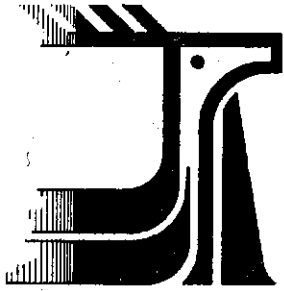


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Committee
on the Status
of Endangered
Wildlife
in Canada

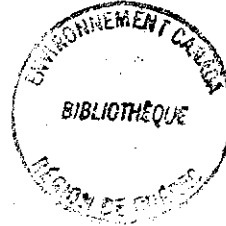
Comité sur le
statut des espèces
menacées
de disparition
au Canada

Ottawa, Ont. K1A 0E7 (613) 997-4991

**STATUS REPORT ON THE CHANNEL DARTER
PERCINA COPELANDI
IN CANADA**

No. 6

BY



CHERYL D. GOODCHILD

**STATUS ASSIGNED IN 1993
THREATENED**

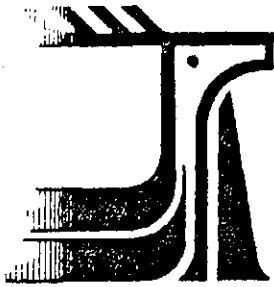
**REASON: LIMITED CANADIAN DISTRIBUTION
LOW NUMBERS WERE FOUND
THREATENED BY SEDIMENTATION IN AQUATIC HABITAT**

OCCURRENCE: ONTARIO AND QUEBEC

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88
573
Vol. 7

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JUNE 1990

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STATUS REPORT ON THE CHANNEL DARTER
PERCINA COPELANDI
IN CANADA

BY

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2064 ESSON LINE, RR 1
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STATUS ASSIGNED IN 1993
THREATENED

Status Of The Channel Darter, *Percina copelandi*, In Canada.

CHERYL D. GOODCHILD

2064 Esson Line, RR 1, Indian River, Ontario, K0L 2B0

Goodchild, Cheryl D. 1993. Status of the Channel Darter, *Percina copelandi*, in Canada. Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Canadian Wildlife Service, Ottawa, Ontario.

The Channel Darter is an indigenous species known from Lake Erie, the Detroit River and tributaries to the St. Lawrence River. Recently, it was collected from the Ottawa River and tributaries to eastern Lake Ontario. Although, the known distribution of the Channel Darter in Canada has expanded, few individuals have been collected indicating exceptionally small populations. In the United States, Channel Darter populations are declining and the species has been extirpated from many locations.

Le Fouille-roche gris est un poisson indigène qui se rencontre du lac Érié, de la rivière Detroit, et dans les tributaires du fleuve saint-Laurent. Il a récemment été découvert dans la rivière des Outaouais et dans les effluents du lac Ontario, dans l'est de l'Ontario. Même si la répartition canadienne connue du dard gris s'est étendue, un nombre relativement peu élevé d'individus ont États-Unis, les populations de fouille-roche gris sont en déclin et l'espèce est disparue en maints endroits.

Key words: Percidae, *Percina copelandi*, darters, Channel Darter, *fouille-roche gris*, rare and endangered fishes.

The Channel Darter (Figure 1), *Percina copelandi* (Jordan, 1877), is a small percid (subfamily Etheostominae), which has a disjunct distribution in central North America. The species may be polytypic with several species or subspecies (Kuehne and Barbour 1983). In particular, the Pearl River and Pascagoula River populations of Mississippi, probably represent undescribed species (Gilbert and Burgess 1980). Populations from the Black Warrior, Cahaba and Coosa Rivers of Alabama are isolated and likely distinct. Specimens from Kansas also have variable characters indicating another distinct form (Cross 1967).

In Canada, the Channel Darter is found principally in the upper St. Lawrence River and its tributaries in Quebec and Ontario, in eastern Lake Ontario tributaries, and along the shores of Lake Erie and in the Detroit River of southwestern Ontario. It is usually restricted to large rivers and major tributaries where it occurs on sand-gravel shoals and riffles (Gilbert and Burgess 1980). It may attain a size of 64 mm total length (TL) throughout its range in North America but commonly averages only 38 mm TL in Canada (Scott and Crossman 1973).

Percina copelandi has probably always been rare in Canada, based on collection records. Very few individuals have been collected in southern Ontario despite intensive aquatic habitat inventory surveys [G.A. Goodchild, Aquatic Ecosystems Branch, Ontario Ministry of Natural Resources (OMNR), Peterborough, Ontario; personal communication]. This suggests that the Channel Darter probably occurs in very low numbers in the northern extent of its range and makes this a species of interest to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This report was prepared to summarize, for the Committee, information pertinent to the status of the species in Canada.

Description

The Channel Darter (Figure 1) resembles the more common Johnny Darter, *Etheostoma nigrum*, and the Tessellated Darter, *Etheostoma olmstedi*; but both

have only one anal spine while the Channel Darter has two. The Channel Darter hybridizes with the Logperch, *Percina caprodes* (Trautman 1981).

