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ABSTRACT

Rohde et al. (2001) reported on the longitudinal distribution of fishes in the Dan River, located in the Blue Ridge and Piedmont provinces in Virginia and North Carolina, based on data from 298 collections made through the year 2000. The present paper is an annotated species list based on our previous research and an additional 1,064 specimens from eight collections made in 2001. Sixty-eight species and 47,526 specimens in 11 families were taken in the Dan River from 1968-2001. The family most commonly represented was Cyprinidae with 21 species and 29,562 specimens taken, followed by the Centrarchidae (12; 5,168), Percidae (7; 3,431), Catostomidae (11; 3,198), and Ictaluridae (9; 3,096). Six other families included eight species that comprised 6.4% (3,071 specimens) of all individuals collected. Fourteen species and four families not taken in the above collections are added from the literature and personal communications. In sum, we report a total of 82 species of fishes in 15 families from the Dan River. We divide the river into six sections, based on physiographic characteristics. These sections are, from upstream: Uplands (located at ca. rkm 320-312); Upper Gorge (ca. rkm 311-284); Lower Gorge (ca. rkm 283-266); Inner Piedmont (ca. rkm 265-197); Fault Basin (ca. rkm 196-112); and Piedmont Lowlands (ca. rkm 111-0). The number of species recorded per river section by us and from the literature, respectively, are 17, 36, 26, 49, 60, and 48. Fifty-one fish species are native, 24 are introduced, two species are native, but their populations have been augmented by stocking, and five are of undetermined origin. The Piedmont Lowlands has the greatest number of introduced species (19; 39.5%) and the Lower Gorge has the least number of introduced species (3; 11.5%). We present data on five VA/NC-listed species of concern.

INTRODUCTION

The Dan River is located in the Blue Ridge/Piedmont provinces of VA and NC and forms the large southern division of the Roanoke River drainage. From its origin to its junction with the Roanoke (Staunton) River, near the upstream end of the John H. Kerr Reservoir, the Dan River is some 320 rkm (river kilometers) long and it drains some 6,600 sq km.

We studied the Dan River because it is relatively pristine in the upper reaches, is of moderate size, is ichthyologically rich, and contains five state-listed species of concern (Rohde et al., 1998). The study area was described in detail by Rohde et al. (2001). This paper supplements and complements our previous report by addressing the status of individual species known from the Dan River.

METHODS

For quantitative evaluation as presented later in Tables 1 and 2, we used data from a total of 306 collections (298 collections made at 42 sites (Fig. 2) from 1968-2000 as per Rohde et al. (2001), as well as 8 additional collections made in 2001). Sources of these collections are as follows: 32 collections made at 23 sites by Rohde and Arndt during 1992-98; 120 collections made by the VA Department of Game and Inland Fisheries (VDGIF) in 1992-98; three by Paul L. Angermeier of VA Polytechnic Institute and State University (VPI) in 1989-90; one by the NC Wildlife Resources Commission (NCWRC) in 1990; 134 by biologists of Duke Energy (DE) during 1977-2001; 13 by Edward F. Menhinick of the University of NC-Charlotte from 1968-85; and three by the NC Division of Environmental Management in 1986. Additional collections have also been made in Virginia and in North Carolina, and these records have been plotted by Jenkins and Burkhead (1994) and Menhinick (1991).

Collections were made with seines, backpack electroshockers, and/or boat electroshockers from near the headwaters at rkm 317 downstream to rkm 23; only three sites were sampled in the lower 98 rkm of the river from Danville, VA to Kerr Reservoir (Fig. 1). All sites were chosen on the basis of ease of access (bridge crossings or

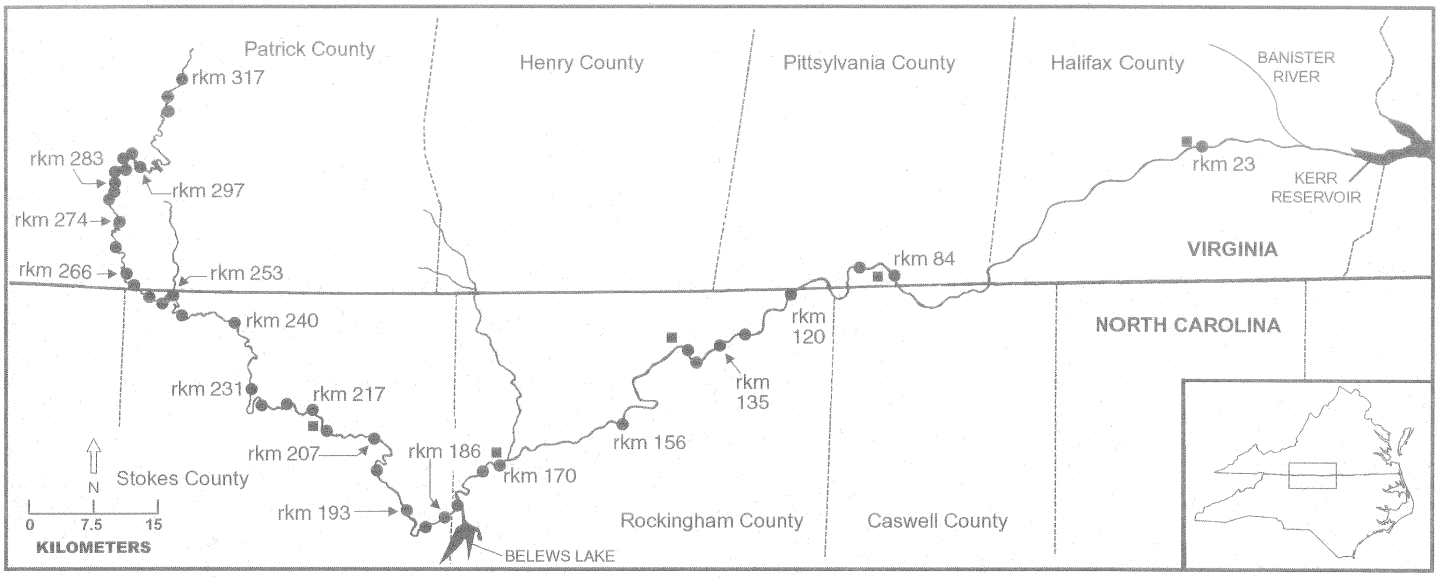

Figure 1. The Dan River in Virginia and North Carolina, showing sites sampled and selected river kilometer (rkm) locations.

boat ramps). Overall, from 1 to 36 collections were made at a given site. We deposited preserved specimens in the NC State Museum of Natural Sciences in Raleigh.

