

COMMITTEE ON THE  
STATUS OF ENDANGERED  
WILDLIFE IN CANADA

OTTAWA, ONT. K1A 0H3  
(819) 997-4991

COMITÉ SUR LE STATUT  
DES ESPÈCES MENACÉES  
DE DISPARITION AU  
CANADA

OTTAWA (ONT.) K1A 0H3  
(819) 997-4991

**STATUS REPORT ON THE EASTERN SAND DARTER  
*AMMOCRYPTA PELLUCIDA***

IN CANADA

BY

ERLING HOLM

AND

NICHOLAS E. MANDRAK

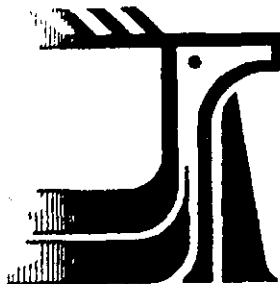
STATUS ASSIGNED IN 1994  
THREATENED

**REASON:** THE EASTERN SAND DARTER HAS DISTRIBUTED  
CONTINUOUS POPULATION DECLINES OVER THE COURSE  
OF THIS CENTURY RELATED TO HABITAT LOSS AND  
DEGRADATION, SILTATION AND SEDIMENTATION  
RESULTING FROM LAND USE PRACTICES.

**OCCURRENCE:** ONTARIO AND QUEBEC

COSEWIC - A committee of representatives from  
federal, provincial and private agencies which  
assigns national status to species at risk in  
Canada.

CSEMDC - Un comité de représentants d'organismes  
fédéraux, provinciaux et privés qui attribue un  
statut national aux espèces canadiennes en péril.



Committee  
on the Status  
of Endangered  
Wildlife  
in Canada

Comité sur le  
statut des espèces  
menacées  
de disparition  
au Canada

JUNE 1990

OH3 (819)  
Ottawa, Ont. K1A 0P2 (613) 997-4991

#### NOTES

1. This report is a working document used by COSEWIC in assigning status according to criteria listed below. It is released in its original form in the interest of making scientific information available to the public.
2. Reports are the property of COSEWIC and the author. They may not be presented as the work of any other person or agency. Anyone wishing to quote or cite information contained in status reports may do so provided that both the author and COSEWIC are credited. Reports may be cited as in the following example:  
  
Bredin, E. J. 1989. Status report on the Northern Prairie Skink, Eumeces septentrionalis, in Canada. Committee on the Status of Endangered Wildlife in Canada. 48 pp.
3. Additional copies of this report may be obtained at nominal cost from Canadian Nature Federation, 453 Sussex Drive, Ottawa, Ontario, K1N 6Z4.

#### DEFINITIONS

**SPECIES:** "Species" means any species, subspecies, or geographically separate population.

**VULNERABLE SPECIES:** Any indigenous species of fauna or flora that is particularly at risk because of low or declining numbers, occurrence at the fringe of its range or in restricted areas, or for some other reason, but is not a threatened species.

**THREATENED SPECIES:** Any indigenous species of fauna or flora that is likely to become endangered in Canada if the factors affecting its vulnerability do not become reversed.

**ENDANGERED SPECIES:** Any indigenous species of fauna or flora that is threatened with imminent extinction or extirpation throughout all or a significant portion of its Canadian range.

**EXTIRPATED SPECIES:** Any indigenous species of fauna or flora no longer known to exist in the wild in Canada but occurring elsewhere.

**EXTINCT SPECIES:** Any species of fauna or flora formerly indigenous to Canada but no longer known to exist anywhere.

**COSEWIC** — A committee of representatives from federal, provincial and private agencies which assigns national status to species at risk in Canada.

**CSEMDC** — Un comité de représentants d'organismes fédéraux, provinciaux et privés qui attribue un statut national aux espèces menacées de disparition au Canada.

**STATUS REPORT ON THE EASTERN SAND DARTER**  
***AMMOCRYPTA PELLUCIDA***

**IN CANADA**

3711009J

**BY**

**ERLING HOLM**

**AND**

**NICHOLAS E. MANDRAK**  
**DEPARTMENT OF ICHTHYOLOGY AND HERPETOLOGY**  
**ROYAL ONTARIO MUSEUM**  
**TORONTO, ONTARIO**  
**M5S 2C6**

**STATUS ASSIGNED IN 1994**  
**THREATENED**

# Status of the Eastern Sand Darter, *Ammocrypta pellucida*, in Canada

ERLING HOLM AND NICHOLAS E. MANDRAK<sup>1</sup>

Department of Ichthyology and Herpetology, Royal Ontario Museum, Toronto, Ontario  
M5S 2C6

<sup>1</sup> Present Address: Department of Biological Sciences, Fort Hays University, Hays  
KS 67661

Holm, E., and N.E. Mandrak. 1995. Status of the Eastern Sand Darter, *Ammocrypta pellucida*, in Canada. Report to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Canadian Wildlife Service, Ottawa, Ontario.

The Eastern Sand Darter, *Ammocrypta pellucida*, is a small slender member of the family Percidae. It is widely and disjunctly distributed in north central North America. The degradation of its preferred sand-bottomed habitat has led to the decline of populations in the United States, where it is classified by the American Fisheries Society as Threatened. Many populations have also declined or been extirpated in Canada. Recent collections from lakes Erie and St. Clair, and the Grand, Sydenham, and Thames rivers indicate that some populations still exist in Ontario. It has not been captured in recent sampling in Québec. It is recommended that the Eastern Sand Darter be classified as Threatened in Canada.

