

TEACHING GUIDE TO CETACEANS

Gulf of Corcovado / Northern Patagonia / Chile

Original title

Guía Didáctica de Cetáceos

Contents

Gloria Howes

Paulina Bahamonde

Gustavo Chiang

Editors

Eduardo Galaz

Macarena Tapia

English translation

Stuart Law

**Director of art, design and
scientific illustration**

María José Bunster

Infographic design and illustration

Vicente Espinoza

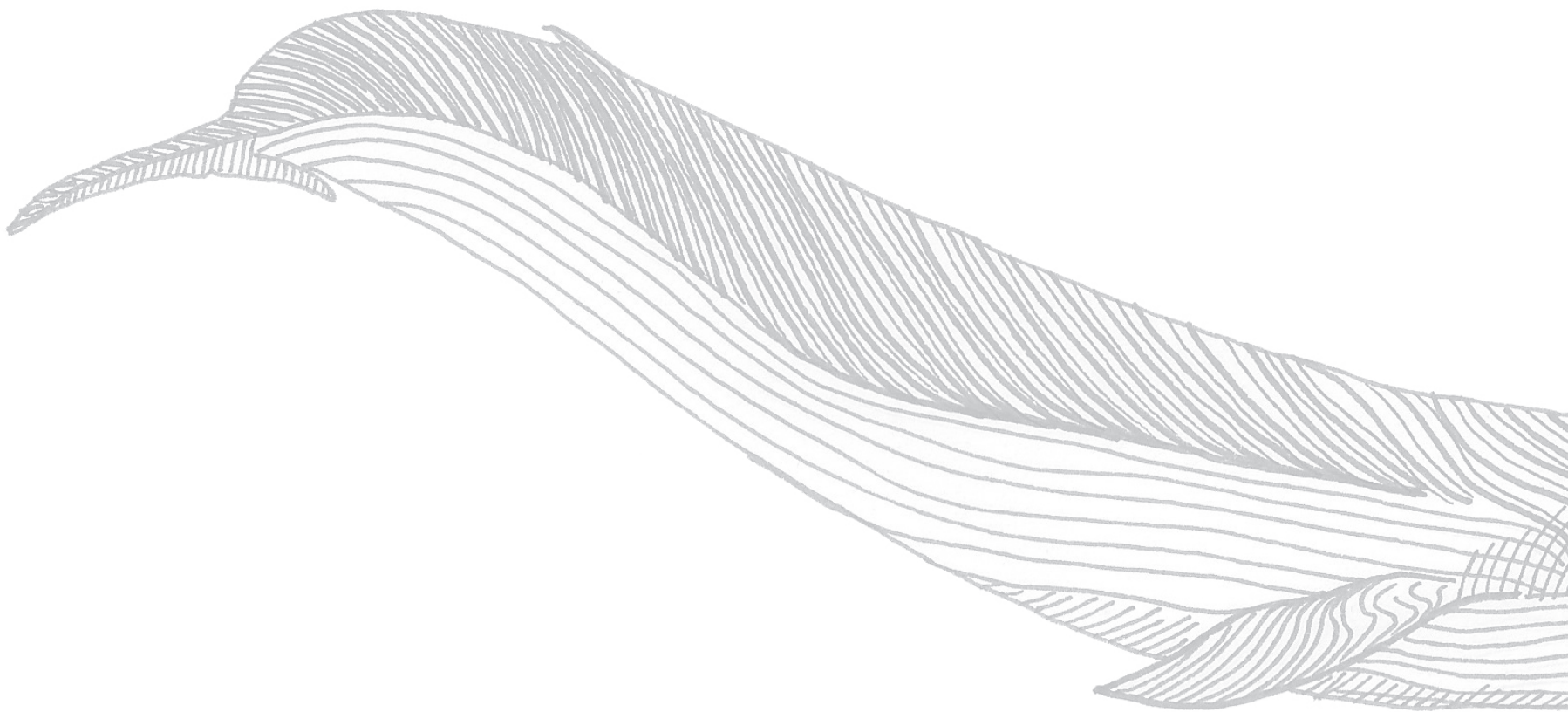
***MERI Foundation on the Web***

 www.fundacionmeri.cl

 [/FundacionMERI](https://www.facebook.com/FundacionMERI)

 [@FundacionMERI](https://twitter.com/FundacionMERI)

*In memory of the dead whales in
the Golfo de Penas in 2015.
The biggest stranding of Mysticeti ever
recorded, with more than 388 found
dead to date.*



INTRODUCTION

About 70% of the Earth's surface is covered by oceans. Sadly, only 1% of the oceans are protected.

Blue whales are the all-seeing sentinels of our blue planet. They are found in four of the five oceans: Pacific, Atlantic, Antarctic and Indian.

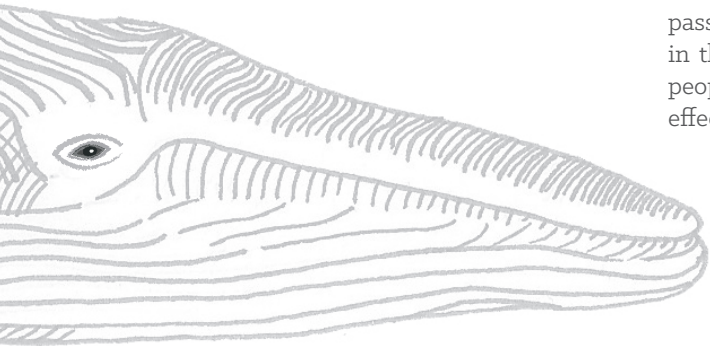
During their extended migrations they silently watch over the hemispheres from end to end.

It is time for us to join in cooperation with them. To protect these species means caring for very large marine areas and the countless beings that share these seas.

Our coasts are both the home and ocean passageways for half of the cetacean species in the world. In spite of this fact, very few people are aware of their presence, or of the effects our behaviors have on them.

This guide was developed to provide friendly and engaging material for all children, young people and adults interested in these enigmatic creatures of the sea. With this information you will learn about their primary observable features, their natural environments, and also discover fun facts that will surprise and delight you.

We invite you to read on and meet the cetaceans and other marine mammal companions of the blue whales in and around the Gulf of Corcovado in Chile's northern Patagonia.



PROLOGUE

In the distance a loud sound is faintly heard; an explosion of air, a lingering plume of vapor on the horizon. Nothing of note for a blind eye and a confused ear. Yet a magnificent whale for an enlightened eye! It is impossible to forget the first time you experience a whale or a dolphin. So far, and yet so near. And that single moment of connection awakens an unexpected curiosity and triggers a compulsion to see them time and time again.

This is the opening to a path of transformation; yes of your eyes and ears, but of your mind and the heart as well. Perhaps the greatest challenge facing us as Chileans is coming to know our natural world. It is also our least understood challenge. Though our love of country is deeply shared, few of us truly know Chile's species and great open spaces. In a country where a large part of the population lives in cities, and many of these urban spaces are also concentrated in the geographical center of the country, opportunities for most Chileans to deeply encounter our natural world are scarce. This is especially true if that natural world

sprawls across Chile's vast southern zone, and is sheltered by the cerulean waters of the Patagonian fjords.

What is also little appreciated is that this natural environment, our natural environment, is not only beautiful and unique, but its existence is what sustains and shapes all of the economic and spiritual well-being to which we can aspire. Just as in the myth of the tortoise that holds the world on its back, the truth is that the foundation upon which all of life rests, even human life, is nature.

Not only is our natural world unknown to us, day by day it is also degraded, becomes lost, and disappears from the face of our country as the result of the ongoing development of a variety of damaging and unsustainable human activities along with the deep ignorance of what it is that surrounds us. The long hand of "civilization" and development touches ever further and more strongly into our nature. And day by day, places that once were shelters for different species today are reached by this relentlessly gripping claw. Perhaps what most starkly represents the

beauty of, and the break from, the natural world is embodied in the world of the cetaceans. Whales, dolphins, beaked whales, and porpoises all sail and frolic in remote and unknown places. These animals have been a primary source of not only food, but also of raw materials and inspiration. Perhaps the cetacean's world is also the most brutally clear example of the destructive power that the human species is unleashing on the other species.

And, paradoxically, it is this same group of animals that bring to light the greatest challenge that we as humans face today: to come to know about, appreciate and value our natural environment.

It is this panoply of magnificent cetaceans, both the national varieties like the Chilean dolphin that swim only in our seas, and the large humpback whales that migrate from Ecuador to Antarctica, [giant compatriots, or the timid and rarely seen porpoises that find their way into your hands today, thanks to the efforts of the MERI Foundation. They are here to fill the emptiness of our knowledge

about the natural world of Chile, and to bring us closer to this valuable yet highly unknown universe. They have come to remind us of what should never have been forgotten: that we as humans are also part of nature. And lastly they are here to nurture and feed a national movement calling for the preservation of our environment and all of the species that inhabit it. A movement that is on the move! thanks to the visionary, committed, innovative and integrating efforts of groups like the MERI Foundation.

Our wish is that when you re-open your eyes after having enjoyed this book that your eyes, and your vision, be transformed. That your new eyes will reach out to the hearts of all who love the wonders of the natural marine world. And then, that they touch all those others who hope to meet and come to know this world by swimming with the small and large cetaceans of the Chilean seas.

Daniela Droguett and Bárbara Saavedra
WCS-Chile

A WORD FROM THE PRESIDENT

The sea; an everyday and little-explored presence. Thanks to literature and poetry we have come to associate the sea with ideas of power, vigor, beauty, immensity, mystery, death, mysticism and many other concepts that nonetheless fail to encompass the complex webs that support a variety of ecosystems and life forms.

For humans, the sea remains a virtually unknown universe. Despite all of the advances in science and technology, we are becoming increasingly aware that the depths of the oceans hold secrets that are difficult to unveil.

This mysterious and vibrant blue world of the Chilean Patagonia's waters and fjords is a key geography in the life of many cetaceans including blue whales, fin whales, sei whales, humpback whales, minke whales, right whales, orcas and sperm whales. These ocean giants are majestic beings that have been revered down through the ages by different cultures connected with the forces of the sea.

At present the oceans are facing a major environmental crisis that threatens the lives of the cetacea and multiple other species, including us humans. From this perspective it is ever more urgent that we preserve our terrestrial and marine ecosystems. Our humanity requires us to urgently embrace the task of becoming aware of the situation and to generate the changes that will allow us to reconnect with our origins, with the sacred, with the divine, and with our relationship with nature.

Science plays a key role in helping us to know how to best approach and understand a living planet called Earth.

It is from this core belief that the MERI Foundation was born in 2012, as a non-profit organization whose mission is "to protect the Melimoyu Nature Reserve and strengthen research and education for the conservation and sustainable management of the terrestrial, freshwater and marine ecosystems and cultural heritage of Northern Patagonia."

The Bay of Melimoyu, which lays adjacent to the Gulf of Corcovado, is an area of extraordinary beauty, and is an especially important place for the feeding and socialization of the protagonists of this Guide: the cetaceans. With this material we are aiming to provide you, our readers, with some basic and useful information for recognizing and identifying whales.