Seventeen sites were scored during low water conditions for eight physicochemical characteristics: water temperature, dissolved oxygen concentration, conductivity, pH, river width, river depth, current speed, and substrate composition. Techniques used are given in Rohde et al. (2001).

RESULTS AND DISCUSSION

Species Occurrence and Abundance

Sampling by us and others yielded 47,526 fish specimens of 68 species recorded from rkm 317 to 23 (Table 1). Eleven additional species have been reported from the Dan River by Jenkins and Burkhead (1994), Menhinick (1991), and from personal communications with others (Rohde et al., 2001). We record here three more species on the basis of additional and more recent personal communications. Thus, a total of 82 species of fishes is known from the Dan River. The brown bullhead, *Ameiurus nebulosus*, had in fact been collected during the study reported upon by Rohde et al. (2001) and in tables in that paper it was correctly included as having been caught by them, but it was incorrectly referred to as "....an additional species..." in the text of that paper.

The relative representation of families and species in the samples remained as reported by Rohde et al. (2001) with the exception that the Ictaluridae comprised 13.2% of the total species, not 16.2%, and the numbers of speci-

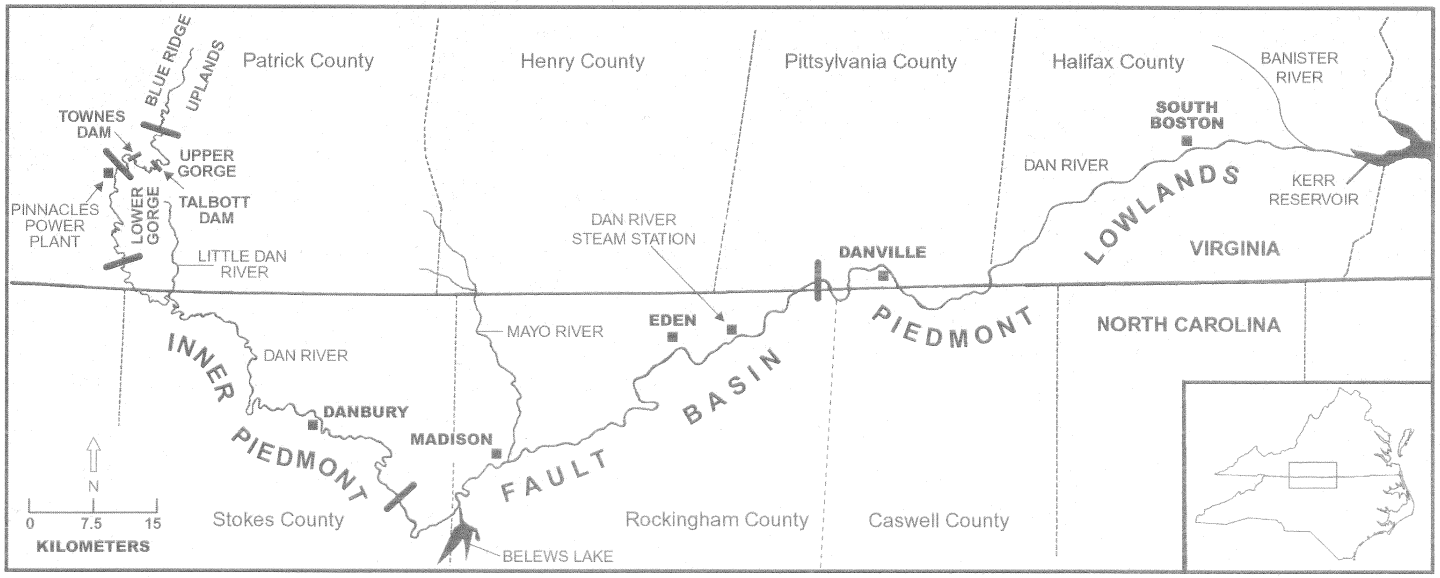

Figure 2. The Dan River in Virginia and North Carolina, showing physiographic provinces and other features mentioned in the text.

mens reported for some taxa has increased (Table 1).

To evaluate longitudinal species distributions, we divided the river into six physiographic sections, based on substrate, gradient, current, and river width (Fig. 2, Table 2). Seventeen species were recorded in the Uplands section of the river (ca. rkm 320-rkm 312). The river in this reach is narrow (mean width 6.8 m) and shallow (mean depth 25.2 cm) and is characterized by a moderate gradient (11 m/rkm) and current (0.17 m/sec) over a substrate of gravel, rubble, and sand. Thirty-six species were taken in the Upper Gorge section (ca. rkm 311-rkm 284), a reach with high gradient (13 m/rkm), moderate current (0.19 m/sec), narrow width (7.7 m), shallow depth (22.3 cm), and a substrate of gravel, rubble, and boulders. In the Lower Gorge section (ca. rkm 283-rkm 266), we recorded 26 species. The river here is wider (14.7 m) and deeper (31.8 cm) with a lower gradient (5 m/rkm), stronger current (0.38 m/sec), and a substrate of rubble, gravel, and boulders. Richness increased in the Inner Piedmont section (ca. rkm 265-rkm 197) to 49 species as the river continued to increase in width (30.8 m) and depth (32.6 cm); the gradient (2 m/rkm) decreased while the current increased (0.40 m/sec) over a predominantly gravel and rubble substrate. The Fault Basin section (ca. rkm 196-112) was the most diverse, with 60 species. As the river widened (49.4 m) and deepened (63.4 cm) in this reach, the gradient (ca. 0.5 m/rkm) and current (0.29 m/sec) decreased over a sand and gravel substrate. In the Piedmont Lowlands section (ca. rkm 111-rkm 0), we recorded 48 species. The river is at its widest in this portion (mean 72 m) and has the lowest gradient (ca. 0.3 m/rkm); no other measurements were made in this section. These last two sections were included in the Fault Basin section in Rohde et al. (2001).

Table 1. Phylogenetic list of fishes captured in the Dan River, 1968-2001, and number of each taken.

