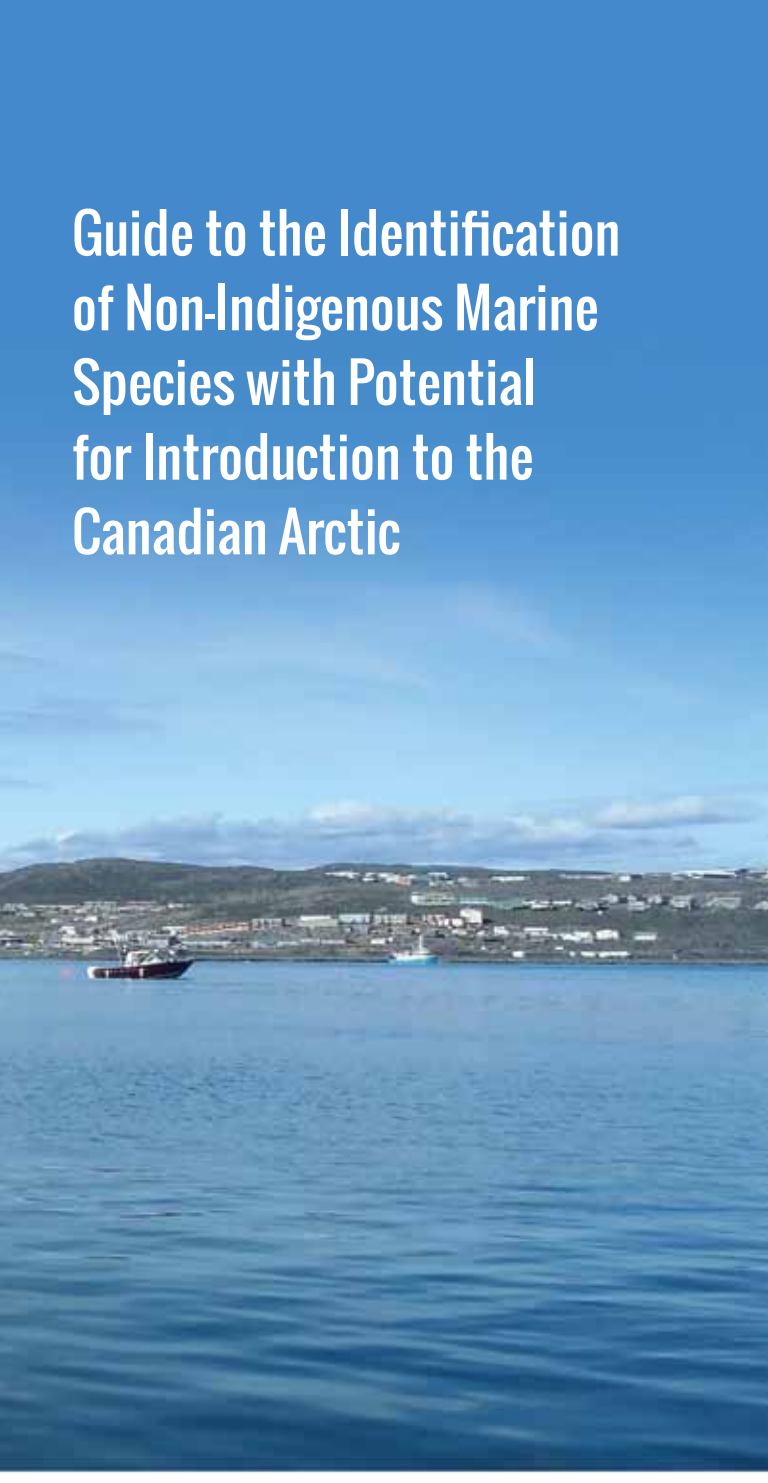
Guide to the Identification of Non-Indigenous Marine Species with Potential for Introduction to the Canadian Arctic



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Common Periwinkle

Littorina littorea

Description of the Species

Shell is thick, heavy and turban shaped, with 5-8 whorls. Colour varies from pale brown-olive-red-black, but usually black or dark gray-brown with 8-25 narrow black bands. Adult shell size typically about 30 mm in length, up to 50 mm maximum.

