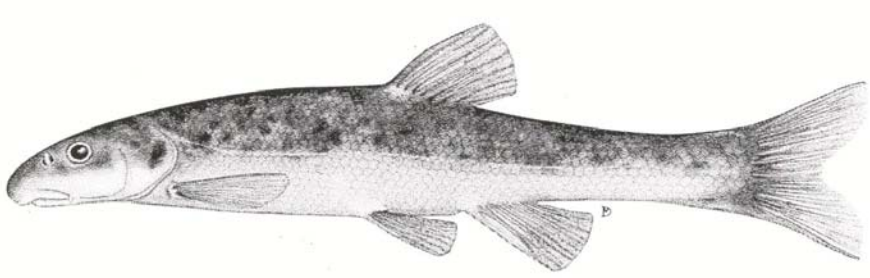
COSEWIC
Assessment and Status Report

on the

Nooksack Dace
Rhinichthys sp.

in Canada



ENDANGERED
2000

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA

COSEPAC
COMITÉ SUR LA SITUATION DES
ESPÈCES EN PÉRIL
AU CANADA

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Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur la situation du naseux de Nooksack (*Rhinichthys* sp.) au Canada

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Nooksace Dace — supplied by the author.

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COSEWIC
Assessment Summary

Assessment summary — May 2000

Common name
Nooksack Dace

Scientific name
Rhinichthys sp.

Status
Endangered

Reason for designation
This species has a restricted range in Canada, and is in significant decline due to habitat loss and degradation.

Occurrence
British Columbia

Status history
Designated Endangered in April 1996. Status re-examined and confirmed in May 2000. Last assessment based on an existing status report.

COSEWIC
Executive Summary
from 1996 Status Report

Nooksack Dace
Rhinichthys sp.

Description

The Nooksack Dace is a small (up to about 105 mm in standard length) cyprinid fish widely distributed in the clear, relatively rapid rivers and streams of western Washington and southwestern B.C. It is a slim fish with a snout that clearly overhangs the mouth, a streamlined back and a flattened underside. The adults are grey-green above with a dull brassy stripe just above the lateral line. The sides below the lateral line are dirty white grading into silver-white on the underparts. Often there are scattered dusky speckles on the sides below the lateral line and a black stripe on the head in front of the eyes. There is no striking sexual dimorphism in colour, but males have conspicuously longer, and darker, pectoral fins than females. In juveniles there is a conspicuous black mid-lateral stripe that extends from the snout back to a diffuse dark spot at the base of the tail.

Distribution

The species is found in western Washington and in Canada, the Nooksack Dace is restricted to tributaries of the Nooksack River in the lower Fraser Valley, of British Columbia.

Population Sizes and Trends

Although the geographic distribution of the Nooksack Dace in Canada is limited, museum records from the 1960s suggest that the species once was abundant within this restricted range. Unfortunately, no formal estimates of past, or present, numbers are available for the Nooksack Dace; however, an October 1993 survey of five riffles in Bertrand Creek revealed an average density of 1.4 (SE =± 0.24) adults m^2. Furthermore, the populations in Bertrand, Cave, Fishtrap and Pepin creeks appear healthy.

However, there is evidence that suggests the B.C. distribution is shrinking. Nooksack Dace are now absent from some of the smaller tributaries (e.g., Howes Creek) and headwaters of both Bertrand and Fishtrap creeks where they occurred in the 1960s. In these creeks, rapid urbanization in the Aldergrove, Clearbrook and

Abbotsford regions has increased siltation, pollution and fluctuations in discharge. The result is deteriorating water quality and a loss of habitat that is spreading downstream. By late August most small tributaries are dry and, in drought years, even the main creeks (Bertrand and Fishtrap) are reduced to trickles. Since adult Nooksack Dace depend on riffles with loose gravel substrate for foraging and breeding silt and low summer flows are especially harmful to this species. Consequently, given that the demand for both housing and gravel in the lower Fraser Valley will continue to increase, habitat suitable for adult Nooksack Dace will continue to decrease and the species probably will go extinct in Canada in the next one or two decades.