Le dard de sable de l'est, *Ammocrypta pellucida*, est un membre, petit et élancé, de la famille des Percidae. Il est très répandu et dispersé dans le centre nord de l'Amérique du Nord. La dégradation des habitats aux fonds sablonneux, qu'il préfère, a provoqué un déclin de populations aux États-Unis, où l'American Fisheries Society l'a classifié "menacé". Beaucoup de populations ont aussi décliné ou sont disparues au Canada. De récents échantillonnages des lacs Erie et St-Clair et des rivières Grand, Sydenham et Thames indiquent qu'il en existe encore des populations en Ontario. Au Québec, il y a l'absence de données récentes. On recommande, pour le dard de sable de l'est, le statut de "menacé" au Canada.

**Key Words:** Eastern Sand Darter, Dard de Sable, *Ammocrypta pellucida*, Percidae, threatened, Ontario, Québec

The Eastern Sand Darter (Dard de Sable), *Ammocrypta pellucida* (Putnam, 1863), belongs to a genus in the family Percidae which includes species commonly known as sand darters because its members are found in large creeks, rivers, and lakes with sandy bottoms. They are small pellucid fishes which are known to bury themselves completely or with only their eyes and snout showing. Scott and Crossman (1973) noted that *Ammocrypta pellucida*, an uncommon species in Canadian waters, has probably declined in abundance from former levels. This report summarizes our current knowledge of the distribution and status of the species in Canada.

## Description

Species in the genus *Ammocrypta* are generally distinguished from other darters (tribe Etheostomatini) by translucent and slender elongate bodies which

are usually incompletely scaled. The Eastern Sand Darter (Figure 1) differs from the other six species of the genus in the following characteristics. It is pale white, yellowish or silvery coloured with a series of 10-14 lateral dark spots usually located entirely below the lateral line scale row. These spots are slightly smaller than the pupil, and are frequently rounded anteriorly and oblong posteriorly. The median fins are not pigmented. *Ammocrypta pellucida* is one of the most elongate species of *Ammocrypta*, with body depth entering into standard length usually 8-9 times. There are usually 10-12 transverse scale rows on each side, 4-7 of these below the lateral line, and 9-11 (usually 10) preopercular-mandibular canal pores. The pelvic rays of adult males are darkly pigmented and have small tubercles. Simon et al. (1992) described larval characteristics of five sand darter species, including *Ammocrypta pellucida*. Average adult size ranges from 46-71 mm total length (TL), and maximum recorded size is 81 mm TL (from Scott and Crossman 1973, Williams 1975, Trautman 1981).

Although the genus *Ammocrypta* is recognized in the widely accepted *A List of Common and Scientific Names of Fishes from the United States and Canada* (Robins et al. 1991), Simons (1991, 1992) proposes that *Ammocrypta* be downgraded to the subgenus level and that six species within the subgenus, including *Ammocrypta pellucida*, be placed in the genus *Etheostoma*. His study indicates that the genus *Ammocrypta* is not monophyletic, and when reduced to a monophyletic group (by removing one species), *Ammocrypta* exhibits a similar amount of character variation as the other *Etheostoma* subgenera *Boleosoma* and *Ioa* (Simons 1991, 1992). However, until this proposed name change is scrutinized and accepted by the scientific community, the Eastern Sand Darter will retain the scientific name *Ammocrypta pellucida* here.

### Distribution

In North America, the Eastern Sand Darter has been found in the Ohio River basin in Ohio, Indiana, Illinois, Kentucky, W. Virginia, and Pennsylvania. It has been recorded from the Lake Huron, Lake St. Clair and Lake Erie drainages in Michigan, Ohio, New York, and Ontario. It has not been recorded in the Lake Ontario drainage, but occurs farther east in Saint-Laurent (St. Lawrence River) and Lac Champlain drainages of Québec, Vermont, and New York. (see inset, Figure 2). Recent reductions in distribution have been documented in Kentucky (Kuehne and Barbour 1983), Illinois (Smith 1971), Ohio (Trautman 1981), Michigan (Smith et al. 1981), and Pennsylvania (Cooper 1983). Since 1970, *Ammocrypta pellucida* has been recorded at new localities in New York (Smith 1985), Ontario, and Québec.

In Ontario, *Ammocrypta pellucida* was collected prior to 1970 from the Ausable River, the Sydenham River (Kent, Lambton, and Middlesex counties), the Thames River, Catfish Creek, Big Otter Creek, and Big Creek. It was first collected in the Canadian waters of Lake Erie in 1953 at Pelee Island, and in both eastern and western basins of Lake Erie in 1957. Since 1970, specimens have been collected at new locations in Lake Erie at Rondeau Bay and Long Point Bay, Lake St. Clair, and in the Grand River (see Figure 2 [Appendices of all records on file and available on request from COSEWIC]).

In Québec, *Ammocrypta pellucida* was collected prior to 1970 in Lac des Deux-Montagnes near Montréal, Saint-Laurent near Sorel, and in some larger tributaries of Saint-Laurent: Rivière Châteauguay, Rivière L'Assomption, Rivière Yamaska, Rivière Saint-François, Rivière Yamachiche, and Rivière Gentilly. Since 1970, specimens have been collected in Rivière Richelieu, Chenal aux Ours (a channel between the Berthier Islands at the western end of Lac St-Pierre),

Rivière Becancour, Rivière aux Orignaux, and Petite Rivière du Chêne (see Figure 2).

On the map of Hocutt (1980), one distribution point appears to be on the Canadian side in the St. Lawrence River around Cornwall, Ontario. Since we could not find any capture records in the vicinity of Cornwall, we conclude that this point probably represents the record for the Little Salmon River near Fort Covington, New York (Smith 1985). We were unable to verify the authenticity of a distribution point about 15 km upstream from the only record we have located in Rivière L'Assomption, Québec. According to C.H. Hocutt, D.E. McAllister (editors of the *Atlas of North American Freshwater Fishes* (Lee et al. 1980); and J.D. Williams (U.S. Fish and Wildlife Service Exotic Fish Lab, Gainesville Florida) Canadian distribution records on the map of Hocutt (1980) are based on Mongeau et al. (1974, 1979), Williams (1975), and Mongeau (1979a). The upper L'Assomption River record could not be found in any of these publications.