Habitat

Occurs on open coasts, especially rocky coasts, but also on mud, sand and marsh habitats in some parts of its range – most common in the lower half of the intertidal zone. Tolerant of a wide range of salinity and temperature.

Invasive History

Native to Europe, with multiple introductions to the West and East coasts of North America since the 1800s. Initial introduction thought to be with rocks (solid ballast) of ships from Great Britain/Ireland. It is now the most abundant marine gastropod along the North Atlantic coast. In Canada, they range from Nova Scotia north to Labrador. Ballast water and live food trade are possible vectors currently.

Impacts

Alters ecosystems by preying on, and competing with, native species. Causes structural habitat change by removing algae, preventing accumulation of sediment and removing habitat for soft-bottom fauna. Affects diversity, abundance and distribution of other animals and plants.

Similar Species

Easily confused with two native species: *Littorina saxatilis* and *Littorina obtusata*. Comparatively, *L. littorea* is bigger than the two natives. The type of shell is also different among species:

Name	*L. littorea*	*L. saxatilis*	*L. obtusata*
Shell	Smooth	Spirally grooved	Smooth surface
Outside insertion	Acute angle	Right angle	No right angle (red lines)

Softshell Clam

Mya arenaria

Description of the species

Bivalve shell is thin, elongate, elliptical and gaping at both ends even when closed. Colour is usually chalky white. Adult shell size typically 75-100mm in length, up to 160 mm maximum.

Habitat

Occurs in bays and estuaries on mud and gravel, in the intertidal zone and deeper waters. Tolerant of low salinity – can be abundant at salinities as low as 4-5 PSU, such as might be found in estuarine habitats.

Invasive History

Native to east coast of North America, although the northern and southern limits of the native range are uncertain. Accidentally introduced to the Pacific Coast of North America with imported seed oysters in the late 1800s. Ballast water, hull fouling and live trade are possible vectors currently.

Impacts

Alters ecosystems by preying on, and competing with, native species. Causes structural habitat change by burrowing in sediments, and can increase water clarity as a powerful filter feeder. Large shell deposits can wash ashore to decay, and may create new habitat for predators.

Similar Species

Easily confused with the native *Mya pseudoarenaria.* They can only be distinguished by structures located inside their valves – requires expert assessment. The few *Mya arenaria* reported from the Canadian Arctic are likely *M. pseudoarenaria.*

Softshell Clam *(Mya arenaria)*

Red King Crab

Paralithodes camtschaticus

Description of the Species

Large, spiny body up to 28 cm length, with distinct "tail" or abdomen shaped like a fan that is usually tucked under the rear of the shell. Dark red or burgundy in colour. The right pincer is usually larger than the left. Leg span can reach 150 cm.

Habitat

Occurs mainly in the subtidal zone on sand and mud substrates at depths up to 300m. Annual migrations to shallow water (less than 50 m) in the late winter/spring for mating.

Invasive History

Native to the North Pacific Ocean, from the Bering Sea to the Sea of Japan. Intentional introduction to the Barents Sea, north of Russia, in 1960s to establish commercial fishery.

Impacts

Alters native biodiversity through predation on a wide range of benthic animals, causing shifts in which species dominate as well as individual biomass.

Similar Species

There are no similar species in the Canadian Arctic.

Red King Crab *(Paralithodes camtschaticus)*

Lacy Crust Bryozoan

Membranipora membranacea

Description of the Species

Individuals form encrusting colonies of very small (less than 1 mm) animals called zooids. The colonies appear as a white lace-like coating on algae (kelp). Zooids appear rectangular, each a little larger than a pin head. When examined closely the colony look like bricks in a wall.

Habitat

Shallow sub-tidal waters, from the surface to a depth of ten meters, attached to kelp, seaweed, rocks, boat hulls, and other surfaces and organisms. Grows best in areas with strong currents or good tidal water exchange.

Invasive History

Broad distribution in temperate oceans in northern and southern hemispheres, but considered non-native to North America. First reported in Canada in Nova Scotia in the early 1990s and in the Gulf of St. Lawrence (Quebec) in 2003. Ballast water and hull fouling are possible vectors currently.