It is also possible to confuse *Percina copelandi* with *Percina shumardi*, the River Darter, in Canada. Adults, however, can be distinguished by spiny dorsal fin pigmentation. *Percina copelandi* is dark at the base and side of the dorsal fin unlike *Percina shumardi* which has a small anterior black spot and a large posterior black spot. Characters most useful in identifying the Channel Darter are: scales around caudal peduncle 18 or fewer; anal rays 7 to 10 usually 8 or 9; anal fin of adult male not elongated (Page 1983). *Percina copelandi* differs from other members of the genus by lacking a frenum or rarely having a narrow one (Kuehne and Barbour 1983).

The overall coloration of the Channel Darter is light sand or olive, with brown speckles on the back. Cross-shaped markings are usually scattered over the dorsal surface, while a dusky bar or spot may be present beneath the eye and extend forward onto the snout. The fins are clear or only lightly speckled and the ventral half of the body is whitish. The breeding male is dusky, and may develop intense darkening of the fins and body with an almost black head. Male Channel Darters may exhibit breeding tubercles (Kuehne and Barbour 1983).

Distribution

North America

Percina copelandi has a wide but discontinuous and extremely disjunct distribution in central North America west of the Appalachian Mountains (Figure 2). It occurs in the upper Mississippi River system, in the Tennessee River drainage, to the northeast throughout most of the Ohio River drainage, the Great Lakes basin (Lakes Huron, Erie, Ontario), and the St. Lawrence River drainage of Ontario, Quebec, New York and Vermont. A disjunct population occurs to the southwest in the Red, Ouachita and Arkansas systems of the Mississippi drainage, in Louisiana, Oklahoma, Arkansas, Kansas, and Missouri. Other isolated populations may represent undescribed species or sub-species

such as in the Mobile Bay basin, Alabama and in Mississippi (Gilbert and Burgess 1980, Kuehne and Barbour 1983).

The Channel Darter may have had a more widely ranging preglacial distribution. Its native distribution in the United States is considered to include the lower and central Mississippi basin (Stauffer et al. 1982). Surprisingly, the Channel Darter is apparently absent from the main stem of the Mississippi River. The Mississippi River was the most probable corridor through which the Channel Darter dispersed into most of its current range, indicative of a previously wider and less disjunct distribution.

Percina copelandi is reported from the entire eastern margin of the lower peninsula of Michigan including Lake Huron (Hubbs and Lagler 1967). As such, it may represent one of the early migrants that utilized eastern connectives from the Wabash River to reach lakes and streams in the Erie basin. Or alternatively, it was widely distributed in rivers and streams tributary to the Ohio River and simply moved through minor drainageways (Underhill 1986).

In Missouri, populations are widely separated from the main range of the species to the northeast. These populations may date from a southwest movement of the species during one of the glacial advances of the Pleistocene Ice Age (Pflieger 1975). Fossil darters tentatively assigned to the extant species *Percina copelandi* have been found in a Pleistocene lake deposit in eastern South Dakota (Cavender 1986), further evidence of a more widely ranging preglacial distribution.

Canada

The Channel Darter is uncommon in Canada but several extremely disjunct populations are established throughout the lower Great Lakes basin (Figure 3), from the Detroit River through Lake Erie, Lake Ontario tributaries and in tributaries of the St. Lawrence River.

Although reported from the United States along the entire eastern margin of the lower peninsula of Michigan (including Lake Huron) (Hubbs and Lagler

1967], there has been only one reported capture of the Channel Darter in the Detroit River area of Canada. In 1940, it was collected one mile south of Amherstburg, Essex County (Radforth 1944).

The first reported collections of Channel Darter along the north shores of Lake Erie were from Port Dover in the early 1940s [Royal Ontario Museum, Toronto; ROM 17924, 17970, 17971, 18292]. In the early 1950s, small collections were also taken at Port Burwell, Erieau, and Point Pelee from sand and gravel beaches (Scott 1955). Recent collections from Pelee Island in 1984, indicate that the species probably still occurs in this area [ROM 44024, 45578].

Other disjunct populations of the Channel Darter are found hundreds of kilometres to the east in Ontario. Two specimens of *Percina copelandi* were collected in 1948 from an unnamed creek near Moira Lake, Hastings County, Lake Ontario drainage [ROM 18471]. Subsequently, several additional collections of Channel Darters were obtained in Hastings County by the Ontario Ministry of Natural Resources (OMNR), in the Trent River [OMNRS64]; and the Skootamatta River [ROM 30556 and OMNRS64]. Collections of Channel Darter from Hastings County are approximately 50 km inland from the Bay of Quinte area of Lake Ontario.

A single specimen of *Percina copelandi* has also been collected in the Ottawa River near Quyon (McAllister and Coad 1974). Collections made at the reported Quyon site a year or two later, however, did not find additional specimens (D. E. McAllister, Canada Museum of Nature, Ottawa, Ontario; personal communication).

In the province of Quebec, many disjunct populations of *Percina copelandi* occur in tributaries to the St. Lawrence River. Early records of the Channel Darter in Quebec, were from the Lachine Rapids, Rivière Châteauguay, l'Anse-au-Sable, as well as from Rivières Nicolet and St François which flow into Lac Saint Pierre (Cuerrier et al. 1946). Mongeau et al. (1974) provide a distribution map for southern Quebec which indicates the presence of *Percina copelandi* in both north and south flowing tributaries to

Lac Saint Pierre. These include Rivière Bayonne and Rivière du Chicot which flow south into Lac Saint Pierre and Rivière Noir and Rivière Yamaska which flow north into Lac Saint Pierre (Service d'Aménagement et d'Exploitation de la Faune 1979). Three additional specimens were collected in Rivière Yamaska in 1969 [ROM 27183] and many more have been collected by the Service de l'Aménagement et de l'Exploitation de la Faune in the Yamaska drainage basin (Mongeau 1979).