	TOTAL	% of TOTAL
Lepisosteidae		>0.1
Lepisosteus osseus	2	
Clupeidae		0.3
Dorosoma cepedianum	157	
Cyprinidae		62.2
Campostoma anomalum	188	
Carassius auratus	4	
Clinostomus funduloides	8509	
Cyprinella analostana	2611	
Cyprinella lutrensis	13	
Cyprinus carpio	104	
Exoglossum maxillingua	245	
Luxilus albeolus	1225	
Luxilus cerasinus	2905	
Lythrurus ardens	2168	
Nocomis leptocephalus	4850	
Nocomis raneyi	893	
Notemigonus crysoleucas	77	
Notropis amoenus	190	
Notropis chiliticus	2504	
Notropis hudsonius	391	
Notropis procne	76	
Phoxinus oreas	1890	
Rhinichthys atratulus	357	
Rhinichthys cataractae	1	
Semotilus atromaculatus	361	
Catostomidae		6.7
Carpiodes cyprinus	41	
Catostomus commersonii	430	
Hypentelium nigricans	157	
Hypentelium roanokense	233	
Moxostoma collapsum	131	
Moxostoma erythrurum	1550	
Moxostoma macrolepidotum	21	
Moxostoma pappillosum	294	
Scartomyzon ariommus	40	
Scartomyzon cervinus	295	
Thoburnia hamiltoni	6	
Ictaluridae		6.5
Ameiurus brunneus	703	
Ameiurus catus	30	
Ameiurus melas	4	
Ameiurus natalis	2	
Ameiurus nebulosus	26	
Ameiurus platycephalus	185	
Ictalurus punctatus	149	
Noturus gilberti	20	
Noturus insignis	1977	
Esocidae		>0.1
Esox americanus	2	
Salmonidae		3.4
Oncorhynchus mykiss	435	
Salmo trutta	1005	
Salvelinus fontinalis	154	
Poeciliidae		>0.1
Gambusia holbrooki	3	
Cottidae		2.8
Cottus caeruleomentum	1313	
Centrarchidae		10.9
Ambloplites cavifrons	7	
Ambloplites rupestris	5	
Lepomis auritus	3384	
Lepomis cyanellus	161	
Lepomis gibbosus	38	
Lepomis gulosus	8	
Lepomis macrochirus	911	
Lepomis microlophus	137	
Micropterus dolomieu	25	
Micropterus salmoides	382	
Pomoxis annularis	20	
Pomoxis nigromaculatus	90	
Percidae		
Etheostoma flabellare	1260	7.2
Etheostoma nigrum	33	
Etheostoma podostemone	590	
Etheostoma vitreum	53	
Percina nevisense	55	
Percina roanoka	1439	
Sander vitreus	1	
Number of species	68	
Number of specimens	47,526	

Annotated List of Species

Species accounts are presented in phylogenetic order. Localities of collections made in this study are listed following the species name and refer to Figure 1. All species are considered native unless otherwise indicated.

Lepisosteidae

Lepisosteus osseus. One longnose gar was taken by VPI biologists with a boat shocker at rkm 23 and one was taken by DE biologists at rkm 131. Jenkins and Burkhead (1994) show one additional locality at ca. rkm 50. Menhinick (1991) recorded it from lower County Line Creek, Caswell County, NC, near its junction with the Dan River near rkm 51.

Amiidae

Amia calva. Several specimens of bowfin have been collected in Kerr Reservoir as well as in the Roanoke River (VDGIF data).

Anguillidae

Anguilla rostrata. There are scattered records of the catadromous American eel from Dan River tributaries in VA (Jenkins and Burkhead, 1994) and NC (Menhinick, 1991). Large individuals are known to have been present in the Dan River system above Kerr Reservoir until the mid-1970s (Jenkins and Burkhead, 1994). This migratory fish is now presumed to be extirpated in the Dan River system due to the barriers to migration presented by three large dams (Kerr, Gaston, and Roanoke Rapids) constructed on the lower Roanoke River.

Clupeidae

Alosa aestivalis. Introduced. A landlocked population of the blueback herring occurs in Kerr Reservoir from fish transplanted from the Nottoway River (Jenkins and Burkhead, 1994). It is the only self-sustaining inland population of this species in VA. The species makes spawning runs up the Dan River as far as the base of the lowermost dam (at rkm 83) in Danville (Dan Wilson, VDGIF, pers. comm.). *Alosa pseudoharengus*. Probably introduced. The alewife is currently present in Kerr Reservoir and the Dan River according to VDGIF data. Jenkins and Burkhead (1994) reported a single record of the alewife from near rkm 118, near the NC/VA border southwest of Danville, VA.

Dorosoma cepedianum, sites (rkm) 23, 84, 98, 120, 131, 135. Naturally-occurring gizzard shad may have been entrapped after construction of the three lower dams on the Roanoke River, but the species was also stocked in Kerr Reservoir by VDGIF and first collected there in 1962 (Jenkins and Burkhead, 1994).

Dorosoma petenense. Introduced. The threadfin shad was introduced into Kerr Reservoir by VDGIF in the late 1980s and is now common to abundant there. It is recorded from the lower portion of a tributary, the Banister River, in Halifax County, VA (Jenkins and Burkhead, 1994; Dan Wilson, VDGIF, pers. comm.).

Cyprinidae

Campostoma anomalum, sites 135, 156, 199, 207, 214, 217, 221, 224, 231, 240, 249, 257, 259, 261, 266, 286, 290, 313. The central stoneroller was found primarily below the gorge between rkm 199 and rkm 266. Two specimens taken at rkm 135 and 156 are presumed waifs.

Carassius auratus, sites 120, 135, 193. Introduced.

Clinostomus funduloides, sites 214, 224, 231, 240, 249, 257, 259, 261, 266, 270, 274, 280, 282, 283, 284, 286, 287, 290, 297, 312, 313, 317. The rosyside dace was the most abundant species taken upstream in the Uplands and in the Upper Gorge, and the second-most abundant species in the Lower Gorge (Table 2).

Cyprinella analostana, sites 23, 84, 98, 120, 131, 135, 138, 139, 156, 170, 174, 183, 186, 190, 193, 199, 207, 214, 217, 221, 224, 231, 240, 249, 259, 287. The satinfin shiner was the second-most abundant species taken in the Fault Basin (Table 2).

Cyprinella lutrensis, sites 120, 138, 139, 174, 193. Introduced. In 1976 one adult red shiner was captured by DE biologists in a tributary to the Dan River in Stokes County, NC above Belews Lake. The species was subsequently taken in 1984 in the Dan River proper. The introductions may stem from a fish hatchery located in Forsyth County, NC where it was raised as an aquarium fish (Jenkins and Burkhead, 1994). While this invasive species has become firmly established in the Yadkin (Pee Dee) River drainage in NC, not well-established in the Dan River. In contrast to the Dan River, the Yadkin River fish fauna is primarily composed of introduced species (F.C. Rohde, pers. obs.).

