COSEWIC
Status Appraisal Summary

on the

Atlantic Mud-piddock
Barnea truncata

in Canada

THREATENED
2021

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada

COSEPAC
Comité sur la situation
des espèces en péril
au Canada

COSEWIC status appraisal summaries are working documents used in assigning the status of wildlife species suspected of being at risk in Canada. This document may be cited as follows:

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COSEWIC
Assessment Summary

Assessment Summary – April 2021

Common name
Atlantic Mud-piddock

Scientific name
Barnea truncata

Status
Threatened

Reason for designation
In Canada, this intertidal marine bivalve species is restricted to small sections of Minas Basin in Nova Scotia. Here, the species is entirely dependent on the red-mudstone facies geological formation where it bores into the mudstone and remains as an immobile adult. Changes in sediment deposition can bury habitat, and smother and kill individuals. The main threat to the species is increased frequency and intensity of severe storms due to climate change, which can abruptly shift and redeposit sediments. Additional threats include human activities that change water current, erosion and sediment deposition patterns, pollution run-off from agricultural or urban sources, and climate-change induced sea-level rise.

Occurrence
Atlantic Ocean (Minas Basin of the Bay of Fundy), Nova Scotia

Status history
Designated Threatened in November 2009. Status re-examined and confirmed in May 2021.

COSEWIC
Status Appraisal Summary

Atlantic Mud-piddock

Pholade tronquée

Barnea truncata

Range of occurrence in Canada - (province/territory/ocean): Nova Scotia, Atlantic Ocean

Status History:

Designated Threatened in November 2009. Status re-examined and confirmed in May 2021.

Evidence (indicate as applicable):

The overall state of the population and the primary threats identified in COSEWIC (2009) remain unchanged although some new threats have been identified (Fisheries and Oceans Canada 2019).

SAS 6
Wildlife species:

Change in eligibility, taxonomy or designatable units:	yes ☐ no ☒
Explanation: No change.	

Range:

SAS 7	Change in Extent of Occurrence (EOO):	yes ☐ no ☒ unk ☐
SAS 8	Change in Index of Area of Occupancy (IAO) :	yes ☐ no ☒ unk ☐
SAS 9	Change in number of known or inferred current locations:	yes ☐ no ☒ unk ☐
SAS 10	Significant new survey information	yes ☒ no ☐

Explanation:
Fieldwork in 2017 and 2018 provided information supporting the identification of critical habitat for Atlantic Mud-piddock (Clark *et al*. 2019). This survey work provided fine-scale information on specific occurrences of extant subpopulations, extirpated populations, as well as the presence or absence of viable habitat for settlement that was not colonized. Fieldwork revisited all the sites identified in COSEWIC (2009) and characterized specific habitat types (now finely defined as tide pools, patches, boulders, capstone and rivulets). Sites supporting Atlantic Mud-piddock that were visited included Parrsboro, Five Islands (Provincial Park), Economy Headlands, Spencer Point, Mungo Brook, Shad Creek, Sloop Rocks, Noel Bay, Burntcoat Head, Tennycape and Port Williams (Figure 1). Evangeline Beach and Kingsport were identified as sites where Atlantic Mud-piddock had previously been extirpated due to siltation (COSEWIC 2009), but are now re-exposed and occupied. The changes in number of sites does not affect the number of locations.

Sites that contain a large amount of habitat and high numbers of live Atlantic Mud-piddock at core and major peripheral sites were noted. In addition, Clark *et al*. (2019) delineated core and peripheral sites with

boundaries and specific occurrences recorded for each site using the Bounding Box Approach (Department of Fisheries and Oceans 2011; Clark *et al*. 2019). Clark *et al*. (2019) defined core sites as the six largest sites, all adjacent to one another, based on their (individual) size, proximity to each other, and apparent stability. Together they comprise more than 90% of Atlantic Mud-piddock habitat. Major peripheral sites are all other sites outside of the core sites that support stable subpopulations.