Impacts

Forms a crust on algae – blocks sunlight, reduces growth and makes the algae stiff and more likely to break during storms. Disturbs kelp ecosystems through competition, and promotes establishment of other invasive plants.

Similar Species

There are many native encrusting bryozoans, but only the Lacy Crust Bryozoan has rectangular zooids and colonies with circular or rounded edges.

A. Atlantic Kelp frond colonized by Lacy Bryozoan (invasive species).

B. Lacy Crust Bryozoan's colonies on kelp.

C. Zoom on the Lacy Crust Bryozoan's colonies.

D. Zoom on *Tegella* sp. (native species),

E. Zoom on *Harmeria scutulata (*native species).

Green Crab

Carcinus maenas

Description of the Species

Carapace about ¾ long as broad, with five obvious spines on each side of the eyes, and three small tips between the eyes. Colour varies among green, red or yellow. Last pair of legs somewhat flattened. The carapace can reach a maximum of 10cm wide.

Habitat

Common in salt marshes, on sandy beaches and rocky coasts. Found in shallow water, generally on muddy, sandy or pebble bottoms or in vegetation. Tolerates a wide range of salinity and prefers sheltered areas.

Invasive history

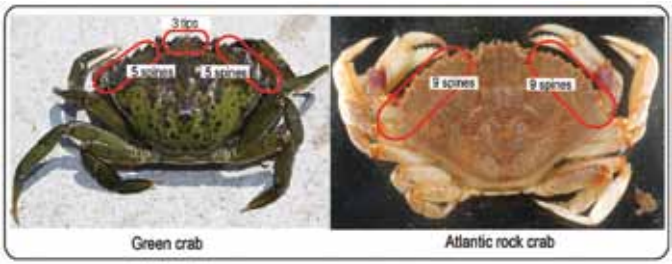
Native to Europe and North Africa. First observed in eastern Canada in the 1950s in the Bay of Fundy and entered Nova Scotia waters of the Gulf of St. Lawrence in 1994. Ballast water, hull fouling and live trade are possible vectors currently.

Impacts

Listed as one of the '100 worst' invasive species in the world. An aggressive and voracious predator that competes with native species for food and for space, reducing invertebrate and fish diversity. This species has caused large economic damage to shellfish aquaculture and commercial fisheries.

Similar Species

May be confused with native Atlantic Rock Crab *(Cancer irroratus).* Distinct features of *C. irroratus* include nine smooth spines on each side of the eyes, and wide and ovoid shape of the peach-coloured shell.



Violet Tunicate

Botrylloides violaceus

Description of the Species

Individuals form gelatinous colonies of very small animals (less than 1 mm) called zooids. Each colony is usually one solid colour ranging from purple, red, yellow, orange, brown or white. Zooids usually organized into network of elongated ladder-like curving chains or tracks.

Habitat

Typically found in sheltered areas, attached to rocks, eelgrass, seaweeds, other animals or on man-made structures such as boat hulls, buoys, ropes, anchors, floating docks, aquaculture gear and wharf pilings.

Invasive History

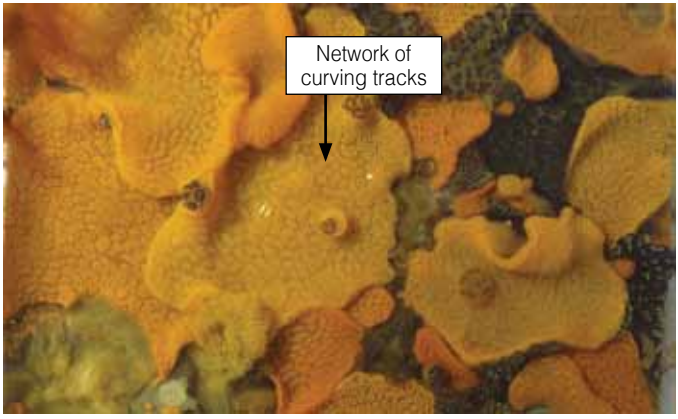
Native to Asia (Japan). First observed in eastern Canada, Nova Scotia, in the 1990s and in the Gulf of St. Lawrence (Prince Edward Island) in 2002.