Cyprinus carpio, sites 23, 84, 120, 131, 135, 138, 139, 174, 214. Introduced. The common carp was most abundant in the Piedmont Lowlands (Table 2).

Exoglossum maxillingua, sites 240, 249, 257, 259, 261, 266, 270, 274, 280, 283, 284, 286. The cutlips minnow was most abundant in the Lower Gorge (Table 2). We recorded it only in areas of fast-flowing runs and pools near large rocks or boulders over clean sand and gravel in the upper 46 rkm. The cutlips minnow is a NC-listed endangered species because the population there is peripheral, located at the southernmost portion of its range.

Luxilus albeolus, sites 120, 131, 135, 138, 139, 156, 170, 174, 186, 190, 193, 199, 207, 214, 221, 224, 231, 240, 249, 257, 259, 266, 270, 274, 282, 284. The white shiner was abundant in the Fault Basin, but uncommon upstream of rkm 259 in the Inner Piedmont (Table 2). Jenkins and Burkhead (1994) recorded it from the Piedmont Lowlands section of the river.

Luxilus cerasinus, sites 120, 131, 135, 138, 139, 186, 190, 193, 199, 207, 214, 217, 221, 224, 231, 240, 249, 253, 257, 259, 261, 266, 270, 274, 280, 282, 283, 284, 286, 287, 290, 297, 312, 313, 317. The crescent shiner was a dominant species in the Uplands, in the Lower Gorge, and in the Inner Piedmont (Table 2). Although not recorded by us in the Piedmont Lowlands section, the crescent shiner is present there according to Jenkins and Burkhead (1994).

Lythrurus ardens, sites 120, 131, 135, 138, 139, 156, 183,

Table 2. Relative abundance (number of specimens/number of collections) of fishes taken in this Dan River study,1968-2001, for each individual river region. Species that in total comprise the top 75% most-abundant species/region are identified in bold type.

SPECIES	UPLANDS	UPPER GORGE	LOWER GORGE	INNER PIEDMONT	FAULT BASIN	PIEDMONT LOWLANDS
Campostoma anomalum	1.60	0.02	0.12	5.47	0.02	
Clinostomus funduloides	**389.40**	**49.31**	**72.25**	2.09		
Luxilus cerasinus	**130.40**	7.99	**28.50**	**30.31**	0.67	
Nocomis leptocephalus	**37.80**	**22.05**	**24.25**	**47.31**	2.17	
Notropis chiliticus	20.60	5.06	**27.00**	**39.59**	2.21	
Phoxinus oreas	17.60	**14.28**	6.88	1.00	0.02	
Rhinichthys atratulus	1.80	2.76	2.12			
Semotilus atromaculatus	11.00	2.30	2.88	0.19	0.01	
Catostomus commersonii	6.20	2.57	1.38	0.81	0.38	
Hypentelium nigricans	0.40	0.09	1.75	1.06	0.68	
Hypentelium roanokense	7.00	0.37	5.38	3.31	0.04	
Noturus insignis	2.80	5.92	1.75	**37.53**	0.26	
Oncorhynchus mykiss	0.60	3.51	0.62	0.19		
Salvelinus fontinalis	0.60	1.25	0.12			
Salmo trutta	2.20	**8.13**	1.38	0.16	0.02	
Lepomis auritus	0.20	0.06		3.00	**23.57**	**9.00**
Etheostoma flabellare	32.20	4.17	22.88	12.47	0.12	
Cyprinella analostana		0.01		9.72	**17.16**	**4.67**
Exoglossum maxillingua		1.46	5.25	0.88		
Luxilus albeolus		0.01	1.50	7.34	**6.93**	
Rhinichthys cataractae		0.01				
Scartomyzon cervinus		0.52	6.88	4.97	0.12	
Thoburnia hamiltoni		0.02	0.38			
Noturus gilberti		0.01	1.12	0.31		
Cottus caeruleomentum		1.85	**124.88**	2.88		
Ambloplites cavifrons		0.02			0.04	
Etheostoma podostemone		0.29	0.75	**15.22**	0.44	
Lythrurus ardens			2.38	**47.00**	4.57	
Etheostoma nigrum			2.00	0.47	0.02	
Percina roanoka			4.00	**41.53**	0.56	
Cyprinus carpio				0.03	0.68	3.33
Nocomis raneyi				3.47	5.82	1.33
Notropis amoenus				0.03	1.34	
Notropis procne				0.81	0.36	
Moxostoma erythrurum				0.97	**10.51**	2.33
Moxostoma pappillosum				1.34	1.79	1.33
Scartomyzon ariommus				1.00	0.06	
Ameiurus brunneus				1.56	4.55	**8.33**
Ameiurus melas				0.03	0.02	
Ameiurus platycephalus				1.94	0.87	
Micropterus salmoides				0.09	2.56	2.33
Micropterus dolomieu				0.12	0.12	0.33
Etheostoma vitreum				1.62	0.01	
Percina nevisense				1.03	0.09	
Lepisosteus osseus					0.01	0.33
Dorosoma cepedianum					0.55	**26.70**
Carassius auratus					0.03	
Cyprinella lutrensis					0.09	
Notemigonus crysoleucas					0.55	
Notropis hudsonius					2.76	1.00
Carpiodes cyprinus					0.22	**3.67**
Moxostoma collapsum					0.85	**4.67**
Moxostoma macrolepidotum					0.04	**5.33**
Ameiurus catus					0.13	4.00
Ameiurus natalis					0.02	
Ameiurus nebulosus					0.16	0.33
Ictalurus punctatus					1.00	4.00
Esox americanus					0.02	
Gambusia holbrooki					0.02	
Ambloplites rupestris					0.05	
Lepomis cyanellus					1.14	
Lepomis gibbosus					0.27	0.33
Lepomis gulosus					0.06	
Lepomis macrochirus					**6.40**	**9.00**
Lepomis microlophus					0.97	
Pomoxis annularis					0.14	0.33
Pomoxis nigromaculatus					0.62	1.33
Sander vitreus						0.33
Number of species	17	27	26	39	58	23
Number of specimens	3,313	16,083	2,787	10,524	14,536	283
Number of collections	5	120	8	32	138	3

186, 190, 193, 207, 214, 217, 221, 224, 231, 240, 249, 253, 257, 259, 261, 266, 270. The rosefin shiner was the second most abundant species collected in the Inner Piedmont (Table 2), and large schools were taken in the slower and deeper waters below riffles and runs. Jenkins and Burkhead (1994) show records from the Piedmont Lowlands.

