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SYSTEMATICS AND REDESCRIPTION OF THE BLACKSIDE
DARTER, *PERCINA MACULATA* (GIRARD),
(PISCES: PERCIDAE).By EUGENE C. BECKHAM, III¹

INTRODUCTION

The blackside darter, *Percina maculata* (Girard), is a widespread species that is distributed over much of the eastern half of North America (Beckham and Platania, 1983). This species has been known to ichthyologists for well over one hundred years, yet it has received limited systematic treatment in the literature. Hubbs and Raney (1939) referred to *P. maculata* as "probably a complex of subspecies" when alluding to the variation within this species over its entire range. A study was undertaken in order to more clearly define the species, assess the limits and extent of geographic variation, and to determine if, indeed, this "complex of subspecies" does exist. One result of this study was the finding that the population in the

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upper New River system represented an unnamed species, which was subsequently described as *Percina gymnocephala* (Beckham, 1980). The present paper deals with the systematics and redescription of *P. maculata*, and a subsequent paper will address the assessment of geographic variation within this species.

TAXONOMIC HISTORY

The blackside darter was originally described as *Alvordius maculatus* by Charles Girard (1859a) from specimens collected by Benjamin Alvord at Fort Gratiot, Michigan. Subsequently, in the same volume, Girard (1859b) described *Hadropterus maculatus* from the Potomac River drainage. When these two forms were later considered congeneric, the Atlantic coast *maculatus* became a junior homonym due to preoccupation by *A. maculatus*. The species from the Potomac was redescribed as *Hadropterus notogrammus* by Raney and Hubbs (1948). Cope and Jordan (*in* Jordan, 1877) described *Alvordius aspro* as a replacement name for a figure (but not a description) labeled *Etheostoma blennioides* from the Ohio River drainage in a publication by Kirtland (1841). The latter name was preoccupied; however, Cope and Jordan's replacement name, listed by Boulenger (1895) as *Percina aspro* but subsequently consigned along with *Alvordius maculatus* to the genus *Hadropterus* by Jordan and Evermann (1896), was deemed a synonym of *Hadropterus maculatus* by Hubbs (1926). *Etheostoma aspro*, another synonym of the blackside darter, was referred to by Eigenmann and Eigenmann (1892) in a list of fishes from Ontario. The use of *Etheostoma* was not justified by the authors, and there is no other reference to this usage elsewhere. This omission is perhaps due to the tendency of some early ichthyologists to synonymize all darters into one genus, whereas others relegated the various species to genera discernible by very tenuous characters; e. g., Jordan et al. (1930) divided the darters into 31 genera. Darter nomenclature was given a more stable foundation by Bailey (1951) as he divided the existing species into four genera: *Ammocrypta*, *Etheostoma*, *Hadropterus* (including *H. maculatus*), and *Percina*. Bailey (*in* Bailey et al., 1954) reduced the number of darter genera to three with the inclusion of *Hadropterus* in *Percina* and referred to the blackside darter as *Percina maculata* (Girard). Recently these three genera and their subgeneric divisions have been examined extensively by Page (1974; 1981; 1983) and

Williams (1975).

Since the original description, virtually no systematic account of *Percina maculata* has been published. Hubbs and Raney (1939) and Raney and Hubbs (1948) used what they considered to be *maculata* for limited comparisons in their original descriptions of *P. oxyrhyncha* and *P. notogramma*, respectively. The comparison, however, was actually based on *P. gymnocephala*, which has recently been shown to be a distinct species endemic to the New River drainage (Beckham, 1980). Moore and Reeves (1955) compared *P. pantherina* with *P. maculata* in their description of the leopard darter. Richards and Knapp (1964) used limited *P. maculata* material for subgeneric comparisons in their treatment of the subgenus *Hadropterus*. Page (1976) used counts of *P. maculata* modified midventral scales for comparison with other *Percina* and used a series of specimens from one locality for elucidating subgeneric divisions within *Percina* (Page, 1974).

MATERIALS AND METHODS

Over 1500 specimens of *Percina maculata* were examined from all major drainages within its range, and counts and measurements were made on approximately 1000 of these specimens for this study. To reduce allometric bias, only adult specimens greater than 45 mm SL were used for measurements. Counts were made from specimens over 38 mm SL.