Information contained in provincial reports, collection records, and distribution maps recently provided to the author indicate a far greater number of specimens of *Percina copelandi* have been collected in Quebec over a wider-ranging area than was previously assumed (Guy Tencia, Québec Ministère du Loisir, de la Chasse et de la Pêche, Charlesbourg, Québec and Michel Huot, Ministère du Loisir, de la Chasse et de la Pêche, Québec, Québec; personal communications).

Before 1945, collections of Channel Darter had been taken from tributaries to the St. Lawrence River from southwest of Montreal as far east as Quebec city. Collections have been reported from tributaries along the south shore of the St. Lawrence River from the Trout River, south west of Huntingdon and from Rivière aux Ormes and the Gentilly River in the Trois Rivières vicinity. Specimens have also been collected east of Quebec from Rivière du Sud and from locations in the most southeastern corner of the province of Quebec; Nigger River near Ayer's Cliff; Salmon Brook; and in a stream entering Lac Aylmer less than 60 km from the United States border (Wynne-Edwards 1945).

Since the early 1960s the known range of *Percina copelandi* has been extended considerably eastward in Quebec. In 1964 specimens of *Percina copelandi* were collected in the Bécancour River at Bécancour (Paquet 1965). A small number of specimens were collected in 1971 from Rivière Henri and Rivière du Chêne, still farther north east approximately half the distance from Bécancour to Quebec city (Tencia; personal communication). Surprisingly large numbers of specimens have been collected in Saint-Lawrence drainage

substantially farther east than Quebec City, in the Montmagny area. Paquet (1965) reports collections of *Percina copelandi* taken from several stations along Rivière du Sud in 1964. In August 1980 a small number of specimens of Channel Darter were also collected from Rivière Bras St. Nicolas which flows into Rivière du Sud (Tencia; personal communication).

Since the mid 1970s, Channel Darters have been collected from several rivers in the vicinity of Montreal: from Rivière Chateauguay, Rivière aux Outaides-Est, Rivière aux Anglais, and Rivière à la Truite (south east of the city); Rivière Noire and Rivière Richelieu (east of the city), and on the north side of the St. Lawrence from Rivière L'Assomption and Rivière Ouareau north east of Montréal (Service d'Aménagement et d'Exploitation de la Faune 1979).

Recent collections taken from the southeast corner of the province of Quebec near the United States border, further enhance our knowledge of the distribution of Channel Darter. In 1977 collections were made in Rivière Au Bluets, Frontenac Co, 3 km west of Courcelles [NMC 77-0752] and in a tributary of Rivière au Salmon, Compton County, 5 km north of Gould [NMC 77-0829].

The extensive but disjunct distribution of the Channel Darter in Canada suggests the species may have been even more extensive in the past. *Percina copelandi* probably survived glaciation in a Mississippian refugium, utilizing the Fort Wayne outlet to gain access to southern Ontario (Mandrak 1990). Bailey and Smith (1981) suggest that it may have used glacial Lake Maumee (which existed in the Erie and lower Huron basins), as a refuge and access route for dispersal into the Lake Ontario watershed. Its occurrence in the Lake Huron basin and the St. Lawrence lowland indicates early migration (Underhill 1986).

Protection

No specific protection exists in Canada for the Channel Darter, although the fish habitat sections of the federal *Fisheries Act* do provide general protection.

In the United States, *Percina copelandi* is listed as rare in Kentucky and West Virginia by Miller (1972). It is also designated as "of special concern" in Kentucky and Quebec, and protected in Michigan and Ohio (Johnson 1987).

Population Sizes and Trends

No population studies have been done for the Channel Darter in North America. However, evidence from its changing distribution and fewer numbers collected supports the conclusion that the Channel Darter has undergone considerable reduction throughout its range.

In the northern tributaries to the Ohio River in Indiana, Ohio, and Pennsylvania, Channel Darter populations are substantially reduced (Trautman 1981). None had been collected in the Ohio River, from 1978 until recently when adult and larval specimens were collected in both the upper and middle reaches of the Ohio River (Reash 1991). The species may have some ability to re-populate areas when water quality improves.

The Channel Darter is apparently absent above the confluence of the Ohio River in the northwestern Mississippi River drainage. No specimens have been collected from the Maumee River, Ohio, since 1922. Small populations once present in the Muskingum River, Ohio, are probably extirpated because none have been collected in this location in more than 40 years (Hocutt et al. 1986). Also, it is likely extirpated from the Little Miami River (Burr and Page 1986). Hocutt et al. (1986) suggest that *Percina copelandi* probably once occupied Illinois but have been extirpated. Populations around Bass Island, Lake Erie, are also declining. Channel Darters were taken annually in considerable numbers before 1954, but none have been collected since 1972 (Trautman 1981). In Pennsylvania, besides localized populations in the Allegheny River and in Lake Erie, Channel Darters are considered rare (Cooper 1983).