Nocomis leptocephalus, sites 120, 131, 135, 138, 139, 156, 170, 174, 183, 186, 190, 193, 199, 207, 214, 217, 221, 224, 231, 240, 249, 253, 257, 259, 261, 266, 270, 274, 280, 282, 283, 284, 286, 287, 290, 297, 312, 313, 317. The bluehead chub was one of the most abundant species in all river sections, except in the Fault Basin (Table 2). It has also been recorded from the Piedmont Lowlands (Jenkins and Burkhead, 1994).

Nocomis raneyi, sites 84, 120, 131, 135, 138, 139, 156, 174, 186, 190, 193, 199, 214, 217, 221, 224, 231, 240, 249, 257, 259. The bull chub was taken from the Inner Piedmont to the Piedmont Lowlands.

Notemigonus crysoleucas, sites 120, 131, 135, 138, 139, 174. Probably introduced. We found the golden shiner restricted to the Fault Basin (Table 2). It was uncommon at a site in the Inner Piedmont (rkm 231) in 1991 (C. Smith, pers. comm.). It may also occur downstream in the Piedmont Lowlands, but it seems to avoid montane and most upland areas (Jenkins and Burkhead, 1994). It is a commonly-used bait fish in VA and NC and populations in the Dan are probably derived from bait releases.

Notropis amoenus, sites 120, 131, 135, 138, 139, 186, 217. The comely shiner was most common in the Fault Basin (Table 2). It is also recorded from the Piedmont Lowlands in Virginia by Jenkins and Burkhead (1994).

Notropis chiliticus, sites 138, 183, 186, 190, 193, 199, 207, 214, 217, 221, 224, 231, 240, 249, 253, 257, 259, 261, 266, 270, 274, 280, 282, 283, 284, 286, 312, 313. The redlip shiner was one of the most abundant species in the Lower Gorge and Inner Piedmont (Table 2). Its general absence from the Fault Basin and from the Piedmont Lowlands may reflect a lack of bluehead chub nests there, which apparently are necessary for this shiner to spawn. Hocutt et al. (1986) and Jenkins and Burkhead (1994) consider it to be native to the Dan River, although the latter suggest that it may have been introduced from the Yadkin River.

Notropis hudsonius, sites 84, 120, 131, 135, 138, 139, 156. The spottail shiner was restricted in the river to the Fault Basin and Piedmont Lowlands. Most (199 specimens) were taken at one site (rkm 135). While it may occur in higher-gradient streams in parts of VA, it is more typical of the lower reaches of large rivers and estuaries (Jenkins and Burkhead, 1994).

Notropis procne, sites 120, 131, 135, 138, 139, 156, 257, 259. The swallowtail shiner has a particularly interesting and puzzling distribution in the Dan River. About one-third of the specimens were taken at rkm 257 and 259 near the VA/NC border, an area with a strong current and a rocky substrate. The remainder were taken at six sites from between rkm 120 to rkm 156, in the lower river, in a region of slower current and a sandy substrate. It has also been recorded from the Piedmont Lowlands near Danville, VA (Jenkins and Burkhead, 1994), and it was rare at rkm 231 in 1993 (C. Smith, pers. comm.). We believe that our observed hiatus of 101 rkm in its distribution is significant, but we cannot explain it. It has been suggested that specimens from the Fault Basin may be the mimic shiner, *Notropis volucellus*, but re-examination confirmed their identity as *N. procne*.

Phoxinus oreas, sites 138, 139, 214, 231, 257, 259, 266, 270, 274, 282, 283, 284, 286, 287, 290, 297, 312, 313, 317. The mountain redbelly dace is a typical headwater species and was abundant in the Upper Gorge (Table 2). Downstream occurrences were likely waifs from upstream or tributary creeks.

Rhinichthys atratulus, sites 266, 270, 274, 280, 282, 283, 284, 286, 287, 290, 297, 312, 313, 317. The blacknose dace was restricted to the Uplands and the Gorge.

Rhinichthys cataractae, site 287. Introduced. One specimen of longnose dace taken in the Upper Gorge represents the first record in the Dan River. Jenkins and Burkhead (1994) report that it has been introduced into the upper Roanoke River drainage in and near Tinker Creek, near Roanoke, Roanoke County, VA, and is now expanding its range there.

Semotilus atromaculatus, sites 138, 257, 259, 266, 270, 274, 284, 286, 287, 297, 312, 313, 317. With one exception, the creek chub was restricted to the Uplands and the Gorge. It was abundant at rkm 249 in 1988 (C. Smith, pers. comm.).

Catostomidae

Carpiodes cyprinus, sites 23, 84, 120, 131, 135, 138, 139, 174, 186, 193. The quillback was distributed throughout much of the lower river in the Fault Basin and the Piedmont Lowlands. One specimen was taken at rkm 231 in 1993 (C. Smith, pers. comm.).

Catostomus commersonii, sites 120, 131, 135, 138, 139, 174, 193, 214, 217, 221, 240, 249, 257, 259, 261, 266, 270, 280, 282, 283, 284, 286, 287, 290, 297, 312, 313, 317. The white sucker was widely distributed from the Uplands to the Fault Basin.

Erimyzon oblongus. There are two records of the creek chubsucker, both from the lower Dan River near rkm 50 and rkm 68 upstream of South Boston, VA (Jenkins and Burkhead, 1994).

Hypentelium nigricans, sites 120, 131, 135, 138, 139, 156, 174, 186, 190, 193, 199, 207, 214, 224, 231, 240, 257, 259, 261, 270, 280, 282, 283, 284, 286, 287, 313. The northern hogsucker was most abundant in the Lower Gorge and Inner Piedmont (Table 2).