Two sites, Economy Point (East Headland) and Saints Rest, previously noted to have supported Atlantic Mud-piddock (COSEWIC 2009), were found to no longer have any live individuals. One additional site, Economy Point (Southwest Headlands) showed a decline in numbers as well as a decline in habitat quality due to increased siltation (a layer >1.0 cm deep blanketing the site). The Saints Rest site, which had recorded Atlantic Mud-piddock from 1948-2008 (COSEWIC 2009), is now fully covered by sand and cobble, with no suitable substrate available. There is a small patch of mudstone (<1 m^2) approximately 250 m from that site that shows no evidence of Atlantic Mud-piddock (Clark *et al*. 2019). The losses and gains of Atlantic Mud-piddock all occurred within the area previously identified by COSEWIC (2009) with no new occurrences encountered outside those sites. The review of habitat availability and water circulation patterns within the Minas Basin/Cobequid Bay by Clark *et al*. (2019) has resulted in three locations being confirmed: The Inner Basin (Cobequid Bay, east of Economy Point), the Mid-Basin (Central Minas Basin, west of Economy Point and extending to Parrsboro) and a more disjunct location — Western Minas Basin (Cornwallis River mouth) (Figure 1). These are the same overall locations defined in COSEWIC (2009).

These losses and gains reflect the very dynamic nature of this system. Small shifts in current can result in changes in sediment deposition that smothers occupied sites, and exposes other sites suitable for colonization. The dynamic nature of this system with occupied sites being smothered, then re-exposed and settled, makes it difficult to meaningfully determine if there is loss or gains in number of sites and in area or quality of habitat. As some suitable and occupied habitat is smothered, other suitable habitat becomes exposed and colonized, and so on. What does appear to be consistent is the sites identified as Core by Clark *et al*. (2019) seem to be unaffected by these small shifts in current and deposition patterns; it is the Peripheral sites that seem to be the most affected.

Population Information:

SAS 11	Change in number of mature individuals:	yes ☐ no ☐ unk ☒
SAS 12	Change in population trend:	yes ☐ no ☐ unk ☒
SAS 13	Change in severity of population fragmentation:	yes ☐ no ☒ unk ☐
SAS 14	Change in trend in area and/or quality of habitat:	Yes ☒ no ☐ unk ☐
SAS 15	Significant new survey information	Yes ☒ no ☐

Explanation:
There is no practical way to count individual animals or follow trends in abundance because, at most sites, Atlantic Mud-piddock lives in the rock under hard protective capstone (rock facies), and counting them would require destroying the protective cap (Department of Fisheries and Oceans 2010; Hebda 2010). Clark *et al*. (2019) identified four types of site status. Stable sites are those sites where the extent and relative abundance of Atlantic Mud-piddock is unchanged from that reported in COSEWIC (2009). Positive trend sites are those where the area supporting Atlantic Mud-piddock is greater than that identified in COSEWIC (2009) as defined by exposed mudstone substrate with active bore holes based on the presence of siphons. Negative trend sites are those where the area of exposed substrate is less than that identified in COSEWIC (2009). Extirpated sites are those where there is no longer any available substrate due to siltation or movement of larger particles such as sands or cobbles or through ice scour.

As noted above, fieldwork determined that two of the sites identified in COSEWIC (2009) no longer support Atlantic Mud-piddock subpopulations (Saints Rest – Bass River and Economy Point – East Headland) due to smothering with sands, muds, and cobbles.

A site identified at Five Islands in COSEWIC (2009) now supports a much larger sub-population based on field investigations on 2 September 2019 (A. Hebda pers. obs.), primarily in rivulet habitats. The shifting of cobble overburden off the mudstone exposed suitable habitat, although no specific storm event was considered to be responsible. Field evaluation of the site after Post-tropical Storm Dorian (7, 8 September 2019) coincident with elevated tides revealed that approximately 50% of this re-exposed substrate was again covered by fine cobble and sands and no longer viable as Atlantic Mud-piddock habitat, demonstrating the threat to habitat posed by storms.

Evangeline Beach, a site previously noted as extirpated (COSEWIC 2009) was found to have three Atlantic Mud-piddock (siphons) and one additional site (Kingsport) had siphons of four Atlantic Mud-piddock observed in an extensive intertidal zone. Those areas were extensively surveyed in 2006/2007 and again in 2017/2018. This confirms the presence of suitable substrate, but with the small numbers of individuals dispersed over an area <10/km^2, are considered to be minor sites (Clark *et al*. 2019) and are not considered to represent new subpopulations.