#### Protection

*Ammocrypta pellucida* receives no special protection in Canada (but see *Habitat* section). It is listed as threatened in the United States by the American Fisheries Society (Williams et al. 1989). It is classified as Endangered in Ohio, Michigan, Pennsylvania, and New York and listed as of Special Concern in Indiana and Kentucky (Johnson 1987).

#### Population Sizes and Trends

*Ammocrypta pellucida* has declined in, or has been extirpated from, many areas of its North American range. Formerly widespread and abundant prior to 1900, the Eastern Sand Darter displayed a steady decline in abundance between 1925 and 1950 in Ohio. Despite thorough investigations, few specimens were captured after 1955 (Trautman 1981). It has been decimated in the upper Wabash River, a major portion of its former range in Illinois (Smith 1971). Cooper (1983) suggested *Ammocrypta pellucida* has disappeared from the Monongahela drainage in southwestern Pennsylvania. Few populations still survive in New York (Smith 1985). Kuehne and Barbour (1983) reported declines in Kentucky in the upper Kentucky and Licking rivers. In Canada, populations have declined or been extirpated from several areas. However, recent collections of specimens indicate that Lake Erie, Lake St. Clair, and several rivers in southwestern Ontario and Québec continue to support populations.

Studies have not been specifically conducted to estimate population sizes of *Ammocrypta pellucida* in Canada. However, changes in population size may be inferred from sampling data. Between 1922 and 1958, the Eastern Sand Darter was collected at 13 sites in six rivers (Ausable, Sydenham, Thames, Catfish, Big Otter, Big) in southwestern Ontario. An intensive sampling program was conducted between 1970 and the mid 1980's by the Ontario Ministry of Natural Resources (OMNR), Royal Ontario Museum (ROM), and the Canadian Museum of Nature (formerly National Museum of Canada) (Mandrak and Crossman 1992). During this time, the Eastern Sand Darter was collected at seven new sites in three river systems (Thames, Sydenham, Grand). At least six of the 13 sites sampled prior to 1959 in five streams (Ausable, Thames, Catfish, Big Otter, Big) were sampled during this program, but the species was captured at none.

Between 1989 and 1991, ROM surveys specifically targeted suitable sand-bottomed habitats. All 13 sites where *Ammocrypta pellucida* was known prior to 1959 were sampled. It was captured at only three of those sites. Seven sites in three river systems (Thames, Sydenham, Grand), including five of the seven sites

where the species was captured between 1970-1987, and two new sites were also sampled. The Eastern Sand Darter was found at all of these sites.

A single specimen was collected in a Lake Huron tributary, the Ausable River, in 1928. Subsequent sampling at this site in 1936 and in 1982, and in 1974 at five sites within 5 km of the capture site, failed to collect specimens. Therefore, it probably no longer occurs in the Ausable River.

*Ammocrypta pellucida* has been collected in two Lake St. Clair tributaries. Forty-eight specimens were collected in the Thames River "at Muncey" in 1923 (Hubbs and Brown 1929). Although it was not captured "near Muncey" in a 1941 sampling, it was recorded during sampling downstream from Muncey (the community of Muncey in Gazetteer of Canada, Ontario: 42°49'N, 81°29'W) in the Thames between Wardsville and the Moravian Indian Reserve in 1958 (ROM Accession 482). The Eastern Sand Darter has been collected at four other sites both upstream and downstream of Muncey in the 1970's. The 1989-1991 ROM surveys found *Ammocrypta pellucida* at most locations in the Thames River where they had been captured in the past including the upstream and downstream extremes. Therefore, it can be concluded that the range of the Eastern Sand Darter has not been reduced in the Thames River. However, the number of specimens captured in one sampling in 1923 is approximately equivalent to the total number of specimens captured in at least 22 subsequent sampling attempts indicating that its abundance has declined in the Thames River.

*Ammocrypta pellucida* was collected in the Sydenham River at Strathroy in 1927, Alvinston in 1929, and downstream at the mouth of one of its tributaries, Fansher Creek, in 1972. It was also captured in the "East Sydenham River" in 1983 (Wilfrid Laurier University 8123). However, no additional locality data for this record were available. Eight collections, made by the ROM at seven sites with sandy bottoms between Strathroy and Alvinston in 1991, failed to capture the Eastern Sand Darter. It was collected in the Sydenham River at and 700 metres below the mouth of Fansher Creek during fish surveys conducted in 1989 and 1991. In 1991, it was captured farther downstream at another location in the Sydenham River. The Eastern Sand Darter still exists in the Sydenham River but because there is no historical data for the Sydenham River downstream of Alvinston, it cannot be determined whether the range of *Ammocrypta pellucida* has been reduced or has shifted downstream.

The Eastern Sand Darter was collected in three central Lake Erie tributaries prior to 1970 and one tributary in 1987. Specimens were collected in Big Creek and Big Otter Creek in 1923 and 1955, and in Catfish Creek in 1922 and 1941. Between 1973 and 1990, four sampling attempts in both Big Creek and Catfish Creek, and nine sampling attempts in Big Otter Creek failed to capture specimens. Therefore, it is probable that *Ammocrypta pellucida* no longer occurs in Big Creek, Big Otter Creek, and Catfish Creek.

In 1987, the Eastern Sand Darter was first captured in the Grand River, at Brantford. The Grand River has been sampled in the vicinity of Brantford between 1966 and 1976 (W. Yerex, Grand River Conservation Authority, personal communication). However, the site of the 1987 capture of *Ammocrypta pellucida* was not sampled during this period and there is no evidence in records available that it was sampled prior to 1966. This population is 60 km from the nearest known native population in Big Creek. It may be the result of an unauthorized introduction, or a remnant of a formerly wider range fragmented by environmental or cultural impacts. Additional specimens caught in 1991 confirm that this population is established and self-reproducing.