Hypentelium roanokense, sites 131, 135, 193, 199, 207, 214, 217, 221, 224, 231, 240, 249, 253, 257, 259, 261, 266, 270, 274, 284, 286, 287, 312, 313. As observed for the northern hogsucker, the Roanoke hogsucker was most abundant in the Lower Gorge. The two species were syntopic at 17 sites. The Roanoke hogsucker was much more

common than the northern hogsucker in the swifter waters in the Uplands, the Gorge, and upper Inner Piedmont. Our observations of a greater abundance of the Roanoke hogsucker in smaller-sized waters agree with the observations made by Jenkins and Burkhead (1994).
Moxostoma collapsum, sites 23, 84, 120, 131, 135, 138, 139, 193. The notchlip redhorse was recently elevated from synonymy with the silver redhorse, *M. anisurum* (need original citation). It was found in the Fault Basin and Piedmont Lowlands.
Moxostoma erythrurum, sites 84, 98, 120, 131, 135, 138, 139, 170, 174, 186, 193, 214, 217, 221, 224, 231, 249. The golden redhorse was most abundant in the slower waters in the Fault Basin and Piedmont Lowlands. It also occurred upstream at rkm 249, in that part of the river that runs through Upper Precambrian-Paleozoic rocks (Table 2).
Moxostoma macrolepidotum, sites 23, 84, 138. The shorthead redhorse was taken primarily in the Piedmont Lowlands. Its scarcity in the Dan River is possibly related to a sensitivity to a high silt load and possibly other forms of pollution or perhaps a preference for downstream reservoirs. However, it is often difficult to collect due to its speed and preference for large and deep waters (Jenkins and Burkhead, 1994), and it may be more common in the Dan than our records indicate. *Moxostoma pappillosum*, sites 84, 98, 120, 131, 135, 138, 139, 156, 170, 174, 186, 193, 199, 214, 221. The suckermouth redhorse was widespread between rkm 84 in the Piedmont Lowlands and rkm 221 in the Inner Piedmont. It was almost as widely-distributed as the golden redhorse. While the golden redhorse was five times more abundant overall than the suckermouth redhorse in the Dan River, the suckermouth was relatively more abundant in the more clear waters of the Inner Piedmont (Table 2).
Scartomyzon ariommus, sites 135, 199, 207, 214, 217, 221, 224, 231, 240. The bigeye jumprock is restricted primarily to that reach of river that flows through the southern part of the Upper Precambrian-Paleozoic rocks. Its occurrence there appears correlated with a substrate of boulders and of undercut bedrock. Eight specimens were taken in four of 24 collections made downstream of the dam at the Duke Power Plant in Eden, NC, at rkm 135. Its occurrence there may result from the presence of suitable habitat, a swift current and hard-rock substrate (rock, cobble, and gravel). Because of its limited distribution in NC, its restriction to large streams, and because of a presumed low population density, the bigeye jumprock is considered to be a species of special concern in that state.
Scartomyzon cervinus, sites 135, 138, 139, 193, 199, 207, 214, 217, 221, 224, 231, 240, 249, 253, 257, 259, 261, 266, 270, 274, 280, 282, 283, 284, 286, 287. The black jumprock was most abundant in the faster waters of the Lower Gorge.
Thoburnia hamiltoni, sites 280, 283, 284, 290. The rustyside sucker was taken only in that reach of river from 7 rkm immediately above and 3 rkm below the Pinnacles Power Plant in VA, between rkm 280 and rkm 290. This species is endemic to the upper Dan River system and is extremely rare (Burkhead and Jenkins, 1991). It was first collected in the Dan River proper in 1983, when one specimen was taken (Jenkins and Burkhead, 1994). Based on extralimital collecting, we also record it (one specimen) from NC from one site in the Little Dan River, at a point some 1.5 km above its confluence with the Dan River at rkm 253. Because this is the only locale known for this species in NC, and because the species is sensitive to siltation, the rustyside sucker is NC-listed as endangered.

Ictaluridae
Ameiurus brunneus, sites 84, 98, 120, 131, 135, 138, 139, 156, 174, 183, 186, 193, 199, 207, 214, 217, 221. Probably introduced. The snail bullhead was most abundant in the slower waters of the Piedmont Lowlands (Table 2) and was also common in the Fault Basin between rkm 120 and rkm 139. One specimen was taken in the Upper Gorge at rkm 297 by VDGIF. This species is reported to prefer fast-flowing streams with sand and rock substrates (Mettee et al., 1996). This is contrary to what we observed in the Dan. The snail bullhead was first recorded in the Dan River in 1976, just above Kerr Reservoir. Its absence from the Roanoke River suggests that it was introduced into the Dan River, possibly from the Yadkin River drainage and in a stocking that also introduced *Ameiurus melas* (Burkhead et al., 1980).
Ameiurus catus, sites 23, 84, 135, 138, 139, 193. The white catfish was found only in slower waters in the Fault Basin and Piedmont Lowlands sections. It was also taken (rare) at rkm 231 in 1991 (C. Smith, pers. comm.).
Ameiurus melas, sites 138, 174, 257. Introduced. The black bullhead was reportedly stocked into Belews Lake, Rockingham/Stokes counties, NC, an upper Dan River system impoundment (Burkhead et al., 1980).
Ameiurus natalis, sites 131, 170. Probably introduced. Menhinick (1991) shows one additional locality for the yellow bullhead from the Dan River near rkm 131. It was also taken (rare) at rkm 231 in 1991 (C. Smith, pers. comm.). Jenkins and Burkhead (1994) depict one locality from the Banister River in the Dan River system and several localities from Kerr Reservoir. While these records may represent immigration from the Roanoke River drainage, the latter authors also indicate that the Dan River population may have been introduced.
Ameiurus nebulosus, sites 98, 120, 135, 138, 139, 174, 193. All specimens of the brown bullhead were from the slower waters of the Fault Basin and Piedmont Lowlands sections of the Dan River. C. Smith (pers. comm.) also collected several specimens from farther upstream, from rkm 231 and rkm 249.
Ameiurus platycephalus, sites 120, 131, 135, 138, 139, 156, 174, 190, 193, 199, 214, 221, 224, 240, 249, 257. The flat bullhead was found to be widely distributed. One individual, an apparent introduction, was taken in the Upper Gorge at rkm 297 by VDGIF. It has also been recorded in

Kerr Reservoir (Jenkins and Burkhead, 1994). The native flat bullhead has a wider distribution in the Dan River than that observed by us for *A. brunneus*. This is presumably a consequence of it being widely established prior to the introduction of the snail bullhead (Burkhead et al., 1980), but it could also reflect different habitat requirements of the two species, or both.

Ictalurus furcatus. Introduced. The blue catfish first appeared in Kerr Reservoir and in the lower Dan River in the early 1980s (VDGIF data). It is now common to abundant in the reservoir and uncommon in the river upstream to below Danville. One specimen was taken and released at rkm 249 in NC in 1988 (C. Smith, pers. comm.). The blue catfish has also been widely introduced elsewhere in NC (Menhinick 1991) and VA (Jenkins and Burkhead, 1994).

Ictalurus punctatus, sites 23, 84, 120, 131, 135, 138, 139, 174, 193. Introduced. All channel catfish were taken from the Fault Basin and Piedmont Lowlands. Jenkins and Burkhead (1994) consider it to be have been introduced into the Roanoke River drainage.