Habitat

Adult Nooksack Dace are demersal and typically occur in riffles with water velocities greater than 0.25 $m\text{-}^{sec}$ and a substrate of loose gravel (4-10 cm in diameter), cobbles, or boulders. In Canada, the species is associated with small to moderate sized streams (1 to 4 m in width); however, this association probably simply reflects the absence of large Nooksack tributaries in Canada; whereas in Washington, the species regularly occur in large rivers. In contrast to adults, young-of-the-year are associated with slow water ($0.14 \pm 0.022 m\text{-}^{s}$ near the downstream ends of pools.

General Biology

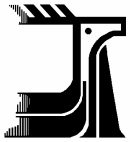
In B.C, Nooksack Dace spawn in the spring (April through May). Spawning apparently occurs at night and the eggs are usually found near the top ends of riffles. Both males and females mature at the end of their second summer (1^{+}) and breed in their third spring (2^{+}). To date, the oldest recorded individual (a female 105 mm in standard length) was in her sixth year (5^{+}). As in most fish, egg number is a function of female size, and in the Nooksack Dace fecundity ranges from about 200 to over 2000 eggs. In summer, adults feed primarily on riffle dwelling insects *(e.g.* nymphs of caddisflies and mayflies, dytiscid beetle larvae and adult riffle beetles). In pools the young feed primarily on chironomid pupae and ostracods. They appear to be nocturnal feeders and the adults appear to inhabit riffles throughout the year, but in less benign climates they may shift to slower, deeper water in the winter.

Limiting factors

Habitat loss through human disturbance is the greatest threat facing the Nooksack Dace in British Columbia. Housing developments, shopping malls and industrial parks are replacing fields and wooded areas in the range of this species at a dizzying pace. Both Bertrand and Fishtrap creeks and their tributaries are vulnerable to straightening, siltation, industrial and domestic chemical spills, and clandestine garbage disposal, as well as attempts to "aesthetically improve" the streams by creating parks and ponds that please the human eye but destroy critical fish habitat. The shrinking Canadian populations are sandwiched between a deteriorating environment upstream and unsuitable habitat downstream.

Protection

No special protection is in place for the Nooksack Dace; however, its Canadian distribution lies entirely within the range of the Salish Sucker (*Catostomus* sp.), a species assigned "Endangered" status in April of 1986 by COSEWIC and in B.C., allocated to the Ministry of Environment's critically imperiled category. Consequently, measures taken by the B.C. Ministry of Environment, Lands and Parks to protect the Salish Sucker also protect the Nooksack Dace.



COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) determines the national status of wild species, subspecies, varieties, and nationally significant populations that are considered to be at risk in Canada. Designations are made on all native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fish, lepidopterans, molluscs, vascular plants, lichens, and mosses.

COSEWIC MEMBERSHIP

COSEWIC comprises representatives from each provincial and territorial government wildlife agency, four federal agencies (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biosystematic Partnership), three nonjurisdictional members and the co-chairs of the species specialist groups. The committee meets to consider status reports on candidate species.

DEFINITIONS

Species	Any indigenous species, subspecies, variety, or geographically defined population of wild fauna and flora.
Extinct (X)	A species that no longer exists.
Extirpated (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A species facing imminent extirpation or extinction.
Threatened (T)	A species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Not at Risk (NAR)**	A species that has been evaluated and found to be not at risk.
Data Deficient (DD)***	A species for which there is insufficient scientific information to support status designation.

* Formerly described as “Vulnerable” from 1990 to 1999, or “Rare” prior to 1990.
** Formerly described as “Not In Any Category”, or “No Designation Required.”
*** Formerly described as “Indeterminate” from 1994 to 1999 or “ISIBD” (insufficient scientific information on which to base a designation) prior to 1994.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list.

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Canada

The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

COSEWIC Status Report

on the

Nooksack Dace
Rhinichthtys sp.

in Canada

J.D. McPhail

1996

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SPECIES INFORMATION

The Nooksack Dace *(Rhinichthys* sp.) is a small (up to about 105 mm in standard length) cyprinid fish widely distributed in the clear, relatively rapid rivers and streams of western Washington (McPhail 1967). In Canada, it is restricted to a few small tributaries of the Nooksack River in the lower Fraser Valley, southwestern British Columbia (McPhail and Lindsey 1986). It is a slim fish with a snout that clearly overhangs the mouth, a streamlined back and a flattened underside (Figure 1). In life, Adults are grey-green above with a dull brassy stripe just above the lateral line. The sides below the lateral line are dirty white grading into silver-white on the underparts.