*Ammocrypta pellucida* was first collected in the Canadian waters of Lake Erie at Pelee Island in 1953 (University of Florida 9911). Additional specimens

were collected in both eastern and western basins during trawls conducted in 1957 (Scott and Crossman 1973), in Rondeau Bay in 1975, and in the western basin in 1984 and 1985. OMNR index netting trawls in Long Point Bay conducted since 1972, captured specimens every year between 1979 and 1987, except 1983. Neither sampling techniques nor personnel had changed in the OMNR index netting program in Long Point Bay (S. Nepszy, Lake Erie Fisheries Research Station, OMNR, personal communication). Therefore, the appearance of specimens in Long Point Bay only after 1978 was not the result of changes in expertise of detection or sampling techniques and may represent the establishment of a new population.

The Eastern Sand Darter was first collected in the Canadian waters of Lake St. Clair in Mitchell's Bay by an OMNR small trawl study conducted between 1983 and 1985. The results of the study show an overall decline in numbers of captured specimens (1983: 97 specimens, 0.6 specimens/tow; 1984: 66, 0.4; 1985: 26, 0.2). This does not necessarily indicate a decline of *Ammocrypta pellucida* in the lake, as this trend may be the result of other factors such as normal fluctuations in year-class numbers or variations in sampling techniques (S. Nepszy, personal communication).

Due to the limited sampling of suitable habitats in Lake Erie and Lake St. Clair, it is difficult to determine the present status of Eastern Sand Darter populations at specific locations within these lakes. However, the population in Long Point Bay appeared to be stable during the nine year period from 1979 to 1987. It is possible that populations of *Ammocrypta pellucida* exist in areas of sandy habitat in lower Lake Huron. These areas have not been sampled by the methods used in Lake Erie and Lake St. Clair (B. Payne, Lake Huron Fisheries Assessment Unit, OMNR, personal communication).

Before 1970, *Ammocrypta pellucida* was collected in southwestern Québec at two sites on Lac des deux Montagnes, one site on Saint-Laurent, and 11 sites on six Saint-Laurent tributaries. Since 1970, it has been collected at one site in Chenal aux Ours, and at 37 sites on seven Saint-Laurent tributaries.

*Ammocrypta pellucida* was collected in Lac des Deux Montagnes in 1941 and 1946. Mongeau and Massé (1976) and Mongeau et al. (1980) did not report its capture in their studies of the waters around Montréal between 1964 and 1977. A sampling attempt in 1990 by ROM on a shallow, sandy beach at the 1941 site, Anse à L'Orme, failed to capture any *Ammocrypta*. The only recorded capture of the Eastern Sand Darter in Saint-Laurent (not including lake expansions) was reported by Cuerrier et al. (1946). It was not recorded in a 1973 survey of 325 sampling stations in Saint-Laurent between Montréal and Sorel (Massé and Mongeau 1976). Cuerrier et al. (1946) reported that the Eastern Sand Darter was particularly abundant in Rivière Saint-François in the Lac Saint-Pierre region. However, it has not been captured in the Rivière Saint-François since 1944 despite sampling by Service de l'Aménagement de la Faune, Ministère du Loisir, de la Chasse et de la Pêche (MLCP)-Montréal between 1965 and 1975 (Mongeau and Legendre 1976) and in 1991 (Audet and St-Onge 1992). Fourteen specimens were collected at a single site on Rivière L'Assomption in 1969. No specimens were captured at or near this site (Station 4) nor at any of the other 15 sites sampled on this river during electrofishing surveys in 1990. At station 4, the water was described as very turbid and the substrate consisted of 100% clay (St-Onge 1992). The Eastern Sand Darter probably no longer occurs in Lac des Deux Montagnes, Saint-Laurent, Rivière L'Assomption, and Rivière Saint-François.

*Ammocrypta pellucida* was collected at 12 sites on Rivière Châteauguay between 1941 and 1976. Vladykov (1942) reported the capture of three specimens in June 1941 from Rivière Châteauguay near Ste. Philomène village (now Mercier).



Cuerrier et al. (1946) later documented the capture in August 1943 of about 180 specimens at a site near the city of Châteauguay. A fish survey of Rivière Châteauguay, where the main course of the river was sampled at approximately 0.32 km intervals from the mouth to the headwaters, was conducted by MLCP-Montréal during 1975 and 1976 (Mongeau et al. 1979). The Eastern Sand Darter was collected at 10 of 287 sampling stations distributed along approximately 55 km of the main course of the river and at one site in one of its tributaries, Rivière Trout. It ranked 31 out of 53 total species in frequency of occurrence in the collections. However, it was not recorded from the city of Châteauguay where it had been previously reported as abundant (Cuerrier et al. 1946). In Rivière Yamaska, *Ammocrypta pellucida* was captured between 1963 and 1971 at four of 120 sampling stations within a 5 km stretch of the river. It ranked 37 out of 59 species in frequency of occurrence in the collections (Mongeau 1979a). No specimens were caught during sampling in the Rivière Châteauguay conducted in 1993 (Nathalie La Violette, University of Toronto, personal communication). It has been recorded from three sites in Rivière Yamachiche near the mouth in 1944 and 1972. As the result of lack of recent sampling, it is not possible to determine the current status of the Eastern Sand Darter in Rivière Yamachiche. The Eastern Sand Darter was collected at one site in 1941 and at two sites in 1982 in Rivière Gentilly where it likely still exists.

Since 1970, the Eastern Sand Darter has been collected in four additional tributaries of Saint-Laurent, and in Chenal aux Ours (in 1974). It has been captured once at single sites in Rivière Becancour (1981; ROM record), Rivière aux Originaux (1982; MacFarlane et Durocher 1984), and Petite Rivière du Chêne (1982; MacFarlane et Durocher 1984). In 1970, *Ammocrypta pellucida* was collected at 19 of 159 sampling stations in a 60 km stretch of the main channel of Rivière Richelieu from McMasterville to its mouth. It ranked 30 of 60 total species in frequency of occurrence in the collections (Mongeau 1979b). In 1974, four specimens were collected at one site less than a kilometre from the mouth of Rivière Richelieu, but at none of the other 481 sites sampled in the Lac St. Pierre region (Massé and Mongeau 1974). Because there has been no sampling since 1982, it is not possible to determine the current status of *Ammocrypta pellucida* in the rivers where it has been captured since 1970.