Counts and measurements, other than those noted, were made as described in Hubbs and Lagler (1964). The number of transverse scale rows was taken from the origin of the second dorsal fin down and back to the anal fin, as proposed in Raney and Suttkus (1964). Head-canal pore counts were made following the methods of Hubbs and Cannon (1935). Only major lateral blotches were counted from the first full blotch posterior to the pectoral fin base back to, and including, the blotch ending at the hypural plate. Small blotches occasionally formed at the juncture of two major confluent blotches were discounted. Dorsal blotches were counted only on the left side of a mid-dorsal line because blotches on either side of the dorsal fins were occasionally asymmetrically distributed and could result in different counts on each side.

A listing of the material examined for this study is given in Beckham (1983), and will be included, more appropriately, in the subsequent paper on geographic variation of the blackside darter.

Percina maculata (Girard)
Blackside darter
Figure 1

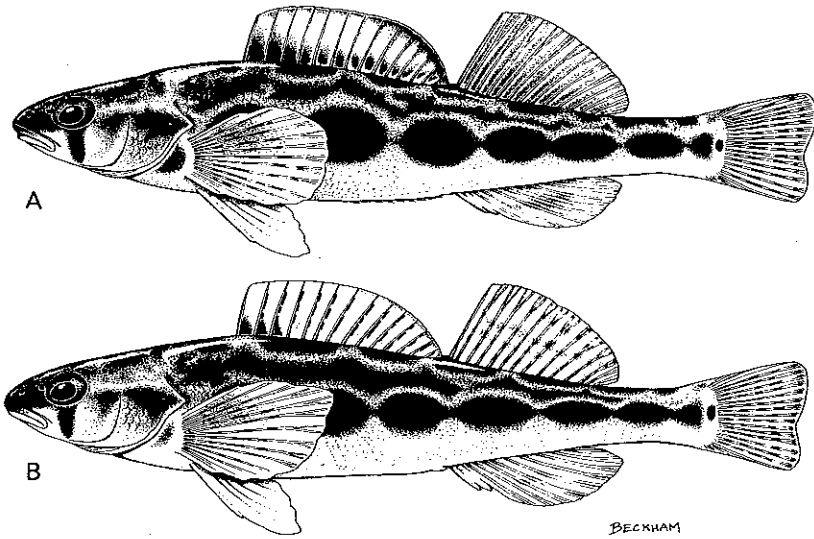


Figure 1. Lateral views of *Percina maculata*. Note pigmentation pattern differences in dorsal and anal fins between male (A) and female (B).

Types.—Two syntypes (USNM 1346) from Fort Gratiot on Lake Huron, on which Girard's original description was based, are listed in the USNM catalog as having been discarded and efforts to find them have proven unsuccessful (Collette and Knapp, 1966). Because no subspecific categories are proposed, no neotype is designated herein, since no "exceptional circumstances . . . for solving a complex zoological problem . . . in the interest of stability of nomenclature" (Stoll, 1964: Art. 75a.) exists for *P. maculata*.

Diagnosis.—A species of the genus *Percina*, subgenus *Alvordius* (diagnosed by Page, 1974), distinguished from other known species of the subgenus by the following combination of characters: spinous dorsal fin

with proximal concentration of melanophores on first 2-4 interradial membranes; distinct black basicaudal spot; 5-8 (usually 6 or 7) round to oval, moderately to broadly connected, dark brown lateral blotches; 6-12 (usually 8-11) rectangular, irregular, dark brown dorsal blotches along midline; nape with embedded scales posteriorly, opercles fully scaled, cheeks scaled or with at least a few embedded scales; chin and branchiostegal membranes immaculate or with uniformly distributed melanophores; no bright breeding colors; 40-44 (usually 42 or 43) vertebrae; only males with modified midventral scales.