Impacts

Fouling animal that grows on hard substrates such as rock, gravel and artificial substrates such as boat hulls and docks. Can outcompete and suffocate filter feeding bivalves such as mussels and oysters. Negatively impacts aquaculture, fishing and other coastal and offshore activities.

Similar Species

Can be mistaken for sponges, but sponges have a soft porous texture rather than a gelatinous one.



Violet tunicate *(Botrylloides violaceus)*

Japanese Skeleton Shrimp

Caprella mutica

Description of the Species

Long, slender body with one pair of long antennae, one pair of shorter antennae and large claws. Colour varies from pale white to bright red, orange, green or purple. Adults have distinct spines or bumps along the back. Males up to 50 mm in length, with very hairy and long neck regions. Females smaller – maximum 20 mm length. Often found in dense aggregations.

Habitat

Typically found in protected nearshore waters, at depths of 0-14 m, in seagrass and algae beds. Associated with biofouling communities on structures like boat hulls, buoys, aquaculture equipment and drifting algae.

Invasive History

Native to the Northwest Pacific, first spread to North America during the 1970s. Currently found along the entire West coast of North America including the Aleutian Islands in Alaska and along the East Coast of North America from Connecticut, USA to Quebec and New Brunswick, Canada. Ballast water and hull fouling are possible vectors currently.

Impacts

Studies on impact are limited, but the species is aggressive and directly competes with native species for resources. May displace native species and affect feeding of native fishes; may affect aquaculture operations.

Similar Species

Most similar in appearance and habitat to the native Linear Skeleton Shrimp *(Caprella linearis).* Comparatively, *C. mutica* has many posterior spines while *C. linearis* has a smooth body or only a few spines. Males of the native species much smaller (maximum 30 mm) than the non-native. Females and juveniles are easily confused with native species.

A male (top) and female (bottom) *Caprella mutica*

Ivory and Bay Barnacles

Amphibalanus eburneus and A. improvisus

Description of the species

These two similar species are off-white (light gray to cream) in color. The six external shell plates are smooth, without lines, ridges or color. The opening at the top of the shell is teardrop shaped in *A. eburneus*, and diamond-shaped in *A. improvisus*. Adults reach a maximum diameter of 20 – 40 mm. The two species can also be distinguished by examining the operculum plates. Both species attach to the substrate with a hard, calcareous base that remains even after the animal is scraped off.

Habitat

Biofouling animals that live in low intertidal and subtidal zones, attached to natural and artificial hard substrates including rocks, docks, boat hulls, wood and the shells of other animals. They thrive in marine and estuarine waters and can survive in fresh water.

Invasive History

Native to middle and low latitudes of the western Atlantic ocean, from Nova Scotia to Venezuela. Larvae can spend weeks or months drifting as plankton, making them easily transported by ship hulls and ballast water.

Impacts

Barnacles attach to hard substrates including vessels, navigation buoys, harbor structures, pipes, aquaculture and fishing gear. Impacts biodiversity by competing for space with native species and changing habitat structure in oyster and mussel beds.

Similar Species

These two species look similar to the native Crenate Barnacle *(Balanus crenatus)* because of the smooth whitish shell plates and smooth circular outline – however, the outline of native species often has irregular lobes and it is not found near fresh water. The three species are distinguished by the pattern of overlap between each of the 6 shell plates. The Ivory barnacle is singular among these similar species by having rows of tiny pits on the scutum (larger opercular shell), which are formed by intersecting vertical and horizontal ridges (requires a hand-lens). Two other native Arctic species, *B. balanus* and *Semibalanus balanoides*, are similar in color and size, but have vertical ridges and are lobed in outline.

Species	*A. eburneus*	*A. improvisus*	*B. crenatus* (native)
Maximum Size	25 – 40 mm	17 mm	25 mm
Scutum Texture	With rows of pits formed by intersecting ridges	No intersecting ridges	No intersecting ridges
Plate Overlap	Complete	Incomplete, wide spacing	Incomplete

Striped Barnacles

Amphibalanus amphitrite and A. reticulatus

Description of the Species

These two similar species both have six smooth, white-ish shell plates with distinct vertical stripes of purple, pink or gray. A. *reticulatus* has additional intersecting stripes, creating a unique net-like pattern. Both species attach to the substrate with a hard, calcareous base that remains even after the animal is scraped off.