Threats:

SAS 16	Change in nature and/or severity of threats:	yes ☒ no ☐ unk ☐

Explanation:
COSEWIC (2009) identified the principal threats to Atlantic Mud-piddock as those which cause smothering of occupied areas by sediment deposition. These included increased frequency and severity of storms due to climate change which shift and redeposit sediments or introduce new sediments from land-based erosion, construction of barrages (turbines in dam-like structures), causeways, and tidal energy projects which have the capacity to alter water current and depositional patterns. Of principal concern is the loss of the sites identified by Clark *et al*. (2019) as Core, which represent 90% of the occupied habitat, and presumably, by extension, 90% of the Canadian population. Other threats identified included industrial activities including tidal turbine installation, excavation of salt domes (with concurrent release of anhydrites into the basin), and oil spills and discharge of chemicals from agricultural or urban runoff.

A Threat Assessment undertaken by the Department of Fisheries and Oceans (2019) as part of the *Species at Risk Act* (SARA) process identified two potential additional threats that were not noted in COSEWIC (2009). One relates to the removal of dikes and flooding of dikelands in the upper stretches of Cobequid Bay with a potential for channel realignment of the North River which feeds into the Cobequid Bay estuary. The change in the configuration of the channel will result in changes in sediment deposition. Consequently, redeposition of sediments may negatively affect Atlantic Mud-piddock habitat. The potential impact of this is unknown and will require further monitoring and investigation, although both immediate and far-afield effects of channel or tributary flow changes have been noted with another project at the west end of the Minas Basin at the Windsor Causeway (Daborn *et al*. 2003). The other threat relates to mountain-bike racing in the rocky intertidal portions of the basin, at Burntcoat Head Atlantic Mud-piddock habitat. This has a potential impact of limited scope but high severity with direct effect on Atlantic Mud-piddock burrows (A. Hebda pers. obs.). There are regulatory tools in place that can be used to mitigate or eliminate this activity. The publication of Atlantic Mud-piddock residence description (Department of Fisheries and Oceans 2019; Fisheries and Oceans Canada 2019) allows for a more detailed definition of the specific habitat affected. These two threats did not exist at the time of publication of COSEWIC (2009).

The threat of tidal turbines affecting current flow patterns has somewhat decreased in significance with the abandonment of one of the experimental turbine projects, and associated infrastructure, by the principal proponents. It is not clear if the other experimental berths at the test site in Minas Passage, the connection between the Bay of Fundy and the Minas Basin, will be used by other investors in the immediate future. There is another initiative of small-scale exploitation of tidal power (Nova Scotia 2017), but its application is restricted to the lower Bay of Fundy and would have no direct impact on the Atlantic

Mud-piddock populations since there are no populations situated within that body of water (outside the Minas Basin).

Protection:

SAS 17	Change in effective protection:	Yes ☒ no ☐ unk ☐

Explanation:
Atlantic Mud-piddock was listed as Threatened on Schedule 1 of the *Species at Risk Act* (SARA) on 13 April 2017. This listing has resulted in both enhanced local education (interpretive panels and programming) as well as enhanced enforcement of avoidance of activities in Mud-piddock habitat (diversion of disruptive recreational activities to areas with no Mud-piddock habitat).

This listing has initiated the process of the development of a Recovery Strategy which will be informed by the following completed publications: residence description (Department of Fisheries and Oceans 2019; Fisheries and Oceans Canada 2019), studies to delineate areas containing current and potential Atlantic Mud-piddock habitat (red mudstone) to support the identification of critical habitat (Clark *et al*. 2019), and Threat Assessment (Department of Fisheries and Oceans. 2019). There is no definition of Atlantic Mud-piddock Critical Habitat or a completed Recovery Strategy at time of preparation of this report.

Rescue Effect:

SAS 18	Change in evidence of rescue effect:	yes ☐ no ☒

Explanation:
The Minas Basin and Cobequid Bay system are at the upper end of the Bay of Fundy and consequently at the upper (north-eastern) end of the Gulf of Maine. Incursion of water during incoming tides is from this (upper) part of the Gulf of Maine. The prevailing circulation within the Gulf of Maine is counter-clockwise resulting in only oceanic water recharging the system and entering the Bay of Fundy/Minas Basin/Cobequid Bay. At the same time, near-shore waters from the lower Gulf are flushed outwards. Consequently, any potential for veligers from these Maine and Massachusetts subpopulations entering Canadian (Fundy/Minas/Cobequid Bay) waters is remote. It is possible that the new site noted in COSEWIC (2009) in mid-Maine (Bath) may be the result of dispersal from the Canadian population.