The sketched illustrations and infographics which follow will allow you to identify some key whale features including morphology and diving patterns, and the fun facts will help you understand what makes the cetaceans some of the oceans' most intriguing animals. These singular beings have found in Chilean seas one of their most important refuge areas.

We invite you to join your head and your heart as you begin a journey into the mysterious deep ocean world in search of these giants of the sea.

Francisca Cortés Solari
President
MERI Foundation

A FOREWORD BY THE SCIENTIFIC DIRECTOR

Chile is a country of contrasts; from mountain ranges towering almost 7 thousand meters high to plunging 8 thousand meter deep submarine trenches along our coasts, flanked by deserts, mountain ranges and sea, we are an island on a continent, and thus enjoy a singular biodiversity.

Our coasts are home to a countless number of species, a hugely diverse and biogeographically valuable faunal group. However, there are still important gaps in our knowledge about our fauna's systems, distribution and above all its basic biology, which together constitute a not insignificant barrier to effective planning and conservation.

Our aquatic systems are currently undergoing a multiplicity of threats, some more noticeable to human eyes than others. Aquatic ecosystems are a varied assemblage of interacting species, each with its own features and habitats. Every species has a different degree of tolerance to environmental changes. We need to understand and try to

predict the possible consequences of these changes before it is too late, and the best way to do this is by developing knowledge regarding the biological and ecological factors that determine the different species' responses.

Since 2012 the MERI Foundation has been carrying out a project designed to help us understand the ecology, feeding and other cetacean behavior on a local scale in the Patagonia. In other words, the idea is to learn how these great animals socialize, what kinds of relationships the visitors to these waters develop, and why they come to these places in the first place. We are also interested in knowing more about what they feed on and what the possible factors that determine their migrations year after year to the fjords of southern Chile are. Our research will also help us to develop more knowledge about the other species that inhabit this area.

Curiosity is in us all, it is a part of our nature to explore and venture out. The Teaching Guide to Cetaceans you hold in your hands is an effort by the MERI Foundation to

use this native curiosity to bring scientific knowledge to the general public, and raise awareness about the value of our native species. The aim is to encourage the public, children especially, to return their gaze to the sea and realize that we are all a part of nature, and that science is a way for us to better understand its different parts. That in this way we can ultimately learn to love and care for what we are a part of.

*Gustavo Chiang
Scientific Director
MERI Foundation*

BACKGROUND INFO



FORMATION



WHAT IS A CETACEAN?

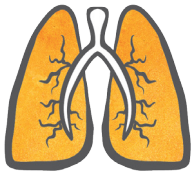
Cetaceans are mammals, which means that:



They are warm-blooded animals



They have hair during at least some stage in their life cycle



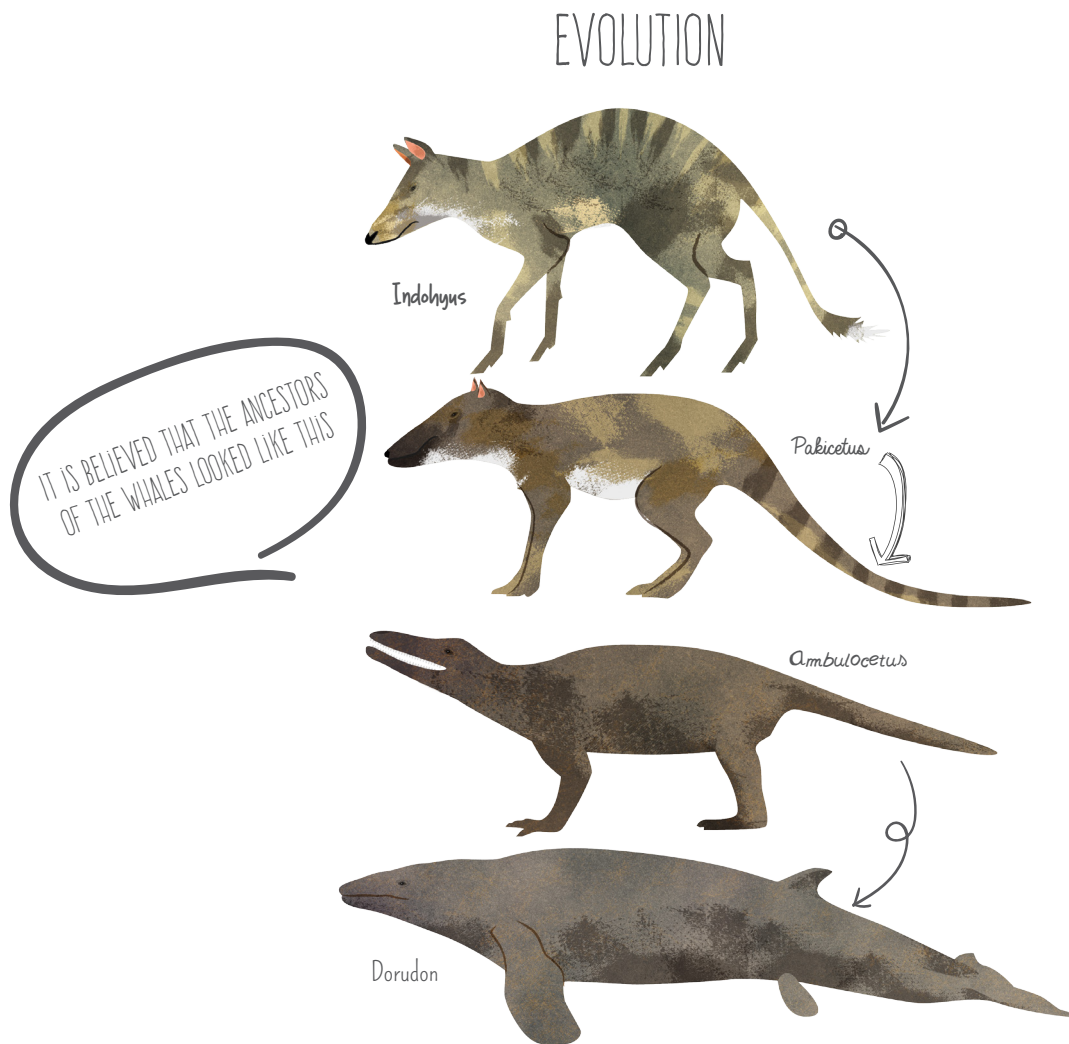
They breathe through two lungs



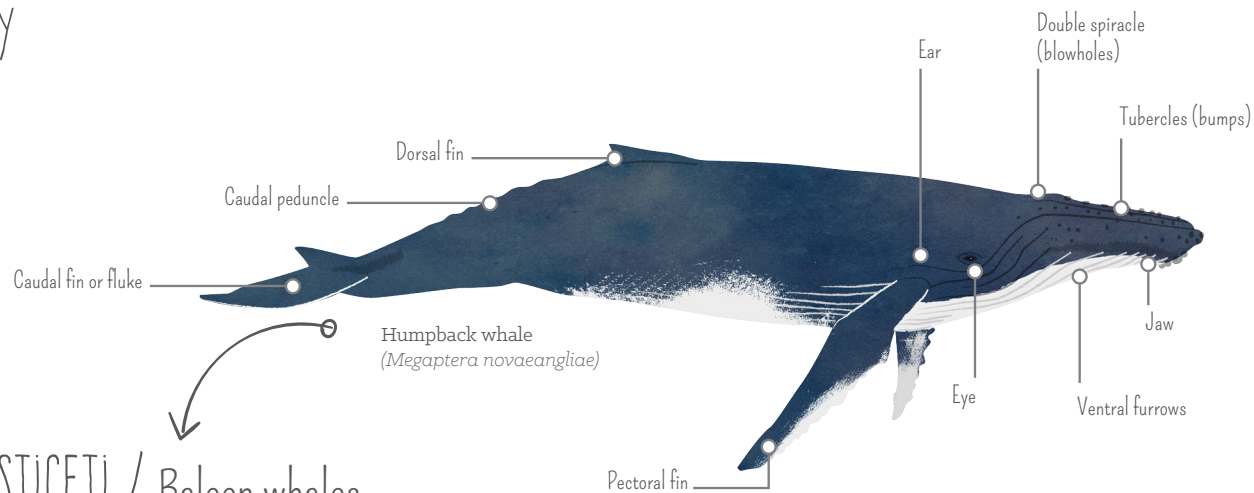
They feed on milk during their first months of life

The cetaceans are currently marine mammals, but this was not always so.

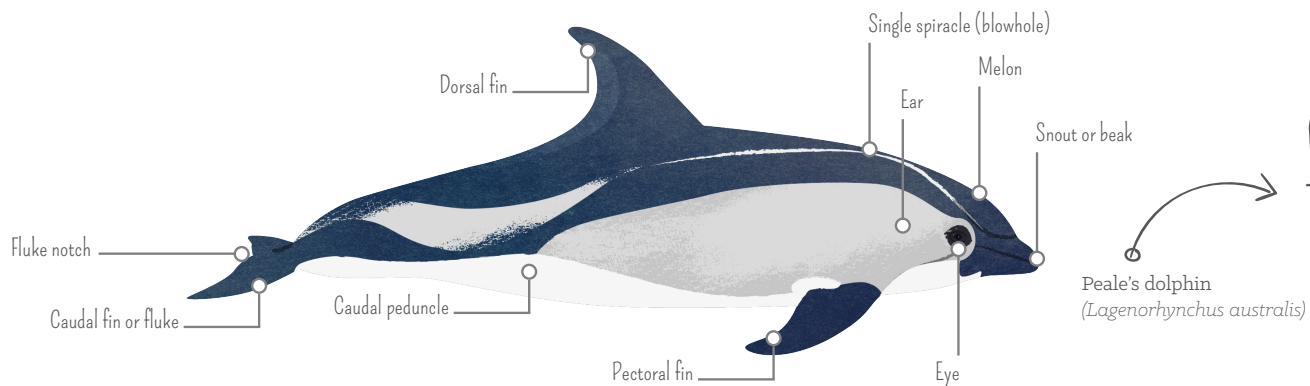
55 million years ago they were terrestrial beings that over the course of their evolutionary process changed habitats and became adapted to aquatic life. Some of the physical changes they went through included the disappearance of their hair and the appearance of a fat layer for thermal insulation; movement of the nostril(s) to the top of the skull in a vertical orientation (one in the Odontoceti and two in the Mysticeti); extension of the jaw and maxilla into a snout shape; modification of the front extremities to become pectoral fins, and disappearance of the back extremities and development of a caudal fin in their place.



CETACEANS TODAY



MYSTICETI / Baleen whales



ODONTOCETI /
Toothed cetaceans

MIGRATIONS

Both the Mysticeti and Odontoceti migrate, although there are some differences in how they do it.