Habitat

Biofouling animals that attach to natural and artificial hard substrates including rocks, docks, boat hulls, wood and the shells of other animals *A. reticulatus* thrives in the subtidal zone of sheltered and exposed marine habitats. In contrast, *A. amphitrite* is found only in sheltered habitats, in the low intertidal and subtidal zones; this species can also tolerate marine and estuary conditions, even in polluted water.

Invasive History

A. reticulatus is native to the Indo-Pacific region and through shipping vectors it has been introduced to tropical and temperate latitudes of the Eastern Pacific, both sides of the Atlantic and the Eastern Mediterranean Sea. *A. amphitrite* is cryptogenic—it has become so widespread in temperate and subtropical latitudes that its origin is difficult to determine.

Impacts

Barnacles attach to hard substrates including vessels, navigation buoys, harbor structures, pipes, aquaculture and fishing gear. Impacts biodiversity by competing for space with native species and changing habitat structure in oyster and mussel beds.

Similar Species

The native barnacles *Balanus balanus* and *Semibalanus balanoides* are similar in size; however, they lack colored stripes, have strong vertical ridges, and *S. balanoides* do not leave a calcareous base when the animal is scraped from the substrate. On the other hand, *B. balanus* has a calcareous base.

Species	*A. reticulatus*	*A. amphitrite*
Maximum Size	18 mm	20 mm
Habitat	Marine; exposed and sheltered areas; subtidal zone	Marine and estuary; sheltered areas; low intertidal and subtidal zones

Triangle Barnacle

Balanus trigonus

Description of the Species

Six exterior shell plates are pink or purple with white vertical ridges. Within the triangle-shaped aperture, the scuta (two largest operculum plates) have rows of pits, visible with a hand-lens. This species reaches a maximum size of 25 mm and has a calcareous base that remains attached to the substrate when the animal is scraped off.

Habitat

Thrives in warm marine conditions and will attach to a variety of submerged habitats including rocks, wood, artificial structures, and oyster shells.

Invasive History

Broad native distribution in temperate and tropical latitudes of the Pacific and Indian Oceans and wide introduced range includes Atlantic shores of North and South America, Africa and Europe, and the Mediterranean Sea. The species is restricted to warm water of temperate latitudes but is regularly observed on visiting ship hulls.

Impacts

Barnacles attach to hard substrates including vessels, navigation buoys, harbor structures, pipes, aquaculture and fishing gear. Impacts biodiversity by competing for space with native species and changing habitat structure in oyster and mussel beds.

Similar Species

The non-native barnacle species *Amphibalanus amphitrite* and *A. reticulatus* have opposite coloration to this species. They have colored stripes but lack strong ridges. Native barnacles *Balanus balanus* and *Semibalanus balanoides* have strong vertical ridges but lack coloration, and *S. balanoides* do not leave a calcareous base when the animal is scraped from the substrate.

Australasian Barnacle

Austrominius modestus

Description of the Species

This barnacle species is small (5 – 10 mm in diameter), but it is uniquely identified by having four gray shell plates that have undulating ridges and that form a square opening at the top. The animal is weakly attached to the substrate, so that when the animal is scraped off, there is no calcareous base remaining.

Habitat

Biofouling animals that live in intertidal and shallow subtidal zones in sheltered or exposed locations. They attach to a variety of substrates, from rocks and shells to boat hulls, docks and buoys. They thrive in marine and estuarine waters, and they can tolerate pollution or variable water quality.