Often there are scattered dusky speckles on the sides below the lateral line and a black stripe on the head in front of the eyes. Viewed from above, there is a distinct pale mark at the anterior and posterior base of the dorsal fin. There is no striking sexual dimorphism in colour, but males have conspicuously longer, and darker, pectoral fins than females. In juveniles there is a conspicuous black mid-lateral stripe that extends from the snout back to a diffuse dark spot at the base of the tail.

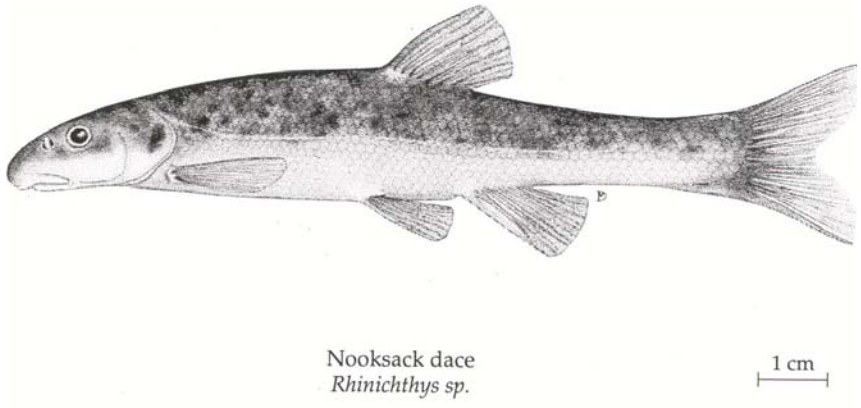

Figure 1. The Nooksack Dace (*Rhinichthys* sp.).

DISTRIBUTION

This distributional account is based on collections in the fish museums of the Department of Zoology, University of British Columbia and the School of Fisheries, University of Washington. The geographic distribution of the Nooksack Dace forms a rough fish-hook around Puget Sound (Figure 2) although, curiously, it is absent from rivers on the west side of the Sound. On the west side of the Olympic Peninsula it occurs from the Queets system in the north to the Willipa River in the south. On the east side of Puget Sound it extends from the Pyuallup River in the south to the Nooksack River in the north. The species is widespread in the Chehalis system, but so far is unrecorded from the Deschutes and Nisqually rivers near Olympia, Washington. In Canada, the Nooksack Dace is restricted to Nooksack tributaries in the lower Fraser Valley, of British Columbia (B.C.) [Bertrand, Cave, Fishtrap and Pepin creeks, inset Figure 2].