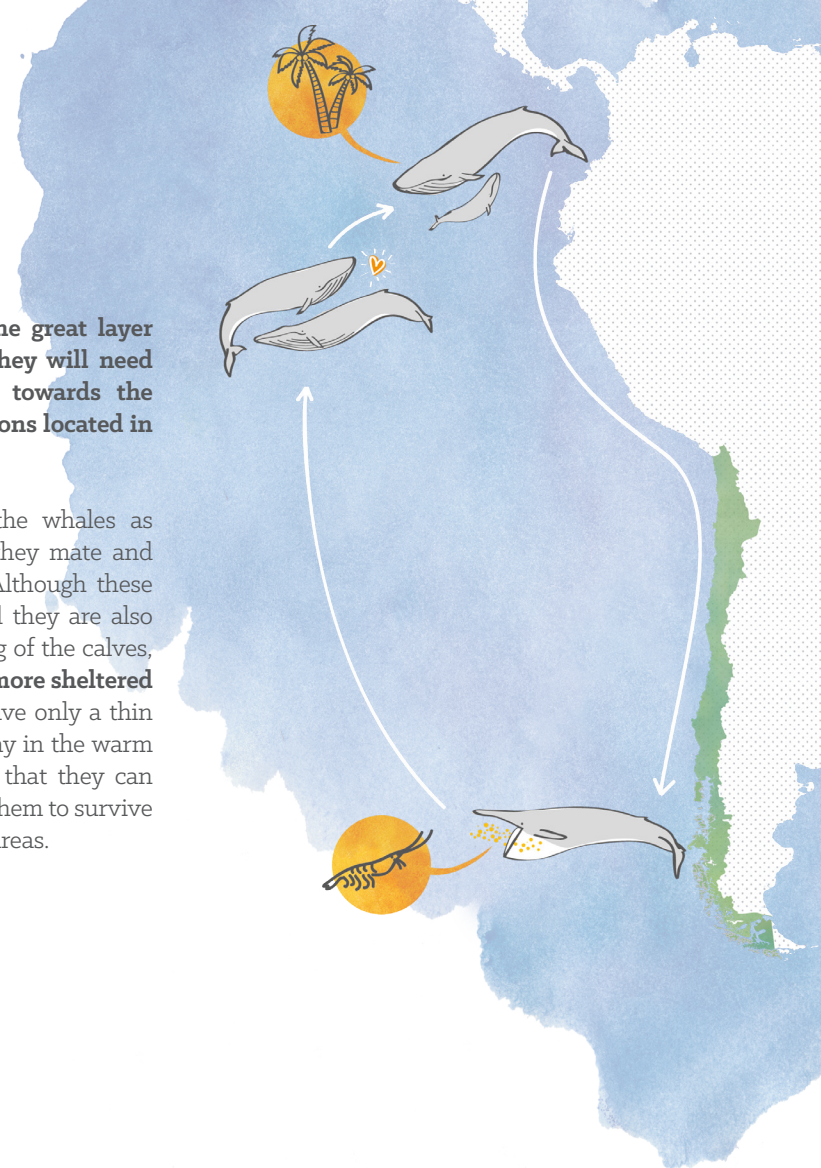
The Mysticeti's migrations are long in distance and time. In contrast, most Odontoceti cover short distances and in different directions. If the place where the whales find themselves is suitable for feeding and reproduction then it is not necessary for them to migrate.

The majority of the baleen whales (Mysticeti), for their part, have a seasonal migration pattern where they travel thousands of kilometers to the north and south. In summer they migrate to feeding areas, and in winter to breeding areas.

The feeding areas are located in cold water regions in the upper latitudes, like the poles and sub-polar zones, like the Patagonia, where solar radiation increases in the spring and the thaws begin, which, among other factors, produces the conditions necessary for increased availability of food that reaches its peak concentration in the summer. In autumn, the ice begins to advance and the available food declines. **It is necessary for**

the whales to have grown the great layer of fat and energy reserves they will need to undertake their journey towards the tropical and sub-tropical regions located in the lower latitudes.

These regions are used by the whales as breeding grounds. Normally, they mate and give birth in the same area. Although these warm waters are poor in food they are also ideal for the feeding and caring of the calves, as **the waters are calmer and more sheltered from predators.** The calves have only a thin layer of fat, so they need to stay in the warm waters with their mothers so that they can grow a fat layer that will allow them to survive the cold waters of the feeding areas.



COMMUNICATION

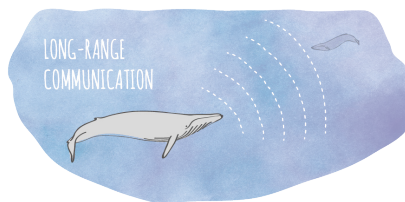
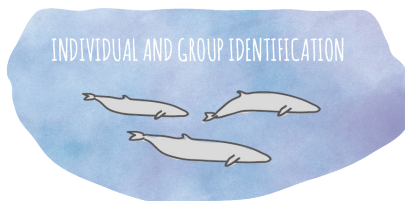
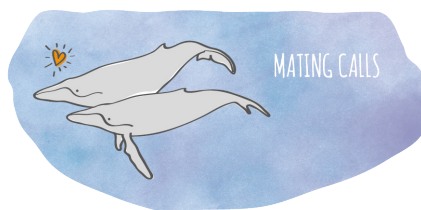
Sound is fundamentally important for both the *Mysticeti* and *Odontoceti*.

Cetaceans have large pupils in their eyes to see when there is little light and ocular musculature that allows them to focus in and out of the water. While this gives them good vision, hearing is their most developed sense and is key to their survival, as they rely on sound to find food, communicate, mate, detect predators and navigate.

Water is an effective medium for transmitting sound. Sound travels faster and farther in water than in the air (speed of sound in sea water: 1,500 m/sec [approximately, it is not a constant velocity] - speed of sound in the air: 240 m/sec). The opposite happens with light which travels only short distances in the ocean before dispersing.



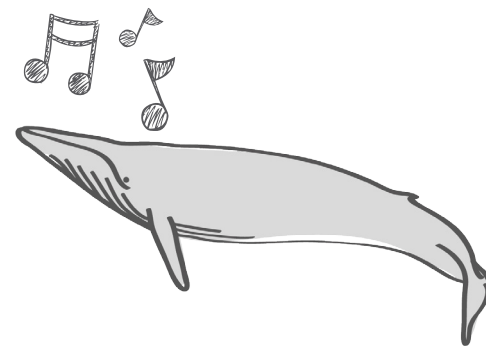
Cetaceans can produce sounds intentionally. The cetaceans' vocalizations serve different purposes. Some of these are:



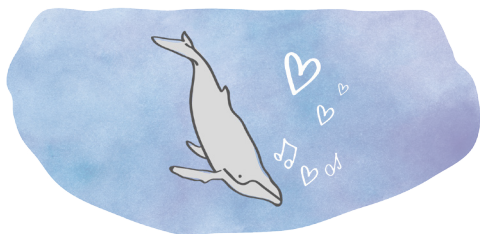
The *Mysticeti* are able to produce vocalizations that can be heard over long distances. In the case of the blue whales (*Balaenoptera musculus*), regional dialects have been identified. These are unique songs that are different from those of other populations found in different geographical regions.

Currently 10 blue whale regional dialects have been identified.

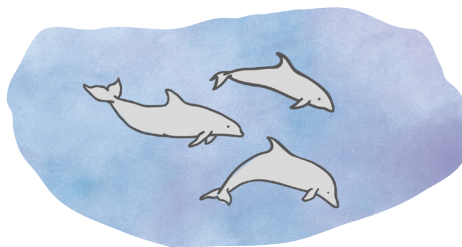
The tenth song was recorded in the Gulf of Corcovado, and is called the song of the Chilean Blue Whale.



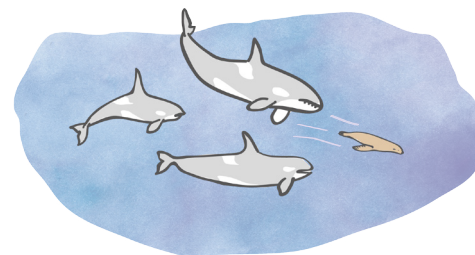
Male humpback whales (*Megaptera novaeangliae*) produce a series of vocalizations which collectively compose a song that they can sing for hours, and which plays an important role in their reproduction.



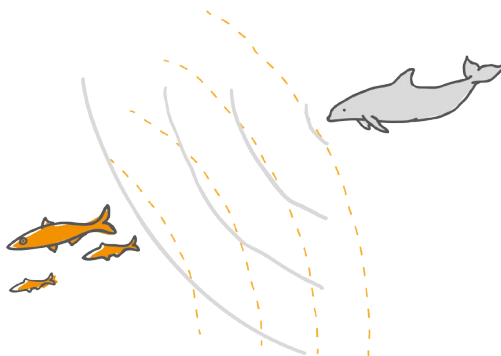
The toothed whales also emit vocalizations. Some dolphins make characteristic whistles, called signature whistles, which identify each individual, and the whistle is their own personal brand and how they keep track of one another.



Orcas (*Orcinus orca*) produce whistles that are unique to their group. This group dialect is taught to each new generations, and is often used by the orcas to coordinate while hunting.



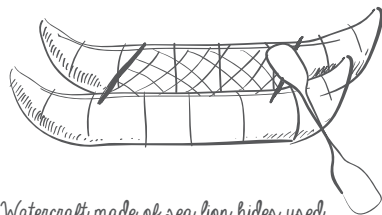
ECHOLOCAATION ALLOWS THE WHALES TO LOCATE PREY AND AVOID OBSTACLES.



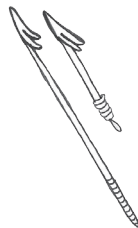
The Odontoceti also use echolocation (unlike the Mysticeti). The whales **send out sounds that are reflected back to them when they hit an object**. The echoes provide information about the location, size and shape of an object. In addition, if the object is in motion the echoes will let the whale know the direction and speed of travel.

THE HISTORY OF WHALING IN CHILE

In Chile knowledge about marine mammals has always been linked to the uses made of their bodies by humans once hunted. Examples from the earliest evidence of these practices include:



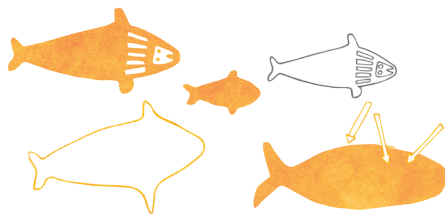
Watercraft made of sea lion hides used by the Chango people



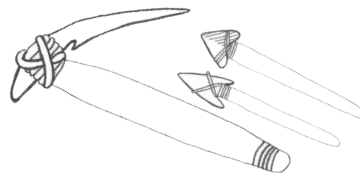
Construction of harpoons



Chono whaling tales



Pictographs alluding to the hunting of free whales found in the Médano ravine of the Tarapacá Region



Whale bone tools produced by the canoeing cultures from Chiloé to the south.

Whales were hunted from 1929 to 1983. The first records of whale sightings off the Chilean coast date back to the 16th century. The presence of cetaceans was described by sailors from the old continent coming to conquer a new world.

After this, the massive hunting of whales, sperm whales, seals and sea lions began.