Pigmentation pattern (Fig. 1) separates *P. maculata* from all other species in *Alvordius*, and Page (1983: Table 5) outlined much of this differentiation. The horizontal orientation of the lateral blotches of *P. maculata* are distinct from the vertical blotches and bars on the sides of *P. crassa* and *P. roanoka*. The horizontally rectangular lateral blotches and lack of a distinct black basicaudal spot in *P. gymnocephala* and *P. peltata* differentiate these two species from *P. maculata*. The dark bar below the basicaudal spot on *P. macrocephala* plus the greater number of lateral blotches on this species and *P. pantherina* separate them from *P. maculata*. *Percina notogramma* most closely resembles *P. maculata* in overall pigmentation pattern but may be differentiated by melanophore distribution on the unpaired fins. In particular the first dorsal fin is darkest basally and anteriorly in *P. notogramma* whereas in *P. maculata* it is dark posteriorly and distally in addition to anteriorly and basally. Thus, a proximal and distal band are present in the first dorsal fin of *P. maculata*, and a proximal band, only, is present in the first dorsal fin of *P. notogramma*. *Percina maculata* is distinct from *P. crassa* and *P. roanoka* of the Atlantic coast drainages in having a higher number of lateral line and caudal peduncle scales, but it differs from *P. macrocephala* and *P. pantherina* of the Mississippi River basin in having a lower number of lateral line and caudal peduncle scales. *Percina maculata* differs from *P. gymnocephala* in head squamation and number of vertebrae, and differs from *P. peltata* and *P. notogramma* from the Atlantic coast drainages in having modally higher scale counts. *Percina gymnocephala* and *P. macrocephala* females have modified midventral scales present, whereas *P. maculata* females do not.

Description.—*Percina maculata* is a moderate-sized species of the subgenus *Alvordius* and attains a maximum size of 95 mm SL.

Premaxillary frenum well developed; branchiostegal membranes separate; branchiostegal rays 6-6 (rarely with 5 or 7 on either or both sides);

cephalic sensory canal system without interruptions; a single coronal pore, supratemporal canal with three pores, supraorbital canal with four pores, infraorbital canal with eight pores, preoperculomandibular canal with 10 pores.

Dorsal spines 12 to 17 (usually 13 to 15); dorsal rays 10 to 15 (usually 12 or 13); anal spines 2 (rarely 1 or 3); anal rays 7 to 11 (usually 8 or 9); pectoral fin rays 11 to 16 (usually 13 or 14); caudal rays modally 17 (occasionally 15 or 16, rarely 14). Total vertebrae 40 to 44 (usually 42 or 43). Breeding tubercles absent.

Cheeks typically scaled, or with at least some embedded scales. Opercles fully scaled. Nape squamation typically embedded scales on posterior 25%, but occasionally naked or partially embedded scales up to 75% of area. Breast usually naked. Midventral row of modified scales well developed and present in males. Lateral line straight, complete (rarely 1 to 3 unpored scales) with 53 to 79 (usually 60 to 71) scales. Transverse scales 13 to 22 (usually 15 to 19). Caudal peduncle scales 18 to 29 (usually 20 to 26).

Proportional measurements, expressed as thousandths of standard length, range as follows: head length, 246-293; orbit diameter, 49-82; snout length, 56-81; snout to first dorsal, 325-364; snout to second dorsal, 625-676; snout to anal, 622-674; snout to pelvic, 215-321; snout to junction gill membrane, 96-146; body depth, 137-202; body width, 119-158; caudal peduncle length, 197-247; caudal peduncle depth, 74-96; first dorsal base, 223-337; second dorsal base, 140-203; anal base, 118-183; longest dorsal spine, 84-139; longest dorsal ray, 90-135; longest anal ray, 103-155; pectoral length, 184-243; pelvic length, 152-213; upper jaw length, 63-91; upper jaw width, 7-13.

Pigmentation pattern (Fig. 1) consists of a series of slightly to broadly confluent, horizontally ovate to round, dark brown lateral blotches, numbering usually 6 or 7. There are typically 8 to 11 irregularly rectangular, dark brown dorsal blotches, the anteriormost of which is often irregularly spotted with light areas. An irregular, wavy or broken, dark band extends along the mid-dorsolateral surface between the lateral and dorsal blotches producing two irregular light bands between the former and the latter; and forming, to a greater or lesser degree, a reticulated pattern along the upper body area.

The ventrolateral body and venter are typically cream colored to light

tan and are usually immaculate or occasionally covered with uniformly spaced melanophores giving the region a dusky appearance. The head is dark above the ventral margin of the eye with the snout having a mottled appearance. A narrow, dark band of pigment extends from the anterior edge of the eye to the tip of the snout onto the premaxillary frenum. Dark pigment extends from this point back along the upper jaw to a distance of one-third to three-quarters of its full length. A narrow, dark bar is present on the orbit above the pupil, and a dark subocular bar extends down and slightly back from the eye to the ventral margin of the preopercle. The chin and branchiostegal membranes are immaculate or with uniformly distributed melanophores giving the area a dusky appearance. A concentration of melanophores is usually present just anterior to the base of the pectoral fins. A distinct basicaudal spot, usually darker than the lateral blotches, is typically present; however, occasionally this pigmentation will be sufficiently broad and diffuse to form a blotch.