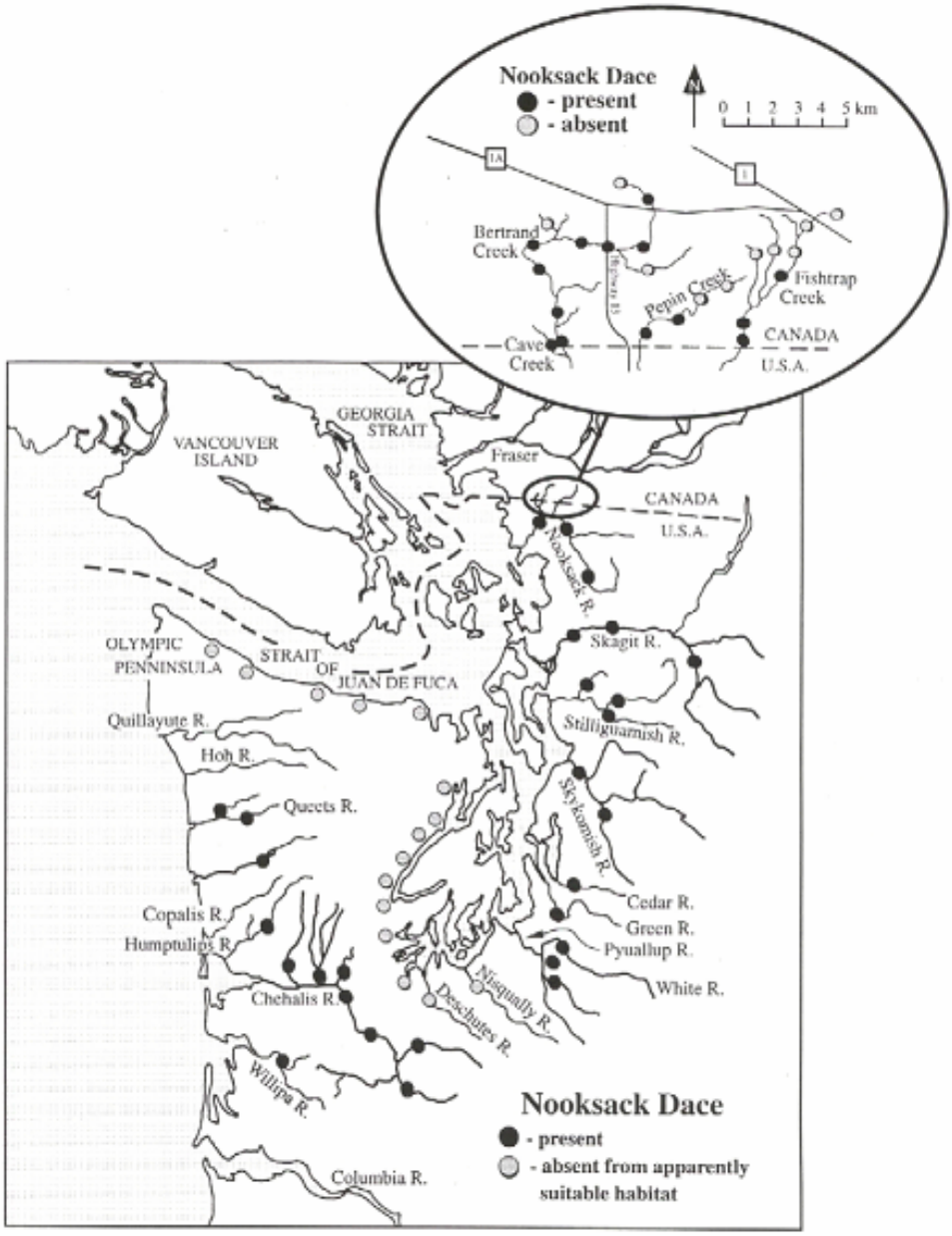

Figure 2. Geographic range of the Nooksack Dace, *Rhinichthys* sp., (inset Canadian distribution.)

PROTECTION

No special protection is in place for the Nooksack Dace; however, its Canadian distribution lies entirely within the range of the Salish Sucker (*Catostomus* sp.), a species assigned "Endanagered" status in April of 1986 by COSEWIC and in B.C., allocated to the Ministry of Environment's critically imperiled category. Consequently, measures taken by the B.C. Ministry of Environment, Lands and Parks to protect the Salish Sucker also protect the Nooksack Dace.

POPULATION SIZES AND TRENDS

Although the geographic distribution of the Nooksack Dace in Canada is limited, museum records from the 1960s suggest that the species once was abundant within this restricted range. Unfortunately, no formal estimates of past, or present, numbers are available for the Nooksack Dace; however, an October 1993 survey of five riffles in Bertrand Creek revealed an average density of 1.4 (SE =± 0.24) adults m^2. Furthermore, the populations in Bertrand, Cave, Fishtrap and Pepin creeks appear healthy: a range of year classes is present in each of the creeks, including substantial numbers of young-of- the-year, although in 1993 the 1+ year class was under represented both in our survey and in a summer survey supported by the Habitat Conservation Fund (S. Inglis, B.C. Ministry of Environment, Lands and Parks, Victoria, B.C.; personal communication). Even though the existing populations appear healthy, there is evidence that suggests the B.C. distribution is shrinking. For example, Nooksack Dace are now absent from some of the smaller tributaries (e.g., Howes Creek) and headwaters of both Bertrand and Fishtrap creeks where they occurred in the 1960s. In these creeks, rapid urbanization in the Aldergrove, Clearbrook and Abbotsford regions has increased siltation, pollution and fluctuations in discharge. The result is deteriorating water quality and a loss of habitat that is spreading downstream. Near the U.S. border, the streams are in better condition. Here, they flow through a rural landscape, but even in this area land clearing and gravel extraction generate silt and decrease summer flows. By late August most small tributaries are dry and, in drought years, even the main creeks (Bertrand and Fishtrap) are reduced to trickles.