Amelia was the name of the first whaling ship in Chile. Between 1788 and 1790 she returned to port with 139 tons of oil; this success attracted English and North American hunters

Records from that time indicate that between 1788 and 1809 approximately 133 North American whaling vessels harvested 121,000 barrels of spermaceti oil from sperm whales



30.000 !

Whales were hunted between 1929 and 1983

(*Physeter macrocephalus*) in Chilean waters. Following Chilean independence, the first local whalers appeared; between Iquique and Magallanes there were seven coastal whaling stations.

Industrial whaling began with the 1848 invention of the explosive harpoon designed to explode inside the cetacean.

Chilean whalers hunted nearly 30,000 whales between 1929 and 1983.

From 1956-1962, the peak whale hunting period in Chile, average annual production reached 43,826 barrels of oil extracted from 2,107 whales.

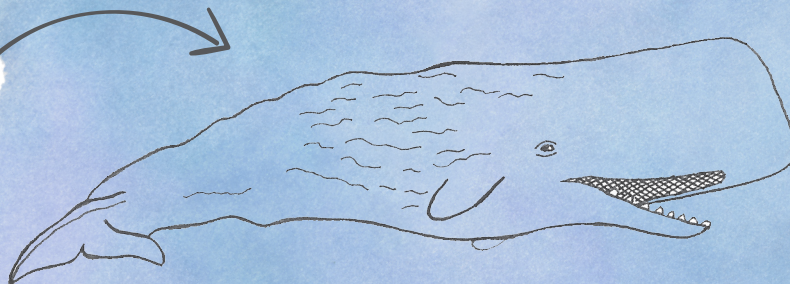
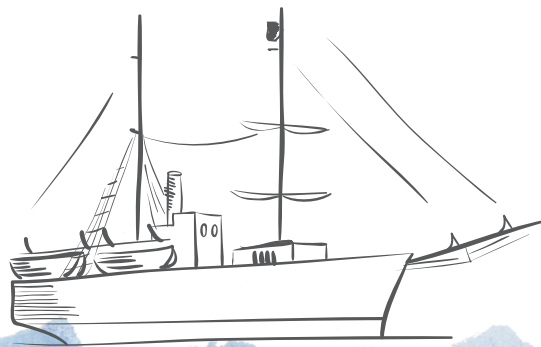


The most well-known episode of whale hunting comes from the novel “Moby Dick.” Herman Melville, the book’s author, was inspired by a real-life event.

The actual ship was the whaler HMS Essex, which sailed from Nantucket in the United States on August 12, 1819. After a year at sea the ship was sunk by an albino sperm whale (*P. macrocephalus*) off the coast of Ecuador.

Some survivors were shipwrecked for three months then rescued near Juan Fernandez Island and taken to the port of Valparaiso.

Owen Chase, one of the survivors, told the story of what had happened in New York where the sperm whale was dubbed “Mocha Dick,” as different sailors had reported that the whale frequently visited Mocha Island, located in the Bio-Bío Region off the coast of Tirúa.



REASONS FOR CONSERVATION



SCIENTIFIC: Research shows that whales use the Gulf of Corcovado and the Chiloe area for feeding, socializing and breeding mainly between the months of December and April. This make the area a singularly unique location for the study and understanding of cetaceans.



ECONOMIC: the wide variety of cetacean species in Chile offers enormous opportunities for the development of environmentally sustainable scientific tourism that would also be beneficial to the local communities by creating new sources of income.



ETHICAL: in 2008 Chile passed a Law (20.293) for the protection and non-lethal uses of cetaceans, declaring the maritime areas under its sovereign jurisdiction to be zones where cetacean hunting is prohibited (Article 10).



ECOLOGICAL: cetaceans are considered to be an umbrella species because they require a tremendously large geographical territory or range to meet their needs. By protecting this species we will be able to also protect others that are within its territory.



AESTHETIC: whales are the largest marine mammals on planet Earth. These giants of the sea have always fascinated human beings since time immemorial because of their great beauty and the aura of mystery that surrounds them.

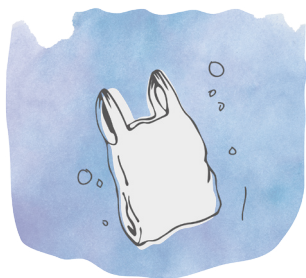


SPIRITUAL: across the globe there are references to different cultures that have established powerful connections with the whale. In the case of Chile, records show that the Selk'nam and Chono cultures had a close relationship with the cetaceans, and this was reflected in their rituals.

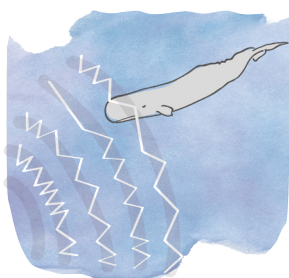
LIVING WITH THE CETACEANS

In Chile's case, **all cetacean species registered in the country (43) have been designated as Natural Monuments** (Decree 230 / 2008). In addition, Chile's sovereign waters have been declared whaling free zones (Law 20.293).

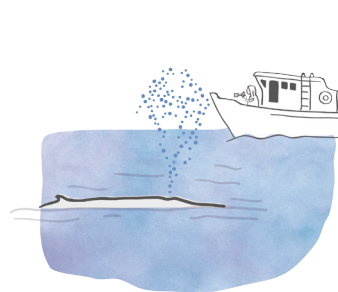
However, **even with the end to hunting, there are still threats to the inhabitants of the sea. It is essential that we learn to respect and live with the cetaceans. So, it is important to remember that:**



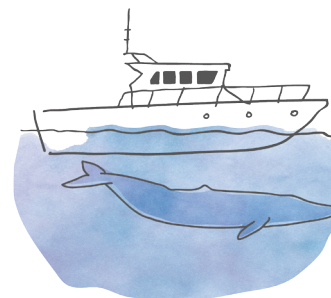
Marine mammals, fish and birds all confuse the garbage that we throw into the ocean with food. This has disastrous consequences, often death.



The noise made by ships (engines, radars, echosounders and others) can cause changes in behavior, hearing loss and strandings.



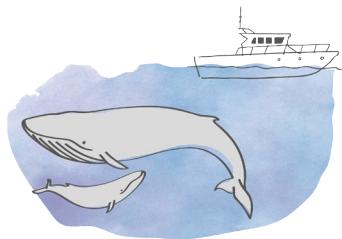
Whale watching boats should be careful to maintain proper distances and speeds to avoid altering feeding, mating and calf suckling behaviors.



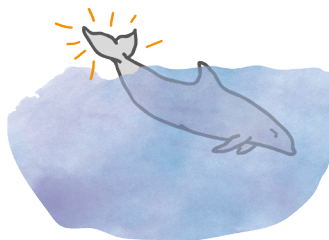
Friendly navigation. To avoid serious injury, and even fatal collisions. We need to bear in mind that our shipping routes coincide with their migratory routes.

WHALE WATCHING

If you are close to these charismatic animals, keep all of your senses on full alert and watch out for and pay attention to these behaviors:



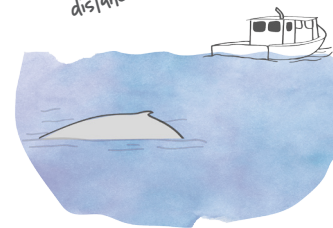
Mother trying to shield her calf



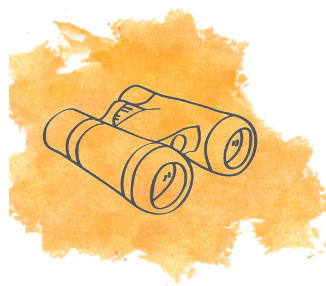
Fluke slapping

THESE ARE SIGNALS THAT
THE WHALES ARE FEELING
UNCOMFORTABLE AND A BIT
SCARED BY OUR PRESENCE

If you observe these types of behaviors,
we advise you to allow a little more
distance or leave the area.



For an excellent whale-watching experience we recommend:



Using binoculars



Limiting observation time



*It is important to respect the whales, and
not touch, feed, or swim with them*



*Let it be the whales that
approach you*

CONTEXT: CETACEANS IN CHILE

In the world there are about:



For its part, the Chilean coast provides areas for:



Migration/ Habitat



Food sources



Feeding Rearing
and socialization



Refuge and protection
for a diverse variety of
marine mammals

The Gulf of Corcovado has been recognized as a highly important area for the conservation of the blue whale (*Balaenoptera musculus*).

In this area it is possible to see most of the cetaceans recorded in Chile. However, most of these species have been classified as being either Vulnerable or Endangered.



MELIMOYU NATURE RESERVE

Since the birth of the MERI Foundation, our work has been focused on researching the ecology of the blue whale (*B. musculus*) in the Gulf of Corcovado and its surrounding areas. Our efforts have not been solely related to studying the marine ecosystems however, as MERI has also made a significant commitment to protecting the land area of the Melimoyu Nature Reserve. The 16,059 hectare reserve is located on the Bay of Melimoyu, in the northern Aysén Region, and is only accessible by sea.

It is here, at the foot of the Melimoyu Volcano, that we have focused our conservation and research efforts on the area's marine, freshwater and terrestrial ecosystems.

The reserve is home to beautiful lagoons and waterfalls, as well as two large tributary-fed rivers that course through the land from east to west; the Colonos River runs through the main operations area, and the Marchant River connects the volcano's glacier with the coast.

A mingling of Valdivian temperate forest and the sub Antarctic forest decorates the hills, providing refuge for the Guaitecas cypress (*Pilgerodendron uviferum*) and Darwin's Frog (*Rhinoderma darwinii*).

Upon reaching the coast, we find ourselves in the Melimoyu inlet, our gateway to the Gulf of Corcovado, home to a variety of species of birds, cetaceans and other marine mammals.