The dorsal fins exhibit sexual dimorphism in pigmentation patterns. Both males and females typically exhibit a proximal concentration of melanophores forming a dark blotch at the corner of the spinous dorsal fin in the anterior two to four interradiial membranes. Males have some concentration of pigment forming a proximal dark band on the remaining interradiial membranes. Another concentration of melanophores is located along the distal margin of the first dorsal and forms a dusky band along the border. Uniformly distributed pigment between these bands is often present and gives the entire fin a dark, dusky appearance. The second dorsal of males has a column of melanophores extending along the posterior half of each interradiial membrane from the base to the point of branching of the rays. The membranes surrounding the branched ends are uniformly pigmented to form a dusky proximal band. In females a fainter series of proximal and distal bands are present in the first dorsal, but the interradiial membrane just posterior to each spine has a vertical series of 3 or 4 dark lines forming a series of bands made up of vertical dashed lines. The second dorsal of females has a similar pattern with a series of bands formed by 4 or 5 dusky patches vertically oriented in each interradiial membrane.

The anal fin is either immaculate or has an overall dusky appearance with the rays being slightly outlined with melanophores. Occasionally a narrow, single band of melanophores is associated with the center of each ray. Series of 4 or 5 patches of melanophores along each caudal ray, but

not in the membranes, give the caudal fin a series of 4 or 5 (occasionally 3 or 6) dark, vertical bands. In larger adults the bands may be obscure and the caudal fin may be dusky in appearance. The pectoral fins have 4 to 6 pale bands formed by concentrations of melanophores in patches along the rays. The pelvic fins may appear immaculate or dusky but do not have pigment arranged in bands. Petravicz (1938) noted sexual dimorphism in the shape of the pelvic fins.

RELATIONSHIPS

In his treatment of the subgenera of *Percina*, Page (1974) proposed a phylogeny of the subgenus *Alvordius* based on phenograms generated from 45 characters measured on all species within the subgenus that were recognized at the time. Subsequently, Page (1981) presented phenograms and cladograms including relationships of *Alvordius* in his study of all darter subgenera based on 52 characters. The results of these clusterings indicate that *P. maculata*, *P. macrocephala* and *P. pantherina* are closely related and that they represent the most primitive members of *Alvordius*. *Percina maculata* is most closely related to *P. pantherina* in five different phenograms generated by Page (1974) based on different character groupings with males, females, and both sexes together. Page (1981) indicated a close relationship between *P. maculata* and *P. pantherina* in one phenogram, but found *P. macrocephala* to be more closely related to *P. maculata* in another phenogram and in one cladogram that included only members of the genus *Percina*. Most data used in the comparison of species in *Alvordius* were meristic, morphometric, and pigmentation character states. These comparisons suggest that, although the three species in question are related, *P. maculata* and *P. pantherina* show a closer relationship to each other than either does to *P. macrocephala*. Moore and Reeves (1955) proposed a closer relationship between *P. pantherina* and *P. maculata* based on the presence of scaled cheeks and opercles in these two species. *Percina macrocephala* has naked cheeks and opercles. Page (1978) concurred with this assessment of relationships among these three species in his treatment of *P. macrocephala*.

The more complete description of *P. maculata* afforded by my study corroborates the relationship inferred by Page (1974; 1978; 1981) and Moore and Reeves (1955).

Zoogeography is an important consideration in the relationship of these species. All three species occur in the Mississippi River basin; however, *P. pantherina* is allopatric to *P. maculata* (and *P. macrocephala*). The allopatry exhibited by *P. maculata* and *P. pantherina* may represent a more recent divergence of the two species than that indicated by the overlap in distribution of *P. maculata* and *P. macrocephala*.

Another possible relative of *P. maculata* is an undescribed species from the Mobile Bay drainage. Its closest extant relative in the subgenus should be more clearly defined subsequent to its description. *Percina maculata* and *P. gymnocephala* may have shared a common ancestor, but the latter species has been shown by Beckham (1980) to have a closer kinship to Atlantic coast members of *Alvordius*.

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