Since adult Nooksack Dace depend on riffles with loose gravel substrate for foraging and breeding (see sections on Habitat and General Biology), silt and low summer flows are especially harmful to this species. Low summer flows restrict adult habitat at the most productive time of the year by reducing the riffle areas, and silt tends to fill the interstices between rocks and cement them into the substrate. This reduces both the cover available to adults and their foraging opportunities. Under low water conditions, adults will shift into pools but they probably do not grow or survive as well in this marginal habitat as they do in riffles. Consequently, given that the demand for both housing and gravel in the lower Fraser Valley will continue to increase, habitat suitable for adult Nooksack Dace will continue to decrease and the species probably will go extinct in Canada in the next one or two decades.

HABITAT

Adult Nooksack Dace are demersal and typically occur in riffles with water velocities greater than 0.25 $m\text{-}^{sec}$ and a substrate of loose gravel (4-10 cm in diameter), cobbles, or boulders. In Canada, the species is associated with small to moderate sized streams (1 to 4 m in width); however, this association probably simply reflects the absence of large Nooksack tributaries in Canada; whereas in Washington, the species regularly occur in large rivers. In contrast to adults, young-of-the-year are associated with slow water (0.14 ± 0.022m^{-s} near the downstream ends of pools (Table 1). Here,

the young occur in shallow water (about 10 to 20 cm deep) but swim above the sand or mud substrate. Thus, the species occupies two basic stream habitats: adults in fast water over loose rock substrates, and juveniles in quiet waters over sand or mud substrates.

GENERAL BIOLOGY

In .B.C, Nooksack Dace spawn in the spring (April through May). Spawning apparently occurs at night and the eggs are usually found near the top ends of riffles. There is no evidence of the spawning colours reported for Longnose Dace (*Rhinichthys cataractae)* in Manitoba (Bartnik 1972). Both males and females mature at the end of their second summer (1^+) and breed in their third spring (2^+). To date, the oldest recorded individual (a female 105 mm in standard length) was in her sixth year (5^+). As in most fish, egg number is a function of female size, and in the Nooksack Dace fecundity ranges from about 200 to over 2000 eggs. In summer, adults feed primarily on riffle dwelling insects *(e.g.* nymphs of caddisflies and mayflies, dytiscid beetle larvae and adult riffle beetles). In pools the young feed primarily on chironomid pupae and ostracods. Adults collected at mid-morning have empty stomachs but packed hind guts. This suggests nocturnal feeding. In the lower Fraser Valley, adults appear to inhabit riffles throughout the year, but in less benign climates they may shift to slower, deeper water in the winter.

Table 1. Habitat differences between adult and young-of-year Nooksack dace, *Rhinichthys* sp., Bertand Creek, October 1, 1993.

	Adults	Young-of-year
Average Water Velocities	0.34 ± 0.039 m^{-sec}	014 ± 0.022 m^{-sec}
Substrate	fist-sized gravel, cobbles and boulders	mud, sand, leaflitter

LIMITING FACTORS

Habitat loss through human disturbance is the greatest threat facing the Nooksack Dace in British Columbia. Around Aldergrove, Clearbrook and Abbotsford, housing developments, shopping malls and industrial parks are replacing fields and wooded areas at a dizzying pace. This accelerating urbanization brings with it all the usual environmental problems, compounded in this case by the development being in the headwaters of the streams. Thus, both Bertrand and Fishtrap creeks and their tributaries are vulnerable to the usual fate of urban streams (e.g., straightening, siltation, industrial and domestic chemical spills, and clandestine garbage disposal), as well as attempts to "aesthetically improve" the streams by creating parks and ponds that please the human eye but destroy critical fish habitat. In the past, accidental fish kills in the Canadian portion of the Nooksack system would have been followed by natural recolonization from the main river. This is no longer the case. The U.S. portions of Bertrand and Fishtrap creeks are ditched and silted. They no longer contain either

Nooksack Dace or habitat suitable for Nooksack Dace. Thus, the shrinking Canadian populations are sandwiched between a deteriorating environment upstream and unsuitable habitat downstream.