IN THE FOLLOWING PAGES WE WILL INTRODUCE YOU TO THE CETACEANS THAT INHABIT THE GULF OF CORCOVADO

Mysticeti / PP. 26 - 43



Blue whale (*Balaenoptera musculus*)
FAMILY BALAENOPTERIDAE
| pp. 32-33



Fin whale (*Balaenoptera physalus*)
FAMILY BALAENOPTERIDAE
| pp. 34-35



Sei whale (*Balaenoptera borealis*)
FAMILY BALAENOPTERIDAE
| pp. 36-37



Humpback whale (*Megaptera novaeangliae*)
FAMILY BALAENOPTERIDAE
| pp. 38-39



Minke whale (*Balaenoptera bonaerensis*)
FAMILY BALAENOPTERIDAE
| pp. 40-41



Southern right whale (*Eubalaena australis*)
FAMILY BALAENIDAE
| pp. 44-45

Odontoceti / PP. 46 - 65



Sperm whale (*Physeter macrocephalus*)
FAMILY PHYSETERIDAE
| pp. 50-51



Peale's dolphin (*Lagenorhynchus australis*)
FAMILY DELPHINIDAE
| pp. 54-55



Bottlenose dolphin (*Tursiops truncatus*)
FAMILY DELPHINIDAE
| pp. 56-57



Chilean dolphin (*Cephalorhynchus eutropia*)
FAMILY DELPHINIDAE
| pp. 58-59



Orca (*Orcinus orca*)
FAMILY DELPHINIDAE
| pp. 60-61



Burmeister's porpoise (*Phocoena spinipinnis*)
FAMILY PHOCOENIDAE
| pp. 64-65

SUBORDER MYSTIC

Sei whale
(*Balaenoptera borealis*)



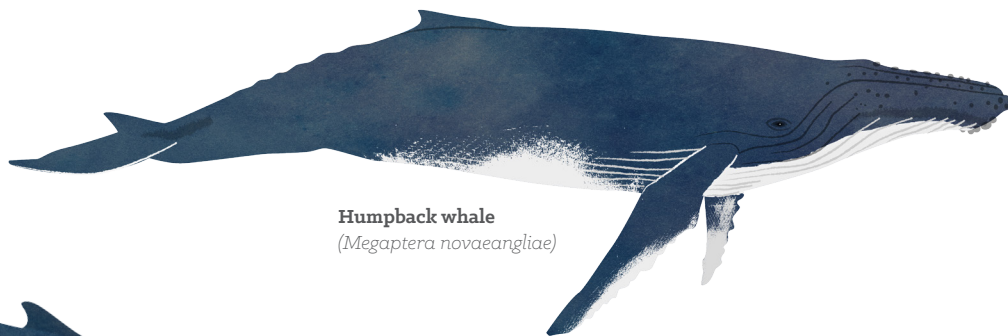
Minke whale
(*Balaenoptera bonaerensis*)



Blue whale
(*Balaenoptera musculus*)



CETI



Humpback whale
(*Megaptera novaeangliae*)



Fin whale
(*Balaenoptera physalus*)

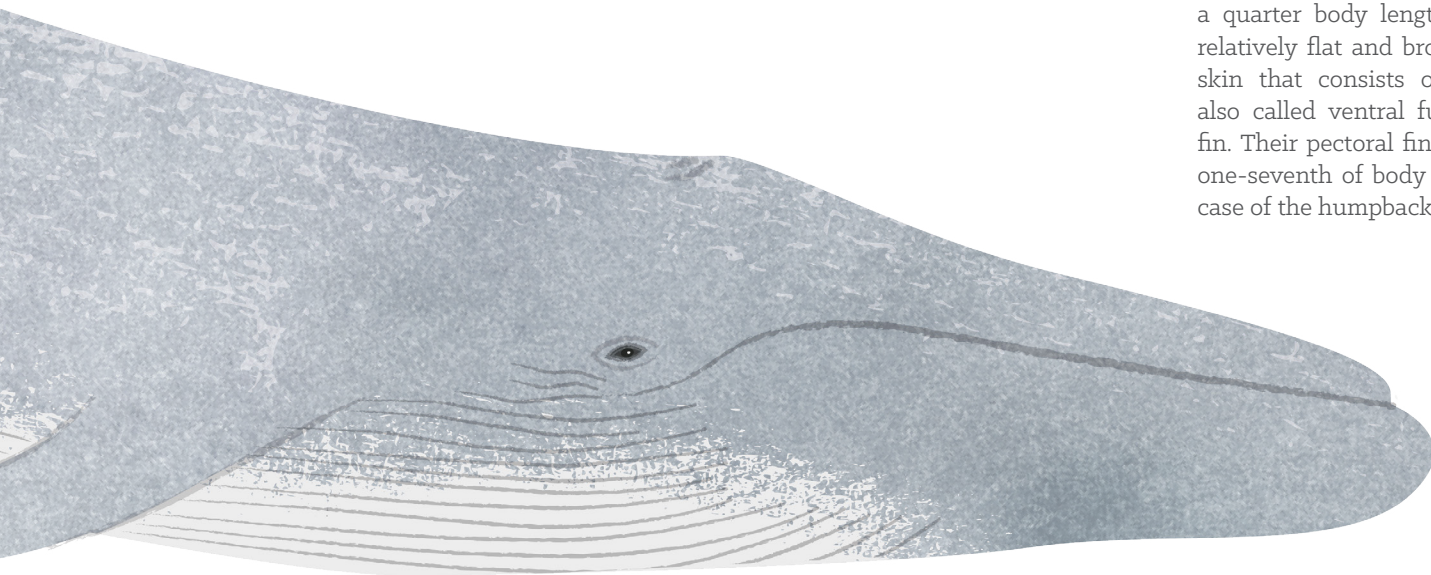


Southern right whale
(*Eubalaena australis*)

These are cetaceans that do not have teeth but rather have oral filtering plates inside their mouths known as “baleen” which is located only on their upper jaw. They also have a double spiracle, i.e. two breathing holes. The species in this group are between 7 and 30 meters long.



FAMILY BALAENOPTERIDAE



Belongs to the rorqual family. All of these cetaceans have a small head, less than a quarter body length, a straight face, a relatively flat and broad upper jaw, throat skin that consists of longitudinal folds, also called ventral furrows, and a dorsal fin. Their pectoral fins are small, less than one-seventh of body length, except in the case of the humpback whale.

Blue whale (*Balaenoptera musculus*) | FAMILY BALAENOPTERIDAE

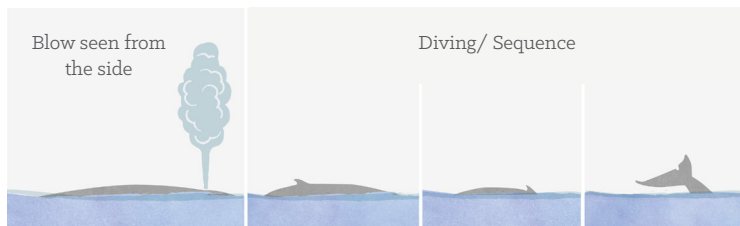


Appearance: between 24 and 27 m long. The calves are 7 m long. Individuals over 30 meters long have been recorded. Leaden blue in color, with small lighter colored spots. The belly is usually a lighter color.



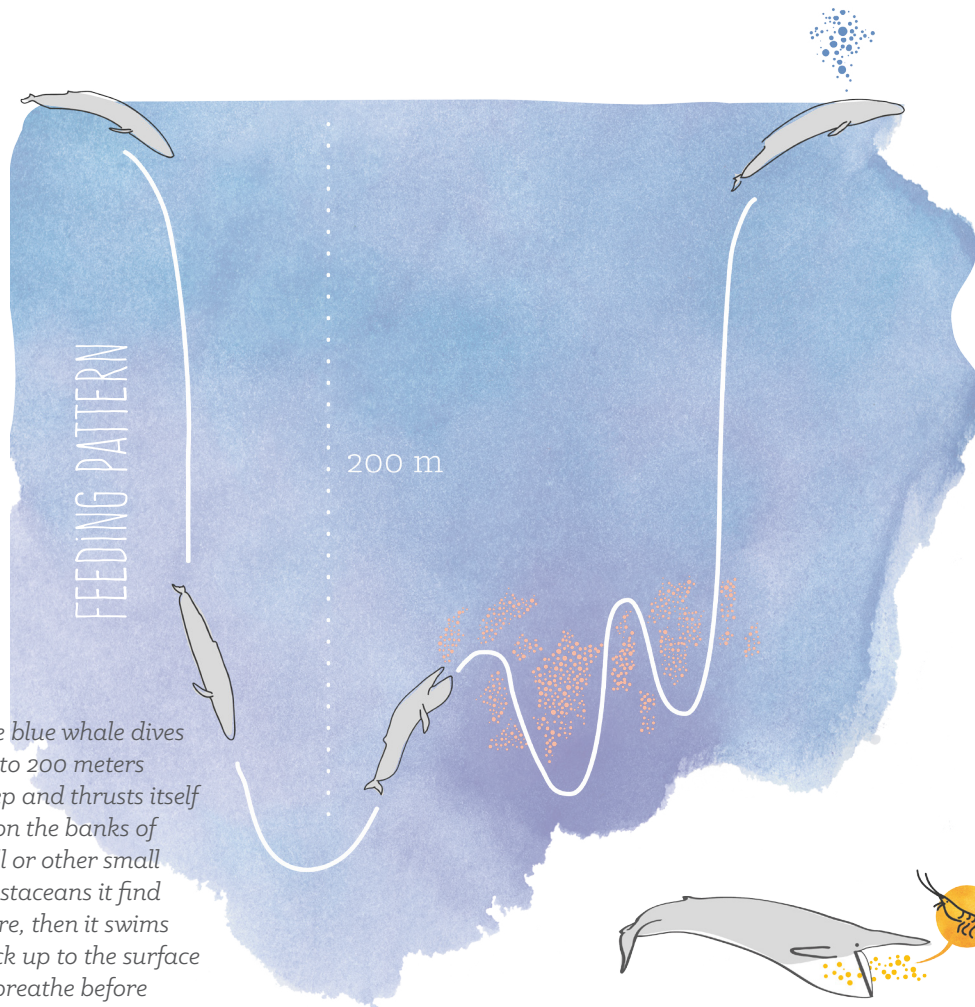
Dorsal fin: small (under 40 cm) and triangular, located at the beginning of the last quarter of the body.

Dive profile:

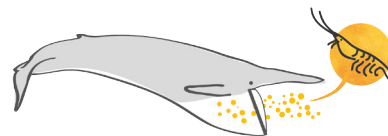


The dive profile will help you determine what species you are watching. Pay close attention to the size of the blow and the relative size of the whale's dorsal fin in relation to body size.

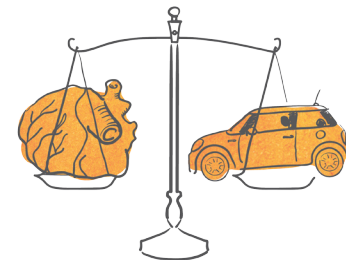
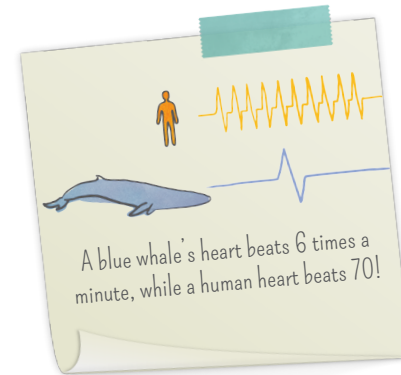
Pod size: from 3 to 5
 Population: a few hundred
 Threats: hunted to the brink of extinction
 Diet: krill or other crustaceans
 Conservation status: Endangered



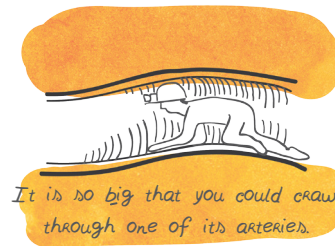
The blue whale dives up to 200 meters deep and thrusts itself upon the banks of krill or other small crustaceans it find there, then it swims back up to the surface to breathe before beginning again. This process is repeated time after time..