In Mississippi, Channel Darters are extremely rare, bordering on extirpation. In Missouri, they occur only in the Spring River and its large

tributaries of the southwestern Ozarks (Pflieger 1975). They are also rare throughout the lower Tennessee River system and probably have been extirpated from the system in Kentucky (Gilbert and Burgess 1980).

Similarly, low numbers are also evident in the disjunct southwest populations of Channel Darter. It is not abundant anywhere in Kansas where it inhabits the larger tributaries of the Arkansas River (Cross 1967). It is, however, widespread in the Arkansas and Red River drainages of Oklahoma and Arkansas (Cross et al. 1986).

Percina copelandi has probably always been rare in Canada, based on collection records. Very few individuals have been collected in southern Ontario despite intensive aquatic habitat inventory surveys in the 1970s and early 1980s (Goodchild; personal communication). This suggests, that the Channel Darter probably occurs in very low numbers in the northern extent of its range. Collection data from the province of Quebec, recently provided to the author, indicates that the species is apparently more widespread there than would be expected based on its scarcity elsewhere in North America.

Due to the apparent difficulty in collecting Channel Darters, assumptions regarding the status of populations of Channel Darter should be viewed cautiously. More intensive surveys occasionally reveal the presence of Channel Darter in new locations. For instance, the Channel Darter is included on the checklist of the fishes of West Virginia (Denoncourt et al. 1975). Also, it was recently added to the faunal list from the Little Kanawtha River, West Virginia, indicating populations may be more extensive than previously believed (Hocutt et al. 1986). Similarly, recent collections expanding the range of Channel Darter in Ontario, and Quebec may indicate that populations are increasing or that its distribution is expanding. Alternatively, these collections may merely reflect increased survey efforts.

Based on the scant numbers of individuals captured, populations of the Channel Darter are extremely limited throughout North America, particularly in Canada.

Habitat

The Channel Darter is a benthic species found most commonly over sand and gravel shoals of larger rivers or beaches where the associated current is slow (Smith 1985; Scott and Crossman 1973). In rivers, the Channel Darter inhabits deeper pools or sluggish riffles with sufficient current to create a silt-free gravel substrate (Pflieger 1975). Although frequently associated with larger river systems, they may inhabit smaller channels and tributaries (Branson 1967). They are seldom found in moderate or fast flowing riffles except during spawning when there is a notable migration to these areas.

Characteristic habitat of Channel Darters from streams in Ontario, as summarized from OMNR field collection records, is rock, sand and rubble bottom in water over a metre deep. Actual current rates are not recorded, however the presence of aquatic vegetation at these sites indicates slow to sluggish flow. Trautman (1981) suggests that Channel Darters occupy water over a metre in depth during daytime, but very shallow areas are favoured at night.

In Canada, Channel Darters are also found in lakes over wave-washed sand and gravel beaches. This is the typical habitat associated with collections of Channel Darters taken along the north shore of Lake Erie.

General Biology

Reproductive Capability

Spawning occurs in spring or early summer. In Kansas, many specimens obtained in late April or early May exhibited breeding coloration and females were distended by eggs. By June, specimens lack spawning colours and females are spent (Cross 1967). In early June, 1929, a 7 mm larval specimen was collected from Lake Erie, Ontario, indicating spawning had taken place in May (Fish 1932). Greeley (1929) reported ripe males in riffle areas in mid-June. In Michigan, spawning occurred in July at water temperatures of approximately 21°C (Winn 1953). Water temperature probably determines time of spawning.

Channel Darters presumably undergo a short migration to the spawning grounds (Cooper 1983). They may move upstream where scattered rubble affords

spawning sites (Kuehne and Barbour 1986). Adults seek streams with moderate to fast current to spawn, probably accounting for the scanty numbers taken in lake tows during the breeding season (Fish 1932).

Winn (1953) provides the most comprehensive discussion of the breeding habits of the Channel Darter. The spawning site described is inside a bend of the Cheboygan River below a Power Dam and Pulp Mill, approximately 1.5 km (1 mile) above its mouth in Lake Huron. At the spawning site the river is 35 m (100 feet) wide, 35 to 175 cm (1.5 to 5 feet) deep, and characterized by a swift current. The Channel Darter may prefer water less than 175 cm (5 feet) deep or may be avoiding competition for spawning sites with *Etheostoma nigrum* which were common in deeper pools.

Fairly rapid current is evidently a requirement for successful spawning of Channel Darters. Breeding activity ceased when flow temporarily slowed in the river. This suggests there is a minimum threshold for water movement below which spawning is inhibited. Breeding adults placed in aquaria with simulated natural conditions but with a slow current, also failed to spawn (Winn 1953).

Males establish territories slightly less than one metre in diameter centred about a large rock in the current. Territories are actively defended against conspecific males but not from males of *Percina caprodes*. Spawning is communal with many territories in a small area. Females move through the territories successively spawning with many males. During an individual spawning act a male will direct a ripe female to an area of gravel behind a rock where the female partly buries herself in gravel.

There is no parental care of eggs. Approximately 4 to 10 eggs are deposited during each spawning act. Total number of eggs deposited by a single female has not been determined but egg counts from one- to two-year-old females range from 350 to more than 700 (Page 1983).

Eggs are approximately 1.4 mm in diameter, but there is wide variation in size. The eggs are slightly adhesive, demersal and oddly shaped. They are partially transparent with an orange oil globule. Fish (1932) provides a

detailed description of the morphology of a 6.1 mm TL larval specimen.