It is apparent that populations of *Ammocrypta pellucida* in tributaries to the north central shore of Lake Erie, the upper Sydenham River, and the Ausable River have been extirpated. Analysis of the results of sampling after 1958 by ROM, OMNR, and NMC indicate that the decline of populations in Ontario streams occurred prior to 1970. Results of sampling between 1990 and 1993 in Québec suggest that populations in the Châteauguay, Yamaska, l'Assomption and St-François rivers have declined or been extirpated. However, capture results may be affected by differences in sampling gear (the 1990's sampling was conducted using boat and back-pack electrofishers, whereas seine nets were used in earlier sampling). The current status of other populations, is unknown as the result of the lack of recent sampling. Based on recent sampling, populations are considered extant in Lake Erie, Lake St. Clair and its tributaries, the Grand River, and Rivière Gentilly.

#### Habitat

The preferred habitat of *Ammocrypta pellucida* is sand-bottomed areas in streams and rivers, and sandy shoals in lakes (Scott and Crossman 1973). It has also been collected over a bottom of "limestone terraces covered with a thin layer of mud" in Rivière Châteauguay (Vladykov 1942), in riffles over rubble and

gravel, and on silted sand bottoms in the Sydenham River (ROM 56997). It has been found in waters that are clear, tea-coloured and highly turbid (secchi depth  $\geq 15$  cm). In these waters, aquatic vegetation ranged from absent to some submerged macrophytes present, and current ranged from still to swift (unpublished data, ROM).

Siltation associated with agricultural practices has led to the significant reduction of the preferred sand-bottomed habitat of the Eastern Sand Darter. For example, a significant increase in turbidity, indicative of an increased potential for siltation, has been documented in Big Creek as the result of an increase in cropped area between 1931 and 1961 associated with the introduction of tobacco. Tobacco farming is characterised by a high percentage of exposed ground, which on the Norfolk Sand Plain results in considerable erosion and siltation (Whillans 1977). This impact is not limited to Big Creek, but has likely occurred in all central Lake Erie watersheds where tobacco farming was practised.

Federal and provincial legislation exists that nominally protects the habitat of *Ammocrypta pellucida*. The Federal Fisheries Act prohibits destruction of fish habitat by any means. The Ontario Lakes and Streams Improvement Act prohibits the impoundment or diversion of watercourses which leads to silt accumulation. The Land Stewardship II program of the Ontario Ministry of Agriculture and Food (OMAF), designed to reduce the erosion of agricultural lands, has the potential to slow the degradation of remaining critical habitat by reducing siltation. However, this program is voluntary and can only be implemented with the cooperation of landowners. In Québec, habitat is generally protected by the Environmental Quality Act, and may be protected by the Ecological Reserves Act if a species is "threatened with disappearance or extinction."

## General Biology

### *Reproductive Capability*

Based on a study in the Scioto River drainage in southern Ohio (Spreitzer 1979), *Ammocrypta pellucida* females are ready to spawn at age 1+ if they have reached a standard length of 36 mm. Fecundity is low but comparable to many *Etheostoma* species. Total number of eggs for ova-bearing females ranged from 22 to 829 (mean = 343.1) and the number of mature ova in fecund females ranged from 30 to 170 (mean = 71.0). Larger females produced more eggs. Based on female fecundity and the great disparity in sizes of individuals of the same year class, the 1974 spawning season was protracted, ranging from May to mid-August. Sex ratio was determined to be 1:1 during the entire year, including the spawning season. Water temperature during spawning season ranged from 14.4°C to 24.4°C.

In captivity, the Eastern Sand Darter has been observed to spawn at water temperatures between 20.5°C and 23°C. During spawning the male mounts the female, and eggs are deposited when the pair have vibrated and buried their tails and caudal peduncles in the substrate. 'Sneaker males' often joined mating pairs (Johnston 1989). A well-oxygenated substrate such as unsilted sand is likely required for high egg survivorship. Spreitzer (1979) suggested that the spawning season was synchronized with low silt levels in the habitat. Examination of the gonads of 17 specimens in the ROM collection indicated that *A. pellucida* probably spawns between late June and late July in Ontario.

### Species Movement

The movements of the Eastern Sand Darter are virtually unknown. Most darters are sedentary, and migrations are rare (Page 1983). However, Johnston (1989) suggested male *Ammocrypta pellucida* may have congregated in an area sampled in the Tippecanoe River, Indiana, in July 1987. Spreitzer (1979) gave evidence that some individuals may migrate to feed when local chironomid population levels are low.

### Behaviour/Adaptability

The diet of *Ammocrypta pellucida* has been reported to be limited to midge larvae, black fly larvae and possibly entomostracans by its small mouth size and restricted habitat (Scott and Crossman 1973; Smith 1979; Cooper 1983). In southern Ohio, chironomid larvae comprised an average of 94.4% of the diet of the Eastern Sand Darter. Oligochaetes and cladocerans comprised significant, but smaller, proportions in June and November, respectively (Spreitzer 1979).

Fossorial behaviour is well-developed in *Ammocrypta*. Daniels (1989) provided evidence indicating that burying is an adaptation to maintain position on the relatively homogenous sand beds, particularly during periods of extremely high or low flow. His experiments suggested that *Ammocrypta* does not bury itself to avoid predators or to ambush prey. Low oxygen levels in silted substrate may discourage complete burial, or reduce the length of burial time. This may have a negative survival effect by increasing the amount of energy expended to maintain position in its habitat.