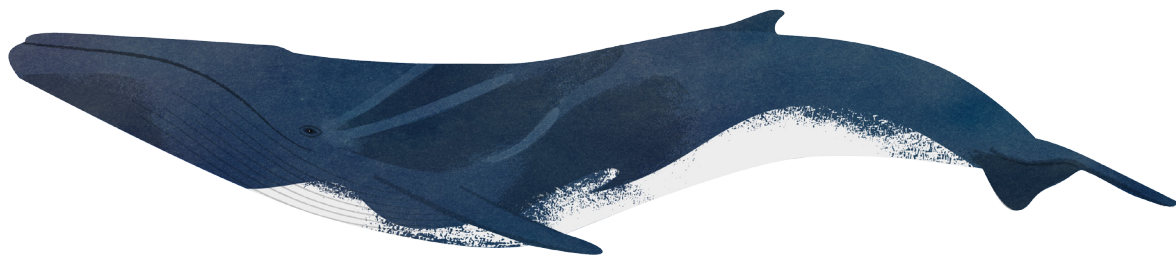
When it opens its mouth to feed, mobility decreases completely



ITS HEART IS AS HEAVY AND AS BIG AS A CAR THE SIZE OF A MINI COOPER!



Fin whale (*Balaenoptera physalus*) | FAMILY BALAENOPTERIDAE



Pod size: 1-3, on occasion from 1-15.
Population: 18,000 -20,000
Threats: nets, pollution, collision with ships
Diet: krill or other crustaceans, fish
Conservation status: Endangered

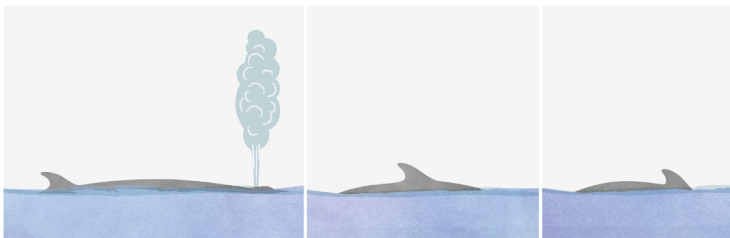


Appearance: Adults are between 18 and 25 m long, and the females are larger; the calves measure 6 to 6.5 meters. Color ranges from black to brown, and their entire lower region, including fins and belly, is white. The pigmentation on their head is irregular.

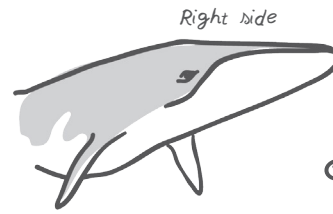
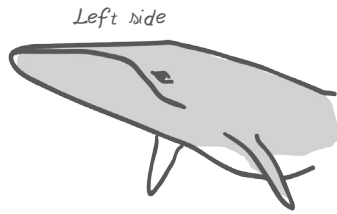


Dorsal fin: up to 61 cm. long, concave on the trailing edge and located towards the end of the third fourth of the body.

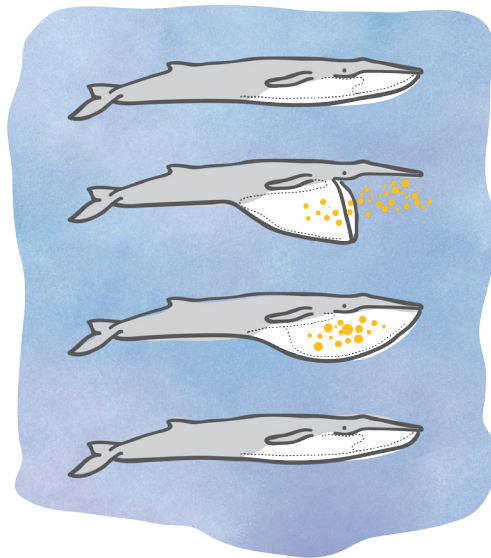
Dive profile:



DISTINGUISHING FEATURES



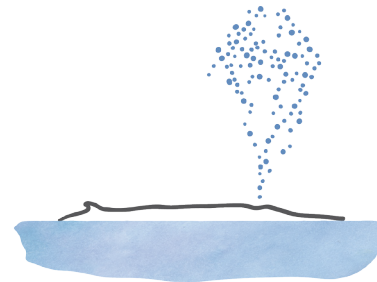
The fin whale's lower mandible or jaw is asymmetrically colored. One side is white the other is dark.



The fin whale, like the other whales in the Family Balaenopteridae, opens its mouth and expands its belly to take in as much food as possible.

They are able to expand their belly this way thanks to the furrows which allow their skin to stretch like an accordion.

In doing this the whale swallows a lot of water that is later expelled through its baleen.



Did you know that only air comes out of the spiracle (the blowhole in the whale's back)?

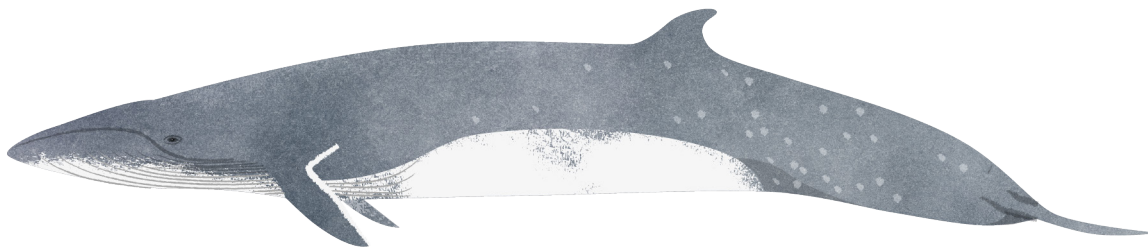
The water is expelled through the mouth where the baleen act as a strainer that leaves only the food on the inside.



The fin whale's blow can go as high as a 2 story house!

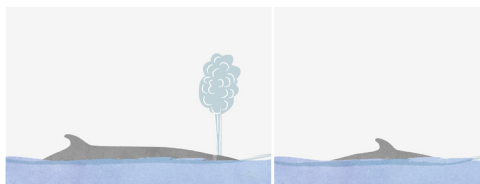


Sei whale (*Balaenoptera borealis*) | FAMILY BALAENOPTERIDAE



Appearance: males can measure up to 18, 5 m and the largest females 21 m; the calves measure from 4,4 to 4,8 m. Bluish black in color, commonly with lighter shaded scars on its back. The underside is white, excluding the pectoral and caudal fins.

Dive profile:



Dorsal fin: tall, pointed and concave at the trailing edge, measures from 50 to 80 cm, located at the beginning of the last third of the body. The dorsal fin and blow can be visible at the same time.

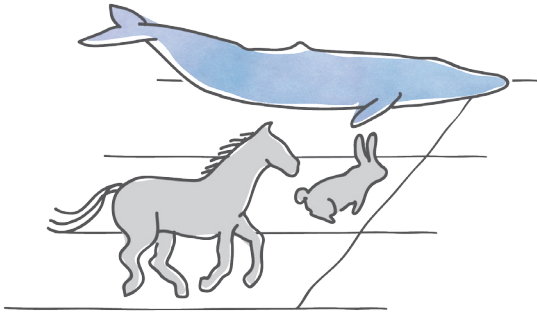
Pod size: from 2 to 5. In feeding areas up to 30 may gather.

Population: 40,000- 60,000

Threats: hunting and collisions with ships
Diet: krill or other crustaceans, fish, squid or octopus

Conservation status:
Endangered

THE SEI WHALE IS THE FASTEST OF ALL THE WHALES!



It can reach speeds of 70 km per hour! This is similar to the speeds reached by horses and hares.

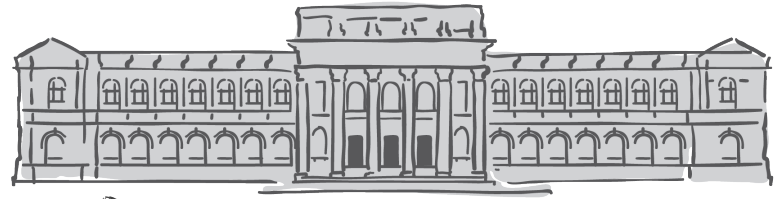


The whale's gestation period is from 11 to 12 months

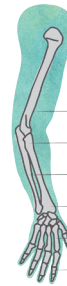
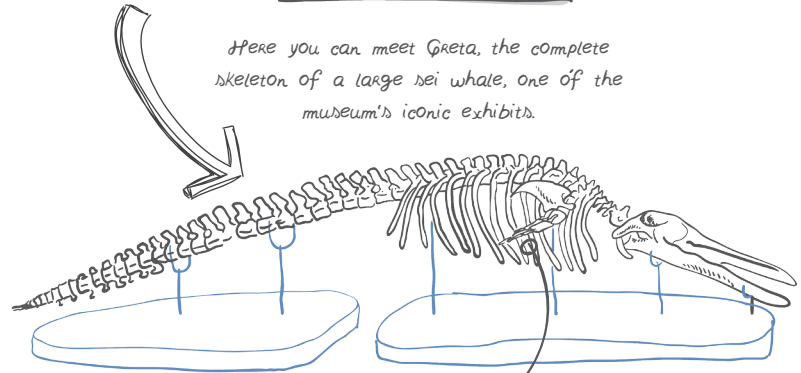


That's a whole year!

DO YOU KNOW ABOUT THE CHILEAN NATURAL HISTORY MUSEUM?

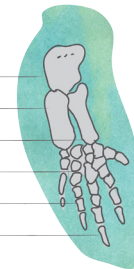


Here you can meet Greta, the complete skeleton of a large sei whale, one of the museum's iconic exhibits.



Human arm

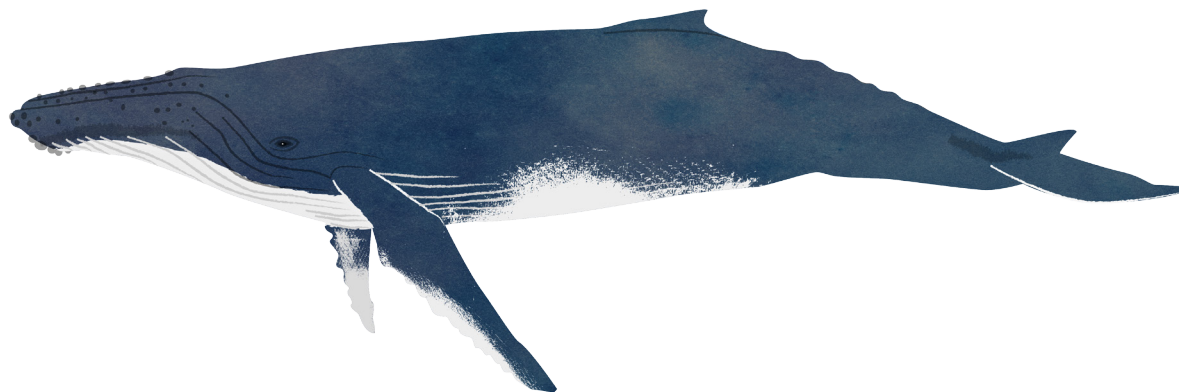
Humerus
Radius
Ulna
Carp
Metacarpals
Phalanges



Whale fin

The whale's fin shares a bone structures similar to that of a human.