Invasive History

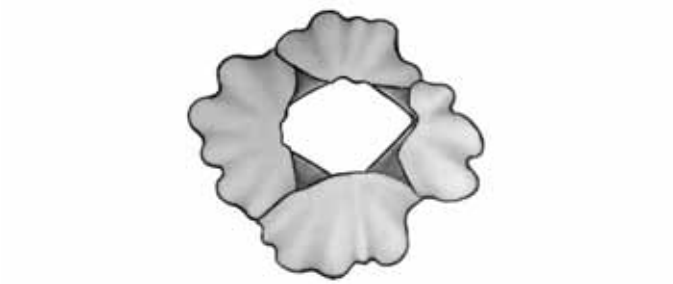
Native to the temperate and subtropical coasts of Australia and New Zealand, and was introduced to Europe starting in the 1940s, and now outnumbers many native barnacle species. The species has very high establishment rates because its larvae can spend weeks or months drifting as plankton, and they can survive a wide range of water conditions.

Impacts

Barnacles attach to vessels, navigation buoys, harbor structures, pipes and fishing gear. They also attach to aquaculture structures and shellfish, adding cost to the industry. They affect the diversity of plants and animals by competing for space with native species and changing the habitats in oyster and mussel beds.

Similar Species

The native barnacle *Semibalanus balanoides* is also small and grey with undulating ridges. However, only *Austrominius modestus* has four shell plates instead of six.



Austrominius modestus, top view

Photo and Drawing Credits

Iqaluit, Nunavut (cover): Kimberly Howland, Fisheries and Oceans Canada

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Caprella mutica: Elizabeth Cook

Amphibalanus eburneus and *A. improvises*: Heather Hawk, Laval University

Amphibalanus amphitrite and *A. reticulatus*: http://www.marineco.co.jp/alien/A_amphitrite.html, https://www.flickr.com/photos/32301703@N05/11989872406

Balanus trigonus: Auguste Le Roux - Own work. Licensed under GFDL via Commons - https://commons.wikimedia.org/wiki/File:Balanus_trigonus_2492.jpg#/media/File:Balanus_trigonus_2492.jpg

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Reporting A New Species

What should you do if you find an unusual plant, animal or insect that may be a non-indigenous species?

This identification guide is intended to help distinguish potential non-indigenous species of concern; however, the identity of a specimen should be confirmed by an expert if possible. Record the date and location of discovery (GPS coordinates if possible) and provide a detailed description of the appearance of the organism as well as the environment you found it in.

If possible take a photo and preserve the specimen (next page). Contact one of the offices listed below to report any findings and get further instructions on where to send photos or preserved specimens:

- Newfoundland and Labrador: 1-855-862-1815
- Quebec: 1-418-775-0682
- Manitoba: 1-877-867-2470
- Northwest Territories: NWTSOER@gov.nt.ca
- Nunavut: Contact your local conservation officer or 1-867-975-7754
- For more information or if contacts at the above listed numbers are unavailable, please contact

  Kimberly Howland,
  Arctic Research Division,
  Fisheries and Oceans Canada,
  501 University Crescent, Winnipeg, MB, R3T 2N6,
  Tel. 1-204-984-4227,
  Fax: 1-204-984-2403,
  Email: Kimberly.howland@dfo-mpo.gc.ca

You can also share your new observations with others on the internet by joining the Local Environmental Observer (LEO) Network, www.anthc.org/chs/ces/climate/leo/

How To Preserve A Specimen For Follow-Up Identification

If you think you have found a new species, it is best to preserve it so it can be sent to an expert who can confirm the identity. All preserved specimens should be labelled with the collection date, collection location and, if possible, the name and contact information of the person who found the specimen.

Freezing: The easiest way to preserve a specimen is to put it in a sealed bag or air tight container and freeze it. Frozen specimens must remain frozen when they are sent to a lab for identification, so they should be well labelled to indicate "keep frozen" and you should verify with the shipper that they can keep the sample frozen.

Alcohol: Specimens can also be preserved in 95% or greater ethanol for genetic analysis. Preservation and shipping require special training that should only be conducted by a knowledgeable person in your community (e.g., Fisheries and Oceans Canada; Arctic Colleges; Aurora/ Nunavut Research Institutes, Nunavik Research Center).

Alternatively if you have access to a Life Scanner Kit (these may be available through DFO or other research/teaching facilities noted above), follow the instructions provided with the kit for photographing, preserving and shipping your specimen. Additional information is available at http://lifescanner.net.