### Limiting Factors

Siltation of critical habitat, impoundments, and deterioration of water quality from effects such as chemical pollution and acid mine drainage, are factors attributed to the decline of the Eastern Sand Darter in Ohio, Illinois, and Kentucky (Smith 1971; Barnes 1979; Trautman 1981; Burr and Warren 1986). Poor water quality near urban areas such as Montréal and Châteauguay, Québec, may have caused its decline or extirpation in those areas (Scott and Crossman 1973). Siltation seems to be the leading cause of significant loss of critical habitat in Canada. Silt reduces the available substrate oxygen, necessary for fossorial behaviour and egg survivorship. It has caused the decline and extirpation of *Ammocrypta pellucida* in some rivers where it was formerly abundant.

### Special Significance of the Species

*Ammocrypta pellucida* is classified as Threatened in the United States and Threatened or Endangered in most U.S. states where it is present. Some *Ammocrypta* (*Ammocrypta beani*, *Ammocrypta bifascia*, and *Ammocrypta meridania*) are considered common by Page and Burr (1991). Other species in the genus such as *Ammocrypta clara* and *Ammocrypta vivax* have been extirpated from parts of their range (see Becker 1983, Robison and Buchanan 1988). Therefore, it can be concluded that the genetic diversity, expressed in behaviour, ecology, and morphology represented in the genus *Ammocrypta* is in jeopardy.

### Evaluation

Population declines will continue in areas where the Eastern Sand Darter is still present, unless the siltation of critical habitat and continued degradation of water quality is prevented. If further siltation and water quality degradation is prevented, populations surviving in areas of remaining critical habitat should stabilize. Extirpated populations may be re-established only if

silt was removed from preferred habitat and dispersal from an extant donor population is possible. Due to physical barriers and limited dispersal capabilities, it is unlikely that populations would become re-established naturally in waterbodies without extant populations.

Populations of *Ammocrypta pellucida* in the Grand River and Lake Erie appear to be stable. Many other populations have declined or been extirpated in Canada. The population trend of the remaining populations cannot be assessed due to lack of adequate sampling in the last 10 years. It is likely that all populations will decline or become extirpated if further loss of critical habitat is not prevented. Therefore, until sampling of these populations is undertaken to determine their stability, it is recommended that the Eastern Sand Darter be classified as Threatened in Canada.

#### Acknowledgements

Financial support was provided by the Royal Ontario Museum, Environmental Youth Corps grants to E. J. Crossman and EH and a World Wildlife Fund grant to E. J. Crossman. Frederique Arnaud, David Boehm, Lisa Dorman, Kira Dunham, Colleen Fennesey, William Ramshaw, Marty Rouse, and Franklin Wong assisted with field work. William Ramshaw, Frederique Arnaud, and Kira Dunham assisted with verification and summary of distribution records. Distribution maps were drawn by William Ramshaw.

We are grateful to the following people who provided information and distribution records: Pierre Dumont and Gilles Roy (MLCP, Montréal), Yves Mailhot (MLCP, Trois Rivières), Steve Nepszy (Lake Erie Fisheries Research Station, OMNR), Nathalie La Violette (Québec Ministère de l'Environnement et de la Faune), Larry Witzel (Lake Erie Fisheries Assessment Unit, OMNR), D. E. McAllister (NMC), Douglas Nelson (University of Michigan Museum of Zoology), Daryl Coulson (Cambridge, OMNR), Warren Yerex (Grand River Conservation Authority). E. J. Crossman, J. S. Nelson, and D. E. McAllister provided useful comments on the manuscript.

#### Literature Cited

- Audet, R. and J. St-Onge. 1992. Recueil de données brutes sur la faune piscicole récoltée dans la Rivière Saint-François (août et septembre 1991). Direction de la qualité des cours d'eau, Ministère de l'Environnement du Québec, ENVIRODOC No EN 920301, Rapport interne QE-92-14.
- Barnes, M. D. 1979. Eastern sand darter, *Ammocrypta pellucida* and other fishes from the streams of the Wayne National Forest. Ohio Journal of Science 79(2):92-94.
- Becker, G. C. 1983. Fishes of Wisconsin. The University of Wisconsin Press. Madison Wisconsin.
- Burr, B. M., and M. L. Warren, Jr. 1986. A distributional atlas of Kentucky fishes. Kentucky Nature Preserves Commission, Scientific and Technical Series Number 4.
- Cooper, E. L. 1983. Fishes of Pennsylvania and the northeastern United States. The Pennsylvania State University Press.

- Cuerrier, J.-P., F. E. J. Fry, and G. Fontaine. 1946. Liste préliminaire des poissons de la région de Montréal et du Lac Saint-Pierre. *Le Naturaliste canadien*. 73:17-32.
- Daniels, R. A. 1989. Significance of burying in *Ammocrypta pellucida*. *Copeia* 1989(1):29-34.
- Hocutt, C. H. 1980. *Ammocrypta pellucida* (Agassiz), Eastern Sand Darter. Page 620 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. North Carolina State Museum Natural History, Publication Number 1980-12.
- Hubbs, C. L., and D. E. Brown. 1929. Materials for a distributional study of Ontario fishes. *Transactions Royal Canadian Institute*. 17(1):1-56.
- Johnson, J. E. 1987. Protected fishes of United States and Canada. American Fisheries Society, Bethesda, Maryland.
- Johnston, C. E. 1989. Spawning in the eastern sand darter, *Ammocrypta pellucida* (Pisces: Percidae), with comments on the phylogeny of *Ammocrypta* and related taxa. *Transactions of the Illinois Academy of Science* 82(3 and 4): 163-168.
- Kuehne, R. A., and R. W. Barbour. 1983. The American darters. The University Press of Kentucky, Lexington, Kentucky.
- Lee D.S., C. R. Gilbert, C. H. Hocutt, R. E. Jenkins, D. E. McAllister, and J. R. Stauffer. Editors. 1980. *Atlas of North American Freshwater Fishes*. North Carolina State Museum Natural History, Publication Number 1980-12.
- MacFarlane, A. et Durocher, J. 1984. Inventaire ichthyologique de la Région de Gentilly). Ministère du Loisir, de la Chasse et de la Pêche, Direction régionale des Trois-Rivières, S. A. E. F., Coordination de la faune aquatique.
- Mandrak, N. E., and E. J. Crossman. 1992. A checklist of Ontario freshwater fishes annotated with distribution maps. Royal Ontario Museum Life Sciences Publication.
- Massé, G., and J.-R. Mongeau. 1974. Répartition géographique des poissons, leur abondance relative et bathymétrie de la région du lac Saint-Pierre. Service de l'Aménagement de la Faune, Ministère du Tourisme, de la Chasse et de la Pêche, Québec.
- Massé, G., and J.-R. Mongeau. 1976. Influence de la navigation maritime sur la répartition géographique et l'abondance relative des poissons du fleuve Saint-Laurent entre Longueuil et Sorel. Service de l'Aménagement de la Faune, Ministère du Tourisme, de la Chasse et de la Pêche, Québec. Rapport Technique.