Noturus gilberti, sites 214, 253, 257, 259, 266, 270, 284. The orangefin madtom has a limited distribution and is apparently uncommon in the Dan River. All specimens of the orangefin madtom were taken from swift waters. C. Smith (pers. comm.) took one individual at rkm 231 in 1993. Eight specimens were collected in 1985 at four sites between rkm 214 and rkm 257 (T. D. Simonson and R. J. Neves, unpubl. data.). Rohde et al. (1998), after an intensive search, found it to be absent from the historical downstream localities between rkm 214 and rkm 240 (three collections made at this former site). It is listed as endangered in NC because of its low population densities despite the presence of apparently suitable habitat, and as threatened in VA due to a reduced range as a result of siltation.

Noturus insignis, sites 135, 138, 139, 156, 170, 174, 186, 193, 199, 207, 214, 217, 221, 224, 231, 240, 249, 253, 257, 259, 261, 270, 280, 283, 284, 286, 287, 290, 297, 312, 313. The margined madtom was widely distributed and was most common in the moderate currents of the river in the Inner Piedmont (Table 2). Matthews and Jenkins (1979) discovered a distinctive spotted form of *N. insignis* restricted to the Gorge. During our study, spotted individuals were captured in the river in the Uplands, Gorge, and Inner Piedmont downstream to rkm 249.

Pylodictis olivaris. Introduced. Two specimens of the flathead catfish were captured by boat electroshocker at rkm 51, near Milton, Caswell County, NC in 1993 (B. Hammers, NCWRC, pers. comm.). It was stocked, probably by anglers, in the Roanoke drainage in the late 1970s and has since become established and common in the lower reaches of the Dan River as far upstream as below Danville (VDGIF data).

Esocidae

Esox americanus, sites 138, 193. Jenkins and Burkhead (1994) show two localities for the redfin pickerel in the Dan River near rkm 98 and rkm 118. It was also recorded as uncommon at rkm 249 in 1988 (C. Smith, pers. comm.).

Esox niger. Jenkins and Burkhead (1994) indicate at least one locality for the chain pickerel from the Dan River near rkm 68, downstream of Danville, VA. Menhinick (1991) indicates one locality near rkm 193, in the vicinity of Danbury, NC.

Salmonidae

Oncorhynchus mykiss, sites 253, 259, 274, 280, 283, 284, 290, 297, 313. Introduced. Most records of the rainbow trout are from the Upper Gorge (Table 2). It has become naturalized in the Dan River (S.M. Smith, pers. obs.), but it is still stocked below the Townes Dam by VDGIF.

Salmo trutta, sites 120, 135, 253, 257, 259, 270, 274, 280, 282, 283, 284, 286, 287, 290, 297, 312, 313, 317. Introduced. The brown trout was most common in the Upper Gorge (Table 2). Originally stocked in the river, impoundments, and tributaries, virtually all the brown trout in the Dan River now result from spawnings of the naturalized populations (S.M. Smith, pers. obs.). One tiger trout, an apparent wild brown trout x brook trout hybrid, was captured at rkm 286 above the Pinnacles Power Plant.

Salvelinus fontinalis, sites 283, 284, 287, 290, 297, 312, 313, 317. Most specimens of the brook trout were captured below Talbott Dam in the Upper Gorge. Once native to the Dan River, the brook trout was extirpated there as a result of logging operations in the mid-1800s and in the early 1900s. It was re-stocked after World War II and the population is now self-sustaining (VDGIF data).

Poeciliidae

Gambusia holbrooki, sites 120, 183. The eastern mosquitofish captured were most likely waifs from tributary creeks.

Cottidae

Cottus caeruleomentum, sites 253, 257, 259, 261, 266, 270, 274, 280, 282, 283, 284. The Blue Ridge sculpin was the most abundant species in the Lower Gorge (Table 2).

Moronidae

Morone americana. Introduced. The white perch is abundant in Kerr Reservoir (Jenkins and Burkhead, 1994) and in the lower Dan River upstream to Danville. It is indigenous to all coastal drainages in VA, but all populations upstream of the Fall Line, which includes the Dan River, are considered to be introduced (Jenkins and Burkhead, 1994).

Morone chrysops. Introduced. The white bass was stocked in Kerr Reservoir by VDGIF in the 1980s and has since become established (VDGIF data). It makes spawning runs up the Dan River to Danville, and it may also occur there year-round.

Morone saxatilis. A strong reproducing population of the striped bass occurs in Kerr Reservoir. This population

was founded by entrapment (dam building), stocking, or both (Jenkins and Burkhead, 1994). Some individuals regularly migrate upstream in the spring for 60 km to the lowermost dam at Danville (Jenkins and Burkhead, 1994).

Centrarchidae

Ambloplites cavifrons, sites 135, 138, 139, 284, 290. The Roanoke bass taken in the Upper Gorge are believed to be remnants of a native population. Specimens from the Fault Basin may be waifs from the Smith River, a tributary to the Dan, which supports small populations of Roanoke bass (Jenkins and Burkhead, 1994).

Ambloplites rupestris, sites 135, 138, 139. Introduced. Eleven additional specimens were taken in the Dan River between Talbott Dam and Townes Dam (VDGIF data). The species was apparently introduced into the impoundments; the source of these specimens is unknown. The presence of the rock bass was first verified in the Dan River in 1941, but it is impossible to determine when it was first introduced (Jenkins and Burkhead, 1994).

Lepomis auritus, sites 23, 84, 98, 120, 131, 135, 138, 139, 156, 170, 174, 183, 186, 190, 193, 199, 214, 217, 221, 224, 231, 240, 249, 253, 257, 284, 313. The redbreast sunfish was widely distributed and was most abundant in the slower waters of the Fault Basin (Table 2). Native populations in the Dan River have been augmented by stocking, although details are not available. One such stocking was in the upper Dan, over 30 years ago. The specimens taken in the river upstream of the Pinnacles Power Plant were either introductions, or migrants from the native population downstream. One specimen was taken in the Uplands, and is a presumed result of stocking.

Lepomis cyanellus, sites 120, 131, 135, 138, 139, 170, 174, 193. Introduced. The green sunfish was found in the slower waters in the Fault Basin. Two specimens collected by VDGIF just downstream of the impoundments at rkm 286 are the result of apparent angler introductions. It has also been collected at rkm 231 (rare) in 1991 and at rkm 249 (common) in 1988 (C. Smith, pers. comm.) and in the Piedmont Lowlands (Jenkins and Burkhead, 1994).