Humpback whale (*Megaptera novaeangliae*) | FAMILY BALAENOPTERIDAE



Pod size: 1 -3 (on occasion up to 15)
 Population: 18,000-20,000
 Threats: nets, pollution, collision with ships
 Diet: krill or other crustaceans, fish
 Conservation status: Low risk



Appearance: 15 to 17 m long; the females are bigger than the males. Calves are 4 m long. Bright black above and white on the neck and belly. Presence of tubercles on different parts of the head.



Caudal fin: lower part partially white, each pattern is unique and differentiates one individual from the others.

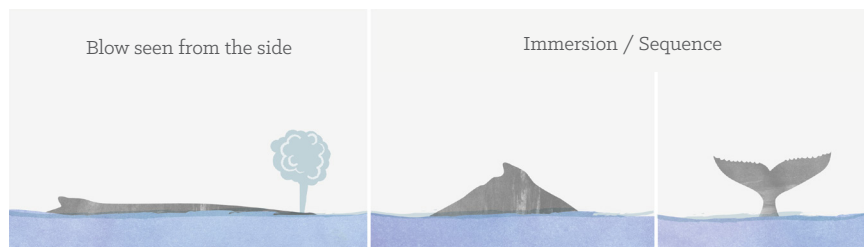


Dorsal fin: broad and non-prominent, with steps at the back and a hump at the front.



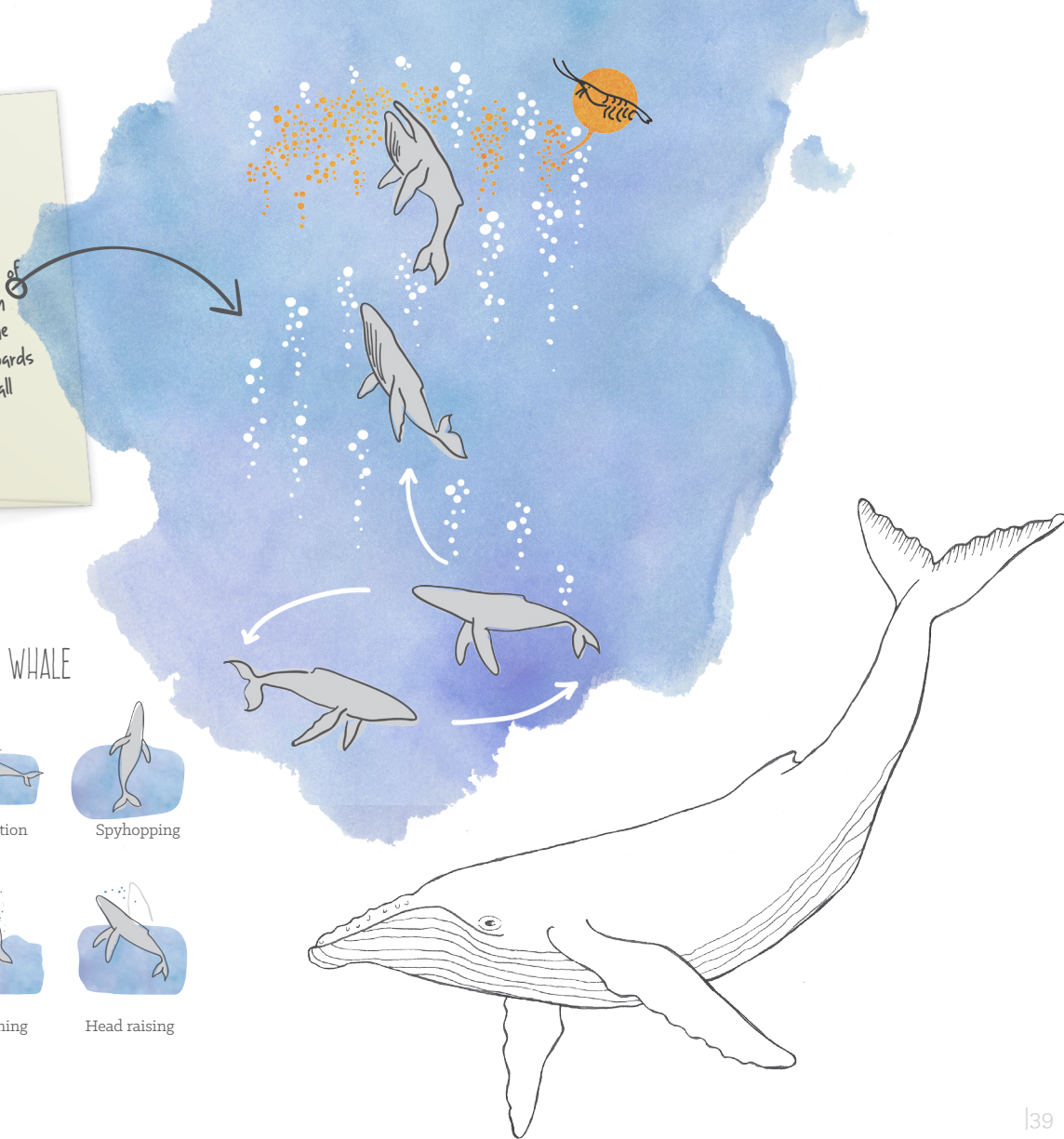
Pectoral fins: very long (one third body length), covered with partially white tubercles on the leading edge.

Dive profile:

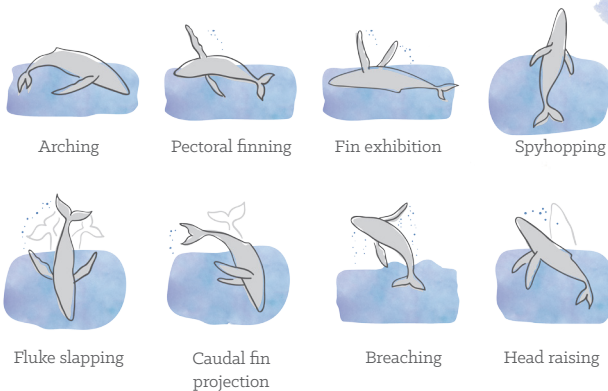


BUBBLE NET FEEDING!

Feeding humpback whales surround a school from beneath and expel air through their spiracles to form a net of bubbles that encloses the krill or fish and forces them to swim towards the surface. Then the whales swim upwards with their mouth open and swallow all of the food.



THE DANCE OF THE HUMPBAC WHALE



Minke whale (*Balaenoptera bonaerensis*) | FAMILY BALAENOPTERIDAE



Pod size: from 1 to 3; in feeding zones more than 2,000 individuals may come together.

Population: unknown

Threats: nets, hunting, pollution

Diet: krill or other crustaceans

Conservation status:

Data deficient

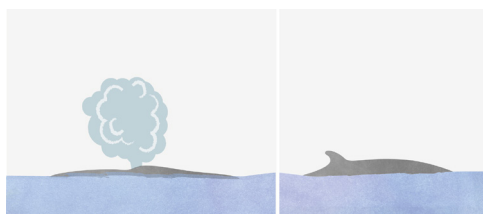


Appearance: the smallest of the Balaenopteridae (rorquals), measuring from 7 to 10 m. Calves range from 2.4 to 2.8 m. The females tend to be bigger than the males. Dark gray in color (dorsal region even darker) and white belly.

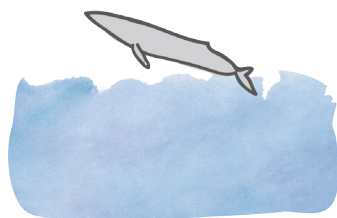


Dorsal fin: tall, pointed and concave at the trailing edge, located at the beginning of the final third of the body.

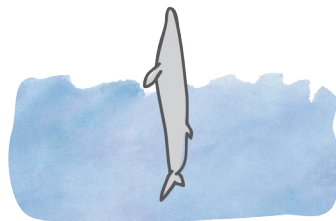
Dive profile:



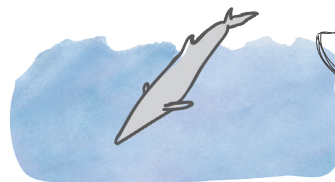
BEHAVIORS :



Breaching



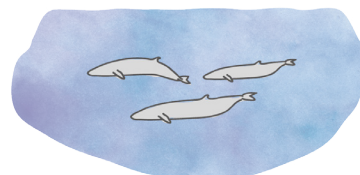
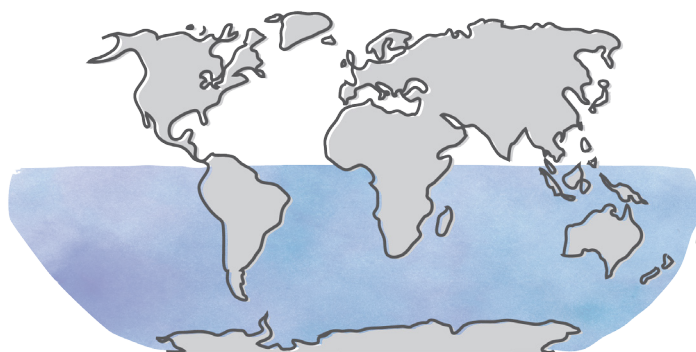
Spyhopping



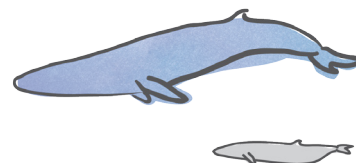
Fluke Slapping



YOU CAN FIND MINKE WHALES HERE



Live in groups of 1 to 3 individuals



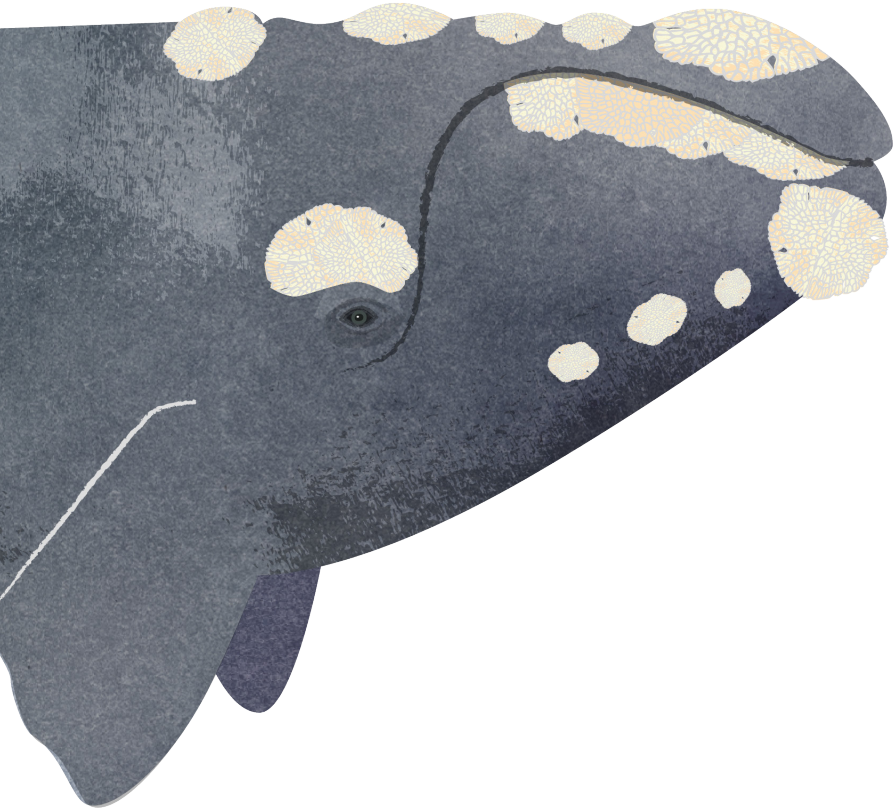
The minke whale is small compared to the blue whale



Even so, the minke whale weighs 10 tons!
The same as a small bus



FAMILY BALAENIDAE



This is the family of the right whales, which are characterized by having a very large head, curved face, smooth and black throat skin. Their common name of “Right whale” came about because they were considered to be the correct or right whales to hunt; so named by whalers because of the large amount of oil and baleen they provided.