- Mongeau, J.-R. 1979a. Les poissons du bassin de drainage de la rivière Yamaska, 1963 à 1975. Service de l'Aménagement de la Faune, Ministère du Tourisme, de la Chasse et de la Pêche, Québec.
- Mongeau, J.-R. 1979b. Dossiers des poissons du bassin versant de la Baie Missisquoi et de la Rivière Richelieu, 1954 à 1977. Service de l'Aménagement de la Faune, Ministère du Tourisme, de la Chasse et de la Pêche, Québec.
- Mongeau, J.-R., J. Leclerc, and J. Brisebois. 1979. Les Poissons du bassin de drainage de la rivière Châteauguay, leur milieu naturel, leur répartition géographique et leur abondance relative. Service de l'Aménagement de la Faune, Ministère du Tourisme, de la Chasse et de la Pêche, Québec.
- Mongeau, J.-R., J. Leclerc, and J. Brisebois. 1980. La répartition géographique des poissons, les ensemencements, la pêche sportive et commerciale, les frayères et la bathymétrie du fleuve Saint-Laurent dans le Bassin de La Prairie et les Rapides de Lachine. Service de l'Aménagement de la Faune, Ministère du Tourisme, de la Chasse et de la Pêche, Québec. Rapport Technique No. 06-29.
- Mongeau, J.-R., and V. Legendre. 1976. Les ressources fauniques du bassin inférieur de la Rivière Saint-François: évolution des populations en dix ans 1965-1974. Service de l'Aménagement de la Faune, Ministère du Tourisme, de la Chasse et de la Pêche, Québec. Rapport Technique.
- Mongeau, J.-R., and G. Massé. 1976. Les poissons de la région de Montréal, la pêche sportive et commerciale, les ensemencements, les frayères, la contamination par la mercure et les PCB. Service de l'Aménagement de la Faune, Ministère du Tourisme, de la Chasse et de la Pêche, Québec.
- Robins, C. R., R. M. Bailey, C. E. Bond, J. R. Brooker, E. A. Lachner, R. N. Lea, and W. B. Scott. 1991. Common and scientific names of fishes from the United States and Canada. American Fisheries Society Special Publication 20, Bethesda, Maryland.
- Robison, H. W. and T. M. Buchanan. 1988. Fishes of Arkansas. University of Arkansas Press, Fayetteville, Arkansas.
- Page, L. M. 1983. Handbook of Darters. TFH Publications, Inc. Ltd. Neptune City, New Jersey.
- Page, L. M., and B. M. Burr. 1991. A field guide to freshwater fishes. Houghton Mifflin Company, Boston.
- Scott, W. B., and E. J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada Bulletin 184.
- Simon, T. P., E. J. Tyberghein, K. J. Scheidegger, and C. E. Johnston. 1992. Descriptions of protolarvae of the sand darters (Percidae: *Ammocrypta* and *Crystallaria*) with comments on systematic relationships. Ichthyological Exploration of Freshwaters 3(4):347-358.

- Simons, A. M. 1991. Phylogenetic relationships of the crystal darter, *Crystallaria asprella* (Teleostei: Percidae). *Copeia* 1991(4):927-936.
- Simons, A. M. 1992. Phylogenetic relationships of the *Boleosoma* species group (Percidae: *Etheostoma*). Pages 268-292 in *Systematics, historical ecology and North American freshwater fishes edited by R. L. Mayden*. Stanford University Press, Stanford, California.
- Smith, C.-L. 1985. The inland fishes of New York State. New York State Department of Environmental Conservation. Albany, New York.
- Smith, G. R., J. N. Taylor, and T. W. Grimshaw. Ecological survey of the fishes in the Raisin River drainage, Michigan. *Papers of the Michigan Academy of Science, Arts, and Letters* 13(3):275-305.
- Smith, P. W. 1971. Illinois streams: a classification based on their fishes and an analysis of factors responsible for disappearance of native species. Illinois Natural History Survey. Biological Notes No. 76.
- Smith, P. W. 1979. The fishes of Illinois. University of Illinois Press. Urbana, Illinois.
- Spreitzer, A. E. 1979. The life history, external morphology, and osteology of the eastern sand darter, *Ammocrypta pellucida* (Putnam, 1863), an endangered Ohio species (Pisces: Percidae). M. Sc. thesis (unpublished). The Ohio State University. Columbus, Ohio.
- St-Onge, J. 1992. Recueil de données brutes sur la faune piscicole récoltée dans la Rivière L'Assomption (août et septembre 1990). Direction de la qualité des cours d'eau, Ministère de L'Environnement du Québec, ENVRODOC No EN 920117, Rapport interne QE-92-10.
- Trautman, M. B. 1981. The fishes of Ohio. Ohio State University Press. Columbus, Ohio.
- Vladykov, V. D. 1942. Two fresh-water fishes new for Québec. *Copeia* 1942(3):193-194.
- Whillans, T. 1977. Fish community transformation in three bays within the lower Great Lakes. M. Sc. Thesis, University of Toronto, Toronto, Ontario, Canada.
- Williams, J. D. 1975. Systematics of the percid fishes of the subgenus, *Ammocrypta* with descriptions of two new species. *Bulletin of the Alabama Museum of Natural History*, Number 1.
- Williams, J. E., J. E. Johnson, D. A. Hendrickson, S. Contreras-Balderas, J. D. Williams, M. Navarro-Mendoza, D. E. McAllister, and J. E. Deacon. 1989. Fishes of North America Endangered, Threatened, or of Special Concern: 1989. *Fisheries* 14(6):2-20.