Sexual dimorphism and the striking breeding colours are described by Winn (1953). Males apparently grow to a larger size than females. Young-of-the-year were reportedly 20 to 38 mm in length by October and the largest specimen reported from Ohio was 64 mm long (Trautman 1981). The largest specimen indicated by Scott and Crossman (1973) was 61 mm TL, and the range in size of specimens collected in Canadian waters is 34 to 61 mm TL.

Species Movement

Due to its scarcity and small size, the Channel Darter has not been extensively studied and therefore little is known about its movements. There is a brief migration to spawning grounds in the spring or early summer (Cooper 1983). Since there is no parental care of eggs and young, adults probably remain in the spawning area for a very short time.

Seasonal movements were observed by Branson (1967), in Oklahoma. The Channel Darter was found to overwinter in quiet, leaf and debris filled backwaters, which it departed for the main channel during April and May.

Behaviour/Adaptability

Percina copelandi is frequently found in association with the Logperch, *Percina caprodes* and the Mimic Shiner, *Notropis volucellus* (Cooper 1983).

The Channel Darter is a benthic feeder. Evidently, there is little difference in the diet of young and adults. Turner (1921) analyzed stomach contents of the Channel Darter from the Bass Islands regions of Lake Erie. He found that the species primarily fed upon mayfly and midge larvae but also ingested large amounts of algae and detritus. Winn (1953) also found that the diet was principally composed of benthos, chiefly chironomid and trichopteran larvae. On the other hand, in Kentucky, the predominant diet consisted of microcrustacea (copepods and cladocerans) with chironomids being second in importance in both volume and frequency (Cross 1967).

The incidence of parasitism of the Channel Darter in western Lake Erie

may be increasing. Only 8 out of 34 specimens examined by Bangham and Hunter (1939) contained parasites (23%). However, 25 were infected when Bangham (1972) later examined the parasites of 33 specimens (76%). Parasitized individuals of Channel Darter contained trematodes, cestodes and nematodes (Bangham and Hunter 1939; Hoffman 1967; Margolis and Arthur 1979).

Limiting Factors

The communal spawning behaviour of female *Percina copelandi* may limit the number of eggs deposited. Females were observed depositing less than 10 eggs during each spawning act. To lay all her eggs, a female must spawn repeatedly with many males and this opportunity may not always exist. During periods when stream flow fluctuates below the minimum required for spawning, the Channel Darter terminates spawning activity, resulting in fewer eggs being deposited. If periods of optimum temperature were also brief then there would likely be very low spawning success, resulting in decreased year class strength.

Also, critical to spawning success is access to areas with moderate to rapid flow. During the breeding season, Channel Darters probably make short migrations from the sand and gravel shoals with slow current with which they are normally associated, to areas with more rapid current (Cooper 1983). Therefore, any barriers preventing movement to preferred breeding habitat would limit reproduction.

Competition for spawning territory from other darters such as *Percina caprodes* and *Etheostoma nigrum* also may play a role in limiting Channel Darter populations.

Trautman (1981) suggests that populations probably once existed on the extensive sand and gravel bars in the Ohio River before impoundments and the resultant increase in siltation and turbidity. As a benthic feeder, heavy siltation may affect both its ability to feed and the availability of desired larval prey. Since the Channel Darter probably dispersed through the Mississippi River, its absence from the main stem is noteworthy. Human

intervention in the Mississippi River has caused such drastic environmental changes and resulting habitat alteration and degradation that it may have been rendered unsuitable for Channel Darters.

In Southwestern Ontario, extensive sedimentation has occurred due to poor agricultural practices and urban land use (Francis et al. 1979). This has caused a loss of optimal habitat for *Percina copelandi* which may have extremely detrimental effects on populations already very low in numbers.

Channel Darters are associated with moderate current over sandy substrate, however, the conditions required to create such habitats may occur only at intervals. This may result in variation in reproductive success and changes in abundance from year to year. For instance, in the Tennessee River drainage, where stream conditions fluctuate, it is often difficult to demonstrate the presence of Channel Darter during some years due to low population density (Starnes et al. 1977).

Increasing susceptibility to parasitism (Bangham 1972) may also be an indicator of the relative health of existing populations, and may contribute to the species inability to compete.

Special Significance of the Species

Percina copelandi is one of several small darter species that occur in Canada. There is little interest in this species by either the public or fisheries managers. Its role in our aquatic environment is not well understood, a direct result of its scarcity and small size. Although the Channel Darter is of no direct economic importance, all indigenous species should be protected to conserve the biodiversity of aquatic ecosystems.

Evaluation

The Channel Darter occurs in very low numbers throughout its range and particularly in the north. In southern Ontario fewer than 100 specimens have been collected, although more have been captured in the province of Quebec. Recent collections expanding the known range of the Channel Darter in Ontario

and Quebec probably result from increased survey efforts and are probably not indicative of increasing populations.

Populations of Channel Darters in the United States are also undergoing considerable reduction in numbers and are being extirpated from many locations where they were formerly well established. The biology of the Channel Darter is not well understood and the reasons for its rarity have not yet been established but populations evidently have limited potential for stabilization.

This indigenous species' continued existence in Canada, is tentative. The Channel Darter should be considered a threatened species in Canada.