Quantitative Analysis:

SAS 19	Change in estimated probability of extirpation:	yes ☐ no ☒ unk ☐

Details:
There is no quantitative analysis because of the difficulty of obtaining abundance estimates. Because the species burrows into substrate that is capped with resistant rock facies, it is not possible to determine subpopulation size or trends in numbers of individuals.

Summary and Additional Considerations [e.g., recovery efforts; summarize exactly what has changed since the previous assessment]

Changes since the last assessment include the change in legal status of the species as well as fieldwork in support of statutory requirements. The species has been listed as Threatened under SARA on Schedule 1 in 2017. In addition, the residence description under SARA has been published (Department of Fisheries and Oceans 2019; Fisheries and Oceans Canada 2019).

Some new basic research has been undertaken on the species. As there were no published data on the

lifespan of Atlantic Mud-piddock available during the preparation of COSEWIC (2009), an estimate of nine years was provided. Subsequently, an aging study was undertaken on previously available and newly collected samples (Roddick 2019; Roddick and Clark 2019). Results indicated a lifespan of about 11 years for the sampled Canadian subpopulation. Therefore, persistent unaffected by random shifts in current and sediment deposition patterns highlights the importance of those stable core subpopulations for maintaining the presence of the species in Canadian waters.

As noted under Population (above), extensive field evaluation was undertaken by Fisheries and Oceans Canada covering all sites reported by COSEWIC (2009) as well as potential areas for colonization within the Minas Basin/Cobequid Bay complex.

The evaluation documented by Clark *et al*. (2019) included mapping fine-scale individual occurrences based on five habitat types (tidepools, patches, boulders, capstones and rivulet habitats). This refined habitat description may have some predictive value in determining future changes in occurrence.

Clark *et al*. (2019) documented Core, Peripheral and Extirpated sites as well as those minor sites in which only a handful of individuals occur (Figure 1). They also documented secure core sites as well as the loss of two sites in the period since the previous assessment by COSEWIC (2009). The three sites that experienced declines or extirpation were all on the north shore of Cobequid Bay. What may be considered as the core sites for the species in Canadian waters are all located on the southern part of the juncture of the Minas Basin and Cobequid Bay. Clark *et al*. (2019) determined that 89.7% of the total identified Atlantic Mud-piddock habitat occurs within six sites (Tennycape to Mungo Brook) on the south shore of the Minas Basin and Cobequid Bay (these are defined as the Core sites) with two disjunct but stable sites at Port Williams (West end of Minas Basin) and Spencer Point (eastern end of Cobequid Bay).

The core sites are found in the most energetically active part of the estuary, primarily associated with capstone substrate. They exhibit little evidence of sedimentation and are separated from each other by shoreline features such as shallow bays, which are specifically characterized by sediment accumulation. The peripheral Port Williams site is on a south facing bank of the Cornwallis River. With the tidal regime, it does not exhibit any sediment accumulation throughout the tidal cycle. It is separated from the core sites by the Avon River estuary and therefore is not contiguous with those sites. The Spencer Point site is separated from the core sites by the North and Shubenacadie river channels. Due to the influence of those two channels, there is also no sediment deposition at the site.

The three minor sites on the north shore (Parrsboro, Five Islands and Economy Point) are associated with more ephemeral protection offered by features such as cobble, boulders and other temporary features, with no capstone protection against higher energy forces such as the movement of ice pans in late winter and early spring.

ACKNOWLEDGEMENTS AND AUTHORITIES CONTACTED:

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Katherine Ogden, Registrar, Natural History, Nova Scotia Museum, Halifax, Nova Scotia.