### List of Figures

Figure 1. The Eastern Sand Darter, *Ammocrypta pellucida* (Putnam), 59 mm TL, Sydenham River, Lambton Co. (ROM 56997). Drawing by Anker Odum.

Figure 2. Canadian distribution of *Ammocrypta pellucida*, with inset of North American distribution modified from Hocutt (1980).



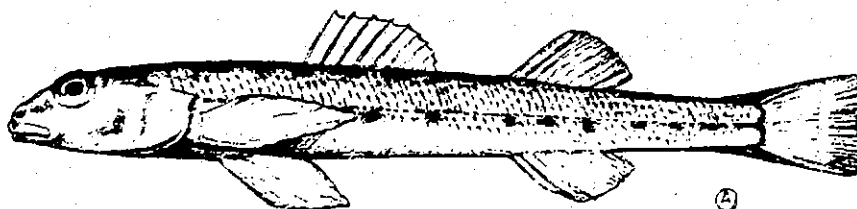


Figure 1

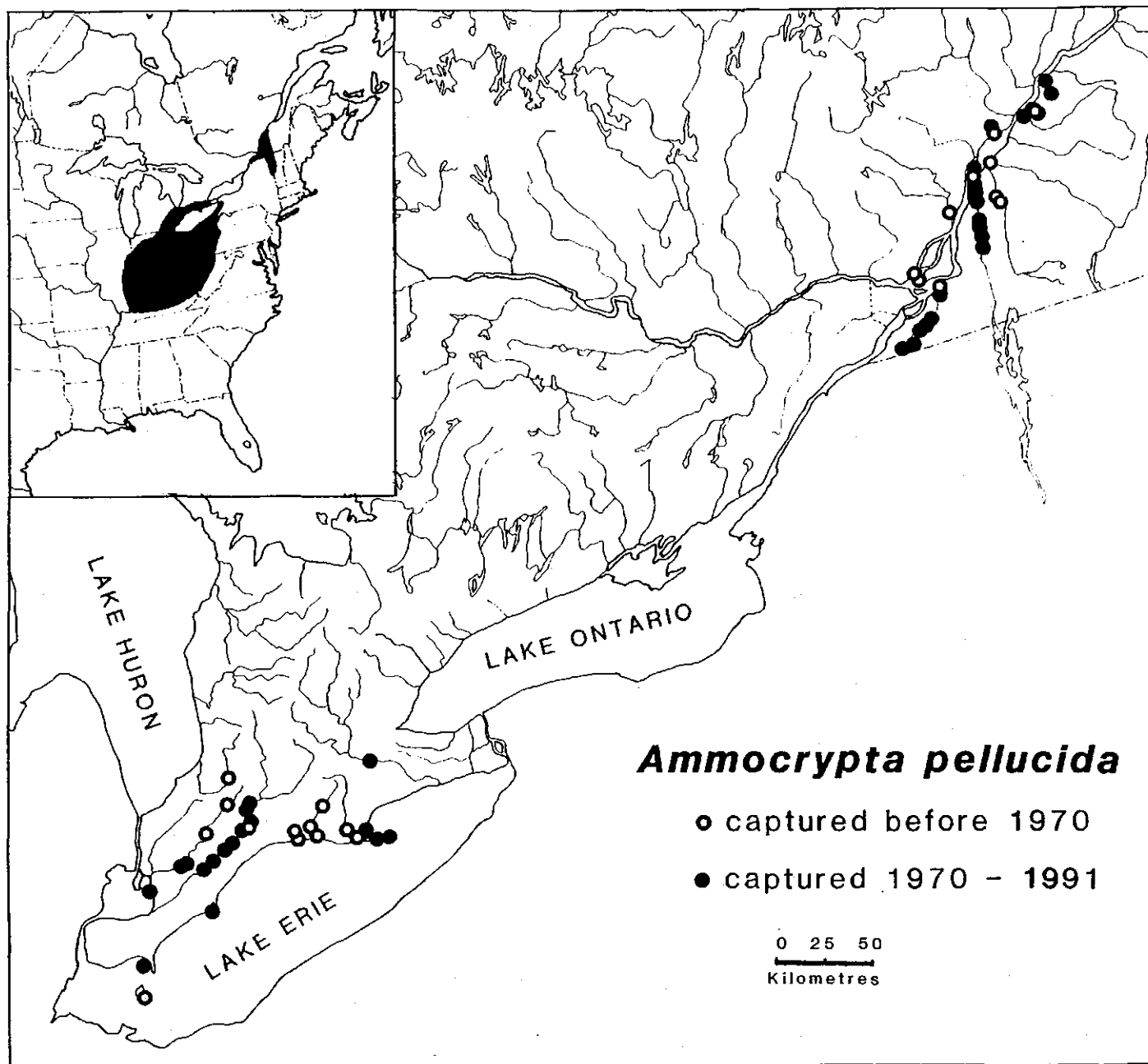


Figure 1  
Distribution of  
*Ammocrypta pellucida*