. 11, 1954, M. H. Ross and R. D. Ross.
608. 1.6 miles W of Sugar Grove. Aug. 18, 1954, M. H. Ross and R. D. Ross.
609. Location of coll. 585. Aug. 18, 1954, M. H. Ross and R. D. Ross.

Dicky Creek was sampled once (Smyth County)

864. Off Rt. 16, 2.1 miles S of Sugar Grove. Aug. 14, 1957, J. T. Wakeman, I. K. Cook, and R. D. Ross.

Comer's Creek was sampled once (Smyth County)

838. Hurricane Branch or Hurricane Creek, tributary of Comer's Creek, 5.5 airmiles SW of Sugar Grove. Aug. 30, 1957, J. T. Wakeman, I. K. Cook, and R. D. Ross.

These collections are summarized together:

Trout family, Salmonidae.

Brook trout, *Salvelinus fontinalis*, 585.

Rainbow trout, *Salmo gairdneri*, 838, 864.

Sucker family, Catostomidae.

White sucker, *Catostomus c. commersoni*, 606.

Northern hog sucker, *Hypentelium nigricans*, 606, 864.

Black redhorse, *Moxostoma duquesnei*, 211, 286, 287, 288.

Minnnow family, Cyprinidae.

Stoneroller, *Campostoma anomalum michauxi*, 606, 608, 864.

Rösyzide dace, *Clinostomus f. funduloides*, 864.

Carp, *Cyprinus carpio*, 288, 289.

Bigeye chub, *Hybopsis a. amblops*, 606, 607.

River chub, *Hybopsis micropogon*, 204, 607.

- Popeye shiner, *Notropis ariommus telescopus*, 585, 606, 607, 608, 609.
 Warpaint shiner, *Notropis coccogenis*, 606, 607.
 Central common shiner, *Notropis cornutus chrysocephalus*, 606, 607.
 Whitetail shiner, *Notropis galacturus*, 288, 299.
 Tennessee shiner, *Notropis leuciodus*, 606, 607.
 Rosyface shiner, *Notropis rubellus*, subsp., 288.
 Saffron shiner, *Notropis rubricroceus*, 585, 608, 609, 864.
 Mirror shiner, *Notropis spectrunculus*, 585, 606.
 Western blacknose dace, *Rhinichthys atratulus obtusus*, 585, 609, 838, 864.
- Sunfish family, Centrarchidae.
 Northern rock bass, *Ambloplites r. rupestris*, 606.
 Pumpkinseed, *Lepomis gibbosus*, 286, 287, 288.
 Northern bluegill sunfish, *Lepomis m. macrochirus*, 287, 288, 299, 586.
 Northern smallmouth bass, *Micropterus d. dolomieu*, 606.
 Black crappie, *Pomoxis nigromaculatus*, 286.
- Perch family, Percidae.
 Fantail darter, *Etheostoma flabellare brevispinna*, 838.
 Tennessee snubnose darter, *Etheostoma simoterum*, 585, 864.
 Swannanoa darter, *Etheostoma swannanoa*, 608.
- Sculpin family, Cottidae.
 Banded sculpin, *Cottus carolinae* subsp., 585, 606, 838.

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