Acknowledgements

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Literature Cited

- Bailey, R.M., and G.R. Smith. 1981. Origin and geography of the fish fauna of the Laurentian Great Lakes basin. *Canadian Journal of Fisheries and Aquatic Science* 38: 1539-1561.
- Bangham, R.V. 1972. A resurvey of the fish parasites of western Lake Erie. *Bulletin Ohio Biological Survey* 4(2): 1-23.
- Bangham, R.V., and G.W. Hunter III. 1939. Studies of fish parasites of Lake Erie. Distribution studies. *Zoologica* 24(4): part 27: 385-448.
- Branson, B.A. 1967. Fishes of the Neosho River system in Oklahoma. *American Midland Naturalist* 78(1): 126-154.
- Burr, B. M., and L.M. Page. 1986. Zoogeography of fishes of the lower Ohio-upper Mississippi basin. Pages 287-324 in *The Zoogeography of North American Freshwater Fishes*. Edited by C.H. Hocutt and E.O. Wiley. John Wiley and Sons, New York, New York. 866 pages.
- Cavender, T.M. 1986. Review of the fossil history of North American freshwater fishes. Pages 699-724 in *The Zoogeography of North American freshwater fishes*. Edited by C.H. Hocutt and E.O. Wiley. John Wiley and Sons, New York, New York. 866 pages.
- Cooper, E.L. 1983. Fishes of Pennsylvania and the northeastern United States. Pennsylvania State University Press. 243 pages.
- Cross, F.B. 1967. Handbook of fishes of Kansas. University of Kansas Museum of Natural History, Miscellaneous Publication 45: 1-357.
- Cross, F.B., R.L. Mayden, and J.D. Stewart. 1986. Fishes in the western Mississippi drainage. Pages 363-412 in *The Zoogeography of North American Freshwater Fishes*. Edited by C.H. Hocutt and E.O. Wiley. John Wiley and Sons, New York, New York. 866 pages.
- Cuerrier, J-P., F.E.J. Fry, et G. Prefontaine. 1946. Liste préliminaire des poissons de la région de Montréal et du Lac Saint-Pierre. *Naturaliste Canadien* 73: 17-32.

- Denoncourt, R.F., E.C. Raney, G.H. Hocutt, and J.R. Stauffer. 1975. A checklist of the fishes from Lake Erie and its tributary waters. Bulletin U.S. Bureau of Fisheries 10, volume 47: 293-398.
- Fish, M.P. 1932. Contributions to the early life histories of sixty-two species of fishes from Lake Erie and its tributary waters. Bulletin U. S. Bureau of Fisheries 10, volume 47: 293-398.
- Francis, G.R., J.J. Magnuson, H. A. Regier and D. R. Talhelm. 1979. Rehabilitating Great Lakes ecosystems. Great Lakes Fisheries Commission Technical Report 37. 99 pages.
- Gilbert, C. R., and G. H. Burgess. 1980. *Percina copelandi* (Jordan), Channel Darter. Page 721. in Atlas of North American Freshwater Fishes. Edited by D. S. Lee, C. R. Gilbert, C. H. Hocutt, R. E. Jenkins, D. E. McAllister and J. R. Stauffer, Jr. North Carolina State Museum of Natural History, Biological Survey Publication 1980-12. 867 pages.
- Greeley, J. R. 1929. Fishes of the Erie-Niagara watershed. Pages 150-179 in A Biological Survey of the Erie-Niagara System. Supplement 18th Annual Report of the New York Conservation Department (1928). 244 pages.
- Hocutt, C. H., R. E. Jenkins and J.R. Stauffer Jr. 1986. Zoogeography of the fishes of the Central Appalachians and Central Atlantic Coastal Plain. Pages 161-212 in The Zoogeography of North American Freshwater Fishes. Edited by C.H. Hocutt and E.O. Wiley. John Wiley and Sons, New York, New York. 866 pages.
- Hoffman, G.J. 1967. Parasites of North American freshwater fishes. University of California Press. 486 pages.
- Hubbs, C.L., and K.F. Lagler. 1967. Fishes of the Great Lakes Region. University of Michigan Press, Ann Arbor, Michigan. 213 pages.
- Johnson, J.E. 1987. Protected fishes of the United States and Canada. American Fisheries Society, Bethesda, Maryland. 42 pages.
- Kuehne, R.A., and R.W. Barbour. 1983. The american darters. The University Press of Kentucky, Lexington, Kentucky.