Lepomis gibbosus, sites 98, 120, 131, 138, 139, 174, 193. The pumpkinseed was taken at rkm 231 (rare) in 1991 and at rkm 249 (common) in 1988 (C. Smith, pers. comm.).

Lepomis gulosus, sites 131, 138, 139. Probably introduced. Although DE has been sampling the NC Fault Basin section of the Dan River since 1977, the warmouth was not collected there until 2000. It has also been recorded from Kerr Reservoir (Jenkins and Burkhead, 1994).

Lepomis macrochirus, sites 23, 84, 98, 120, 131, 135, 138, 139, 174, 190, 193. Introduced. The bluegill was one of the most abundant fishes in the Fault Basin and Piedmont Lowlands (Table 2). Specimens taken upstream of the Pinnacles Power Plant by VDGIF are presumed to be a result of recent introduction, possibly by anglers. It is also known (common) from rkm 231 and rkm 249 (Charles Smith, pers. comm.). The bluegill is presumed to be a nonnative species in the Roanoke River drainage, because the first records for the drainage are from 1947 (Jenkins and Burkhead 1994). Its native range on the Atlantic slope is probably North Carolina southward.

Lepomis microlophus, sites 120, 131, 135, 138, 139, 193. Introduced. The redear sunfish captured at rkm 290 by VDGIF is presumed to be a waif from an impoundment. All VA populations of this species have been recently established by introduction, and it was not known from the Roanoke River drainage prior to 1971 (Jenkins and Burkhead, 1994).

Micropterus dolomieu, sites 84, 131, 135, 138, 156, 186, 214, 257, 259. Introduced. The smallmouth bass was most common in the turbid waters of the Fault Basin. One specimen was captured in the river above the Pinnacles Power Plant by VDGIF, and is presumed to be a waif from an impoundment. It is not native in any Atlantic slope drainage of Virginia (Jenkins and Burkhead, 1994). By the late 1800s nearly all the principal streams in VA had been stocked with it, primarily by the Virginia Fish Commission. Jenkins and Burkhead (1994) reported that it was virtually absent from the moderately to heavily silted middle and lower portions of the Dan River system.

Micropterus salmoides, sites 23, 84, 98, 120, 131, 135, 138, 139, 156, 174, 193, 214, 224, 249. Introduced. The largemouth bass was most abundant in the lower reaches of the river. Specimens taken in the gorge are the result of recent introduction (VDGIF data). The northern limit of natural populations of the largemouth bass is the Tar River drainage in NC, located just south of the Roanoke River (Jenkins and Burkhead, 1994).

Pomoxis annularis, sites 84, 131, 135, 138, 139, 174, 193. Introduced. One white crappie was taken at rkm 231 in 1993 (C. Smith, pers. comm.). The white crappie is considered to be an introduction to the Virginia and North Carolina portions of the Atlantic slope (Jenkins and Burkhead, 1994).

Pomoxis nigromaculatus, sites 84, 120, 131, 135, 138, 139, 193. Probably introduced. While the black crappie is native to the Roanoke River drainage, it is probably not indigenous to its upper portion and all Dan River records may represent transplants from Coastal Plain populations.

Percidae

Etheostoma flabellare, sites 135, 156, 183, 186, 190, 193, 207, 214, 217, 221, 224, 231, 240, 249, 253, 257, 259, 261, 266, 270, 274, 280, 282, 283, 284, 286, 287, 290, 297, 312, 313. The fantail darter was most abundant in the Uplands and Lower Gorge (Table 2).

Etheostoma nigrum, sites 131, 138, 257, 259, 266, 270. Most johnny darters were found in the 14 rkm between rkm 257 and rkm 270. However, a few individuals were taken near rkm 283 around the Pinnacles Power Plant in 1983 (R. E. Jenkins, pers. comm.). The two specimens taken in the Fault Basin are presumed to be waifs from nearby tributary creeks.

Etheostoma podostemone, sites 135, 156, 183, 186, 190, 193, 199, 207, 214, 217, 221, 224, 231, 240, 249, 253, 257,

259, 261, 270, 274, 280, 284, 290. The riverweed darter was most abundant in the Inner Piedmont between rkm 207 and rkm 259 (Table 2). It is a species of special concern in NC because it is endemic to the upper and middle Roanoke drainage, primarily in VA, and its range extends into NC only in the Dan system.

Etheostoma vitreum, sites 135, 214, 221, 231, 240, 249, 253, 257, 259. The glassy darter was most abundant in the Inner Piedmont (Table 2). The record from the Fault Basin is probably a waif from a tributary stream.

Perca flavescens. The yellow perch is abundant in the Dan River below Danville (VDGIF data). It is recorded from Kerr Reservoir and from several tributaries to the Dan in VA (Jenkins and Burkhead, 1994) and NC (Menhinick, 1991). It is native to the Atlantic slope.

Percina nevisense, sites 120, 131, 135, 139, 193, 214, 221, 231, 240, 259. The chainback darter was recently resurrected from synonymy with the shield darter, *P. peltata* (Goodin et al., 1998). It was found sporadically in the Inner Piedmont and Fault Basin.

Percina roanoka, sites 120, 135, 186, 193, 199, 207, 214, 217, 221, 224, 231, 240, 249, 253, 257, 259, 261, 266, 270, 274, 280. The Roanoke darter was most abundant in the lower portion of the Upper Precambrian-Paleozoic Inner Piedmont section of river (Table 2).

Sander vitreus. Introduced. One walleye was collected in the Dan River by boat electroshocker at rkm 84. It may have been a "live-well transplant" from specimens known to have been stocked in Kerr Reservoir. Jenkins and Burkhead (1994) depict a locality record on the lower Dan River downstream of South Boston, VA, near rkm 19, and one on the lower Banister River, Halifax County, VA, a Dan River tributary. Prior to the formation of Kerr Reservoir, spawning runs extended from the Roanoke River into the Dan River and some of its tributaries (Jenkins and Burkhead, 1994). All central Atlantic slope populations of the walleye are considered to be introduced (Jenkins and Burkhead, 1994).

Sciaenidae

Aplodinotus grunniens. Introduced. The freshwater drum has been present in Kerr Reservoir since the late 1980s, and the species there is derived from stocking either by VDGIF or anglers. A reproducing population now exists in low numbers as multiple age classes occur, and their numbers appear to be increasing. It could potentially move up into the Dan River, although its preferred habitat of deep water does not appear to be abundant (Dan Wilson, VDGIF, pers. comm.).

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