INFORMATION SOURCES:

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Writer of SAS: Andrew Hebda

TECHNICAL SUMMARY

Barnea truncata

Atlantic Mud-piddock

Pholade tronquée

Range of occurrence in Canada (province/territory/ocean): Atlantic Ocean (Minas Basin of the Bay of Fundy), Nova Scotia

Demographic Information

Generation time (usually average age of parents in the population; indicate if another method of estimating generation time indicated in the IUCN guidelines (2011) is being used)	4-5 years. Estimated based on life span up to 11 years, with sexual maturity possibly as early as 2 years.
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Unknown
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations].	Unknown
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future.	Unknown
Are the causes of the decline a. clearly reversible and b. understood and c. ceased?	a. N/A b. N/A c. N/A
Are there extreme fluctuations in number of mature individuals?	Unknown

Extent and Occupancy Information

Estimated extent of occurrence (EOO)	985 km^2
Index of area of occupancy (IAO) (Always report 2x2 grid value).	76 km^2
Is the population “severely fragmented” i.e., is >50% of its total area of occupancy in habitat patches that are (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	No

Number of "locations"* (use plausible range to reflect uncertainty if appropriate)	Three: Inner Basin (Cobequid Bay); Mid-Basin (Central Minas Basin); and Western Basin (Cornwallis River)
Is there an [observed, inferred, or projected] decline in extent of occurrence?	No
Is there an [observed, inferred, or projected] decline in index of area of occupancy?	No
Is there an [observed, inferred, or projected] decline in number of subpopulations?	N/A: It is a very dynamic system susceptible to subtle shifts in currents and sediment deposition. One historical site (Saints Rest) lost probably due to storm surge action, and one minor site (Economy Point East) lost due to siltation. Other previously smothered sites have been exposed and are occupied (e.g. Evangeline, Kingsport, patch associated with Five Islands).
Is there an [observed, inferred, or projected] decline in number of "locations" *?	No
Is there an [observed, inferred, or projected] decline in [area, extent and/or quality] of habitat?	Unknown. There is some loss of habitat, but evidence of settlement in newly exposed areas of suitable substrate. Impact of storm surge activity can be significant but is not predictable.
Are there extreme fluctuations in number of subpopulations?	No
Are there extreme fluctuations in number of "locations"*?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of Mature Individuals (in each subpopulation)

Subpopulations (give plausible ranges)	**N Mature Individuals**
Minas Basin/Cobequid Bay	Unknown
Total	Unknown

Quantitative Analysis

Is the probability of extinction in the wild at least [20% within 20 years or 5 generations, or 10% within 100 years]?	Unknown; not performed

* See Definitions and Abbreviations on COSEWIC web site and IUCN (Feb 2014) for more information on this term

Threats (direct, from highest impact to least, as per IUCN Threats Calculator)

Was a threats calculator completed for this species? No What additional limiting factors are relevant? Very specific and restricted habitat requirements.

Rescue Effect (immigration from outside Canada)

Status of outside population(s) most likely to provide immigrants to Canada.	No conservation status assigned outside of Canada; *Natureserve* listed as G5
Is immigration known or possible?	Highly unlikely
Would immigrants be adapted to survive in Canada?	Probably
Is there sufficient habitat for immigrants in Canada?	Yes
Are conditions deteriorating in Canada?+	Unknown
Are conditions for the source (i.e., outside) population deteriorating?+	Unknown
Is the Canadian population considered to be a sink?+	Unknown
Is rescue from outside populations likely?	Unknown, but not likely

Data Sensitive Species

Is this a data sensitive species?	No

Status History

COSEWIC: Designated Threatened in November 2009. Status re-examined and confirmed in May 2021.

Status and Reasons for Designation:

Status: Threatened	**Alpha-numeric codes:** D2
Reasons for designation: In Canada, this intertidal marine bivalve species is restricted to small sections of Minas Basin in Nova Scotia. Here, the species is entirely dependent on the red-mudstone facies geological formation where it bores into the mudstone and remains as an immobile adult. Changes in sediment deposition can bury habitat, and smother and kill individuals. The main threat to the species is increased frequency and intensity of severe storms due to climate change, which can abruptly shift and redeposit sediments. Additional threats include human activities that change water current, erosion and sediment deposition patterns, pollution run-off from agricultural or urban sources, and climate-change induced sea-level rise.	

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Not applicable. Number of mature individuals is unknown.

+ See Table 3 (Guidelines for modifying status assessment based on rescue effect)

Criterion B (Small Distribution Range and Decline or Fluctuation): Not applicable. Current IAO (76 km^2) and number of locations (3) meet the thresholds for Endangered (IAO: < 500 km; locations: < or =5), but there is no known continuing decline in EOO, IAO, area, extent or quality of habitat, number of locations, and number of mature individuals.
Criterion C (Small and Declining Number of Mature Individuals): Not applicable. Number of mature individuals is unknown.
Criterion D (Very Small or Restricted Population): Meets D2 Threatened because number of locations is 3 (< or = 5) and population is prone to effects of stochastic events (severe storms that can bury and smother a large proportion of habitat) in an uncertain future and is capable of becoming critically endangered or Extirpated within 1 or 2 generations (8-10 years). D1 is not applicable because number of mature individuals is unknown.
Criterion E (Quantitative Analysis): Not applicable. Analyses not conducted.