SPECIAL SIGNIFICANCE OF THE SPECIES

The Nooksack Dace is a member of the Chehalis fauna (McPhail 1967, 1987; McPhail and Lindsey 1986). This isolated fauna is derived from the Columbia fauna and, with the exception of the endemic Olympic Mudminnow *(Novumbra hubbsi),* all the species are closely related to Columbia species. These Chehalis isolates diverged from their Columbia counterparts sometime before the last (Fraser or Vashon) glaciation, and survived the ice-sheets south of Puget Sound but north of.the Columbia River. Consequently, their geographic distributions include the Chehalis River, the rivers on the west side of the Olympic Peninsula and some rivers on the east side of Puget Sound. In two cases, the Salish Sucker and Nooksack Dace, Chehalis isolates have dispersed postglacially as far north as the lower Fraser Valley (Figure 2).

The Nooksack Dace is a typical Chehalis isolate: it is related to, and presumably derived from, the western North American form of a widely distributed species, the Longnose Dace *(Rhinichthys cataractae).* It differs from this species in scale counts (McPhail 1967; Bisson and Reimers 1977), body shape and in consistent sequence differences in both mitochondrial and nuclear genes. For example, the mitochondrial sequence differences between Nooksack and Longnose Dace are comparable to the sequence differences between such well established species as Largescale Sucker (*Catostomus macrocheilus*) and Longnose Suckers (*Catostomus catostomus*) [McPhail and Taylor, in preparation). The Nooksack Dace also shows the characteristic distribution pattern of a Chehalis isolate: scattered populations in the Chehalis River and populations in rivers draining the west side of the Olympic Peninsula and the east side of Puget Sound (Figure 2).

Typically, the genetic separation between Chehalis isolates and their Columbia relatives, as measured by allozyme frequencies or gene sequences, is greater than their morphological separation (McPhail and Lindsey 1986; McPhail and Taylor, in preparation. Still, Chehalis isolates usually can be separated from their Columbia counterparts by a combination of morphological traits. Because the geographic distributions of most Chehalis isolates do not overlap with their closest relatives, any decisions regarding their taxonomic status (e.g., species or subspecies) are necessarily arbitrary; however their status is independant, divergent linages are not debatable, and for conservation purposes they should be regarded as species. Certainly, their distinctive morphologies, gene sequences and characteristic geographic distributions argue that the Nooksack Dace has not exchanged genes with the Longnose Dace for a long time (i.e., since well before the beginning of the last galciation and, perhaps, since before the Pleistocene).

EVALUATION

The Canadian distribution of the Nooksack Dace probably will continue to shrink as long as the Vancouver megalopolis continues to expand. To stop the decline will require a concerted effort by all levels of government to protect the remaining free-flowing streams occupied by this species...an unlikely event. Even if the political will is there, accidents are inevitable in urban streams, especially with a drinking-water supply that for public health reasons will require chloramination in less than a decade. Once this happens, it will be a minor miracle if, in Canada, the Nooksack Dace survives into the next century.

ACKNOWLEDGMENTS

The illustration of the Nooksack Dace was drawn in "Freehand" on a Macintosh computer by Diana McPhail. Marvin Rosenau, Juanita Ptolemy and Susan Inglis (B.C. Ministry of Environment, Lands and Parks) helped in many ways. Over the years, Ron Jones, Dave Greenfield, Clyde Murray and Gordon Haas helped me outline the nature and distribution of the Chehalis fauna. I am grateful for their support and enthusiasm. More recently, Mike Folkes assisted in the field, Ruth Withler did an allozyme survey, and Claire Thompson and Ric Taylor did DNA analyses. The Fisheries Branch, B.C. Ministry of Environment, Lands and Parks, commissioned and funded this report.

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