- Mandrak, N.E. 1990. The zoogeography of Ontario freshwater fishes. M.Sc. thesis, Department of Zoology, University of Toronto, Toronto, Ontario.
- Margolis, L., and J.R. Arthur. 1979. Synopsis of the parasites of fishes of Canada. Canada Department of Fisheries and Oceans Bulletin 199. 269 pages.
- McAllister, D.E., and B.W. Coad. 1974. Fishes of Canada's National Capital Region. National Museum of Natural Sciences Miscellaneous Special Publication 24. 200 pages.
- Miller, R.R. 1972. Threatened freshwater fishes of the United States. Transactions of the American Fisheries Society 101(2): 239-252.
- Mongeau, J-R. 1979. Les poissons du bassin de drainage de la rivière Yamaska, 1953 a 1975. Ministère du Tourisme, de la Chasse et de la Pêche, Service de l'Aménagement et de l'Exploitation de la Faune.
- Mongeau, J-R., A. Courtemanche, G. Masse and B. Vincent. 1974. Cartes de répartition géographique des espèces de poissons au sud du Québec d'après les inventaires ichthyologiques effectives de 1963 a 1972. Ministère du Tourisme, de la Chasse et de la Pêche, Faune Du Québec, Rapport Spécial No. 4. 92 pages.
- Page, L.M. 1983. Handbook of darters. Illinois Natural History Survey, Champlain, Illinois. 271 pages.
- Paquet, G. 1965. Inventaire de la rivière du Sud, comtes de Montmagny et de Bellechasse. Ministère du Tourisme, de la Chasse et de la Pêche, Service de la Faune, Québec. Tire a part no 69: 101-114.
- Paquet, G. 1970. Étude physique et inventaire ichthyologique sommaires de la rivière Bécancour, affluent sud du Saint-Laurent. Ministère du Tourisme, de la Chasse et de la Pêche, Service de la Faune, Québec. Rapport no 5. 51 pages.
- Pflieger, W.L. 1975. The fishes of Missouri. Missouri Department of Conservation. 343 pages.
- Radforth, I. 1944. Some considerations of the distribution of fishes in Ontario. Royal Ontario Museum of Zoology Contribution 25. 116 pages.

- Reash, R.J. 1991. Status of the Channel Darter (*Percina copelandi*) in the Upper and Middle Ohio River. *Ohio Journal of Science* 91(2): 75-75.
- Scott, D.M. 1955. Additional records of two fishes, *Erimyzon sucetta kennerlyi* and *Hadropterus copelandi*, from southern Ontario, Canada. *Copeia* (2): 151.
- Scott, W.B., and E.J. Crossman. 1973. *Freshwater fishes of Canada*. Fisheries Research Board of Canada Bulletin 181. 966 pages.
- Service d'Aménagement et d'Exploitation de la Faune. 1979. 97 cartes de répartition géographique de la région administrative de Montréal. Ministère du Tourisme, de la Chasse et de la Pêche.
- Smith, C.L. 1985. *The inland fishes of New York State*. New York State Department of Environmental Conservation. 522 pages.
- Smith, P.W. 1979. *The fishes of Illinois*. University of Illinois Press. 314 pages.
- Starnes, W.C., D.A. Etnier, L.B. Starnes, and N.H. Douglas. 1977. Zoogeographic implications of the rediscovery of the percid genus *Ammocrypta* in the Tennessee River drainage. *Copeia* (4): 783-786.
- Stauffer, J.R., Jr., B.M. Burr, C.H. Hocutt, and R.E. Jenkins. 1982. Checklist of the fishes of the central and northern Appalachian Mountains. *Proceedings of the Biological Society of Washington* 95(1): 27-47.
- Trautman, M.B. 1981. *The fishes of Ohio with illustrated keys*. Revised Edition. Ohio State University Press. 782 pages.
- Turner, C.L. 1921. Food of the common Ohio darters. *Ohio Journal of Science* 22(2): 41-62.
- Underhill, J.C. 1986. The fish fauna of the Laurentian Great Lakes, the St. Lawrence Lowlands, Newfoundland and Labrador. Pages 105-136 in *The Zoogeography of North American Freshwater Fishes*. Edited by C.H. Hocutt and E.O. Wiley. John Wiley and Sons, New York, New York. 866 pages.
- Winn, H.E. 1953. Breeding habits of the percid fish *Hadropterus copelandi* in Michigan. *Copeia* (1): 26-30.

Wynne-Edwards, V.C. 1930-1945. *Manuscript*. Répartition géographique des poissons de la province de Québec. 76 cartes. Montréal.

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[Drawing by A. Odum, from Scott and Crossman (1973) by permission.]

Figure 2. North american distribution of the Channel Darter, *Percina copelandi*. [From Gilbert and Burgess (1980).]

Figure 3. Canadian distribution of the Channel Darter, *Percina copelandi*.