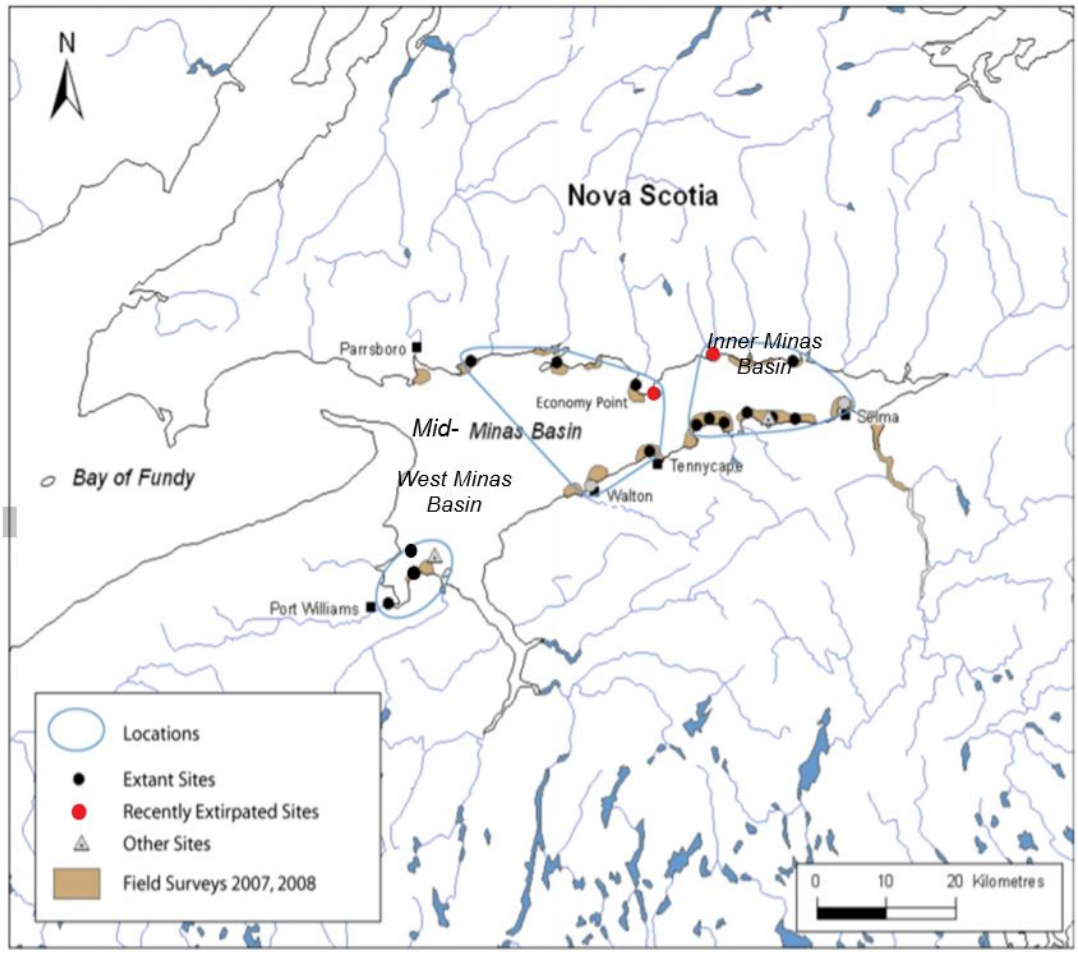

Figure 1. Current Distribution of *Barnea truncata* sites (Extant and Extirpated sites) from Clark *et al.* 2019. The three locations noted (Inner Minas Basin, Mid-Minas Basin, and West Minas Basin), are unchanged from COSEWIC (2009).

COSEWIC HISTORY

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. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS (2021)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* 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. Definition of the (DD) category revised in 2006.

Environment and Climate Change Canada
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