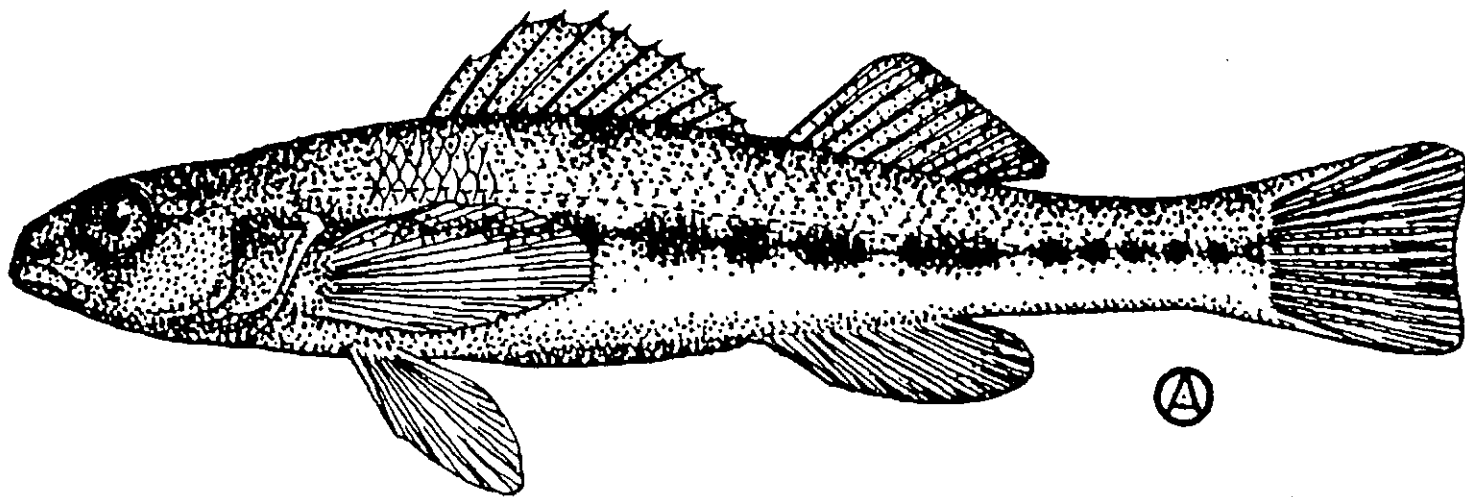
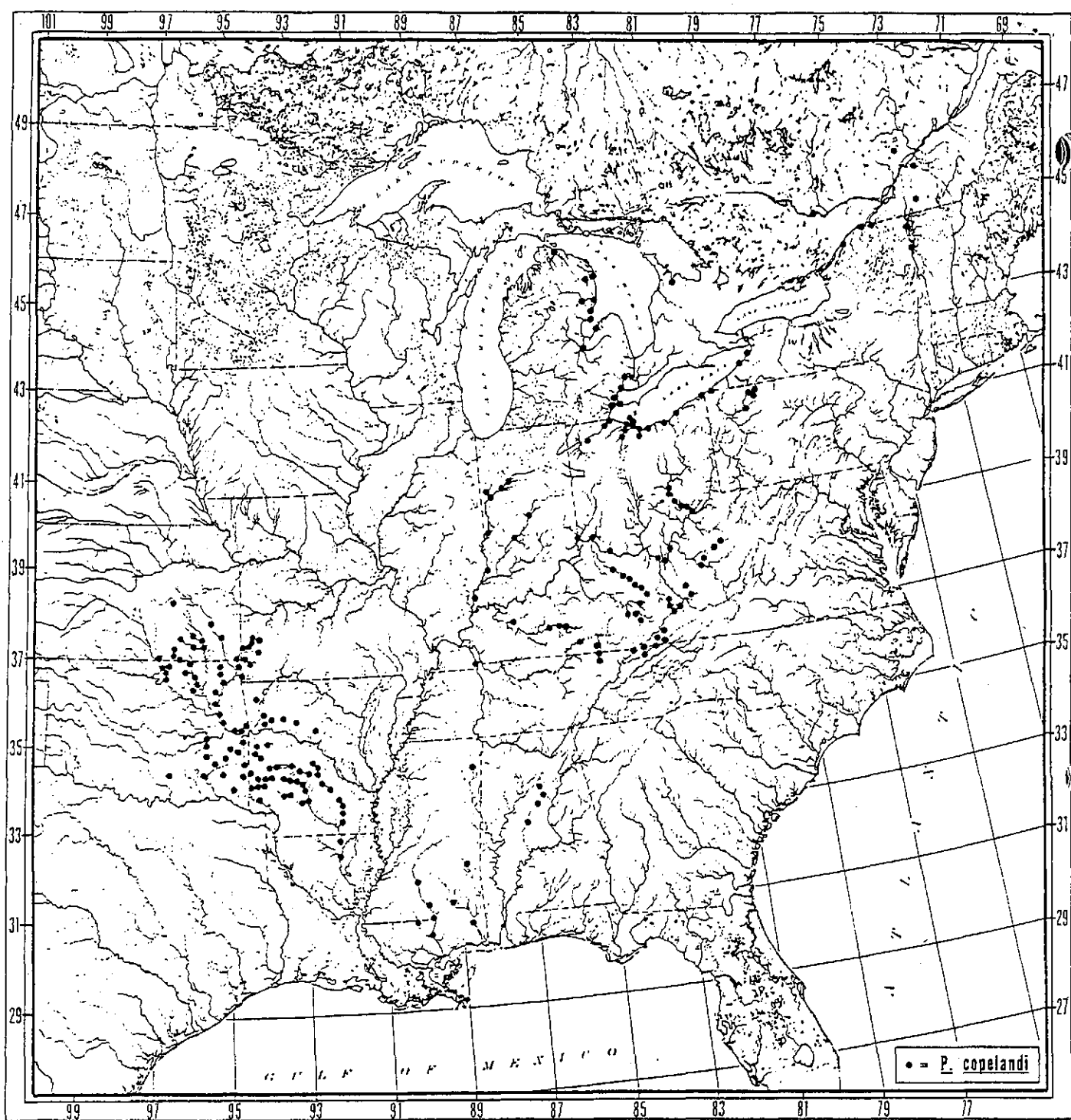


Figure 1. The Channel darter, *Percina copelandi*, [from Scott and Crossman (1973) *Freshwater Fishes of Canada*, drawing by A. Odum; by permission].



Distribution of *Percina copelandi*.

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MAY CONTAINS SPOTS IN RETINA

P. Copelandi

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