Southern right whale (*Eubalaena australis*) | FAMILY BALAENIDAE



Pod size: 1-20
 Population: 6,000 - 7,000
 Sub-population of Chile and Peru: 50
 Threats: nets, habitat destruction
 Diet: krill or other crustaceans.
 Conservation status: Low risk (world population). Critically endangered (sub-population of Chile and Peru)



Appearance: from 11 to 18 m long. The males are bigger than the females. Calves range from 4.5 to 6 m in length. Dark pigmentation, between black and brown. No ventral furrows. Curved face and very large head, with cephalic calluses in different parts, unique to each individual.

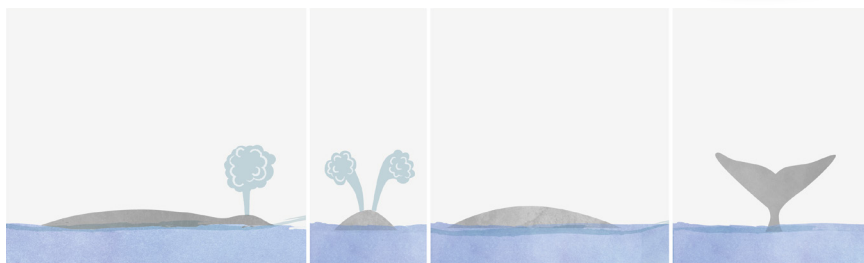


Dorsal fin: absent.



Pectoral fins: broad with concave trailing edges shaped like spatulas.

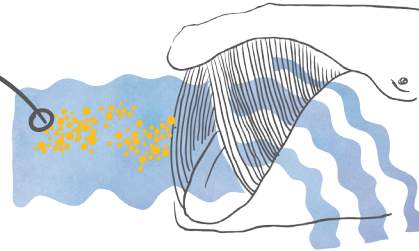
Dive profile:



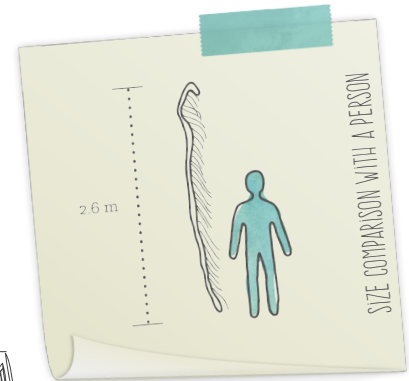
In Chile recreational right whale watching is only permitted from shore given the high degree of threat to the sub-populations of Chile and Peru.

HOW DO RIGHT WHALES EAT?

A RIGHT WHALE CAN EAT MORE THAN 300 KILOS OF KRILL IN AN HOUR!



- By swimming slowly with an open mouth.
- The food comes in with the water.
- The water is expelled with the tongue through the baleen, where the food is trapped.



Rather than teeth they have 460 keratin baleens (a tissue similar to that of human fingernails)



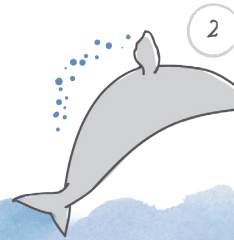
BEHAVIORS :



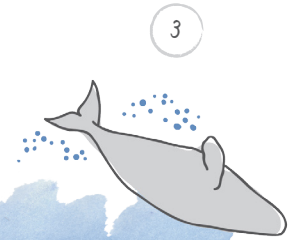
It is said that the southern right whale has the ability to sail with the wind. Apparently this behavior is a kind of game, where they put themselves into a vertical position with their head down and tail up facing the wind seeming to use it as a sail.



1
It swims at an oblique angle to the surface generating great force with its tail.



2
The spectacular fall happens either on one of the flanks or the back.



3
As it jumps it twists its body to the side.

SUBORDER ODONT

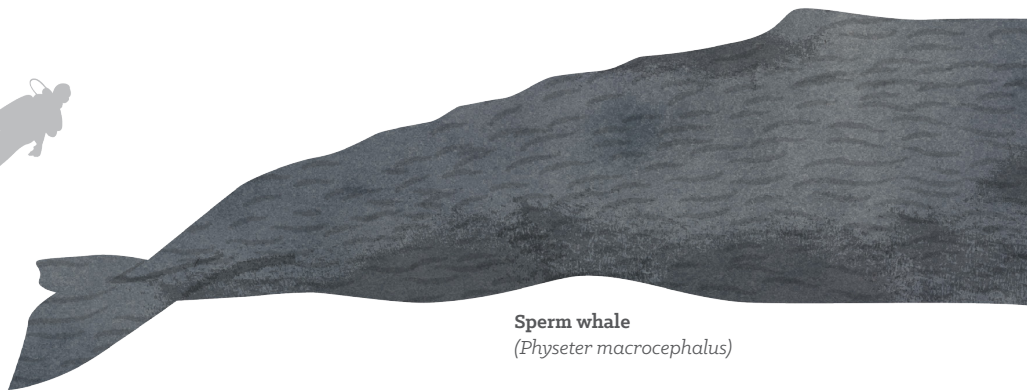
Bottlenose dolphin
(*Tursiops truncatus*)



Chilean dolphin
(*Cephalorynchus eutropia*)



Sperm whale
(*Physeter macrocephalus*)



OCETI



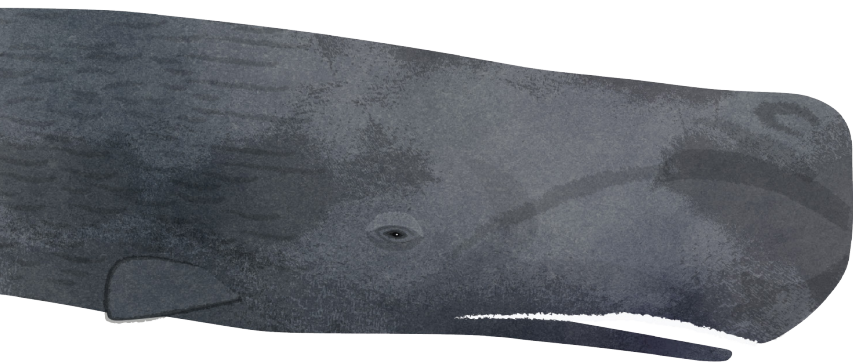
Burmeister's porpoise
(*Phocoena spinipinnis*)



Orca
(*Orcinus orca*)



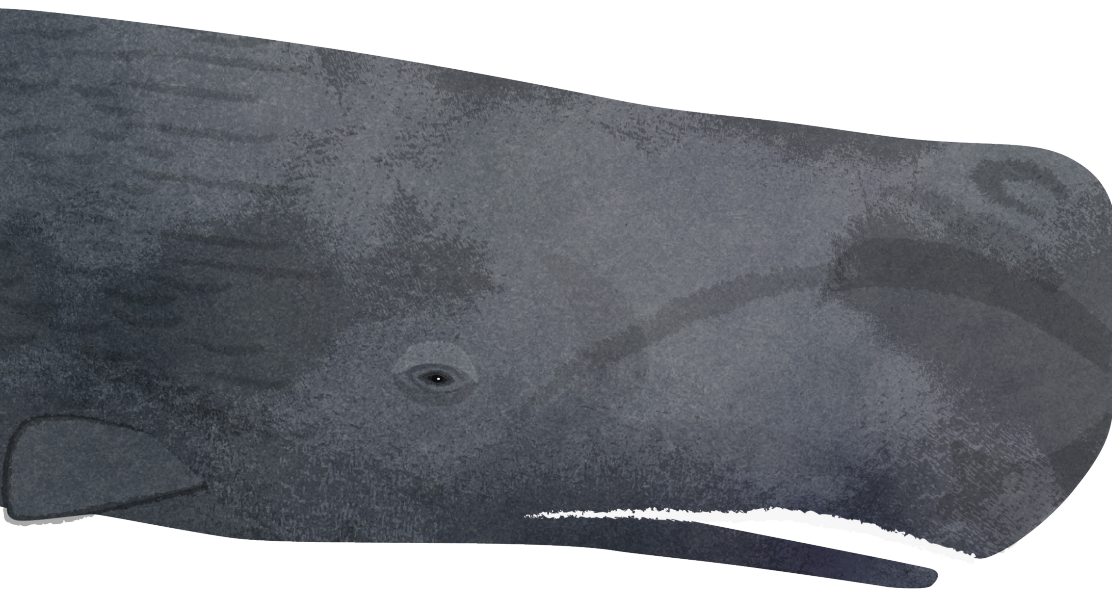
Peale's dolphin
(*Lagenorhynchus australis*)



These are all the cetaceans that have teeth, in different shapes and sizes, and sometimes even hidden under the gums. The species in this group have a single spiracle, i.e. one nostril. Sizes in this species vary from 1 to 18 meters.



FAMILY PHYSETERIDAE



This family comprises three species of sperm whales (sperm whale, pygmy sperm whale and dwarf sperm whale). The only species of this family that has been sighted near Melimoyu is the sperm whale, the largest of the toothed whales. Its spiracle is S-shaped, arranged longitudinally and offset to the left, causing its blow to emerge to the left at a 45° angle.

Sperm whale (*Physeter macrocephalus*) | FAMILY PHYSETERIDAE

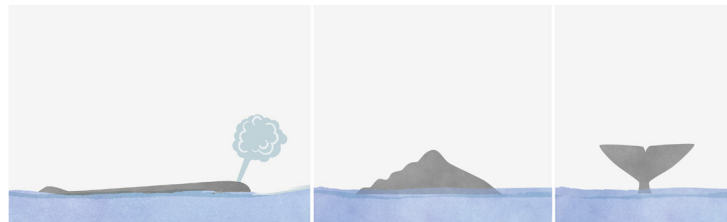
Pod size: 1 – 50 (on occasion reaches 150). They can travel together in large groups.
 Population: unknown
 Threats: nets, pollution
 Diet: squid, octopus, and fish
 Conservation status: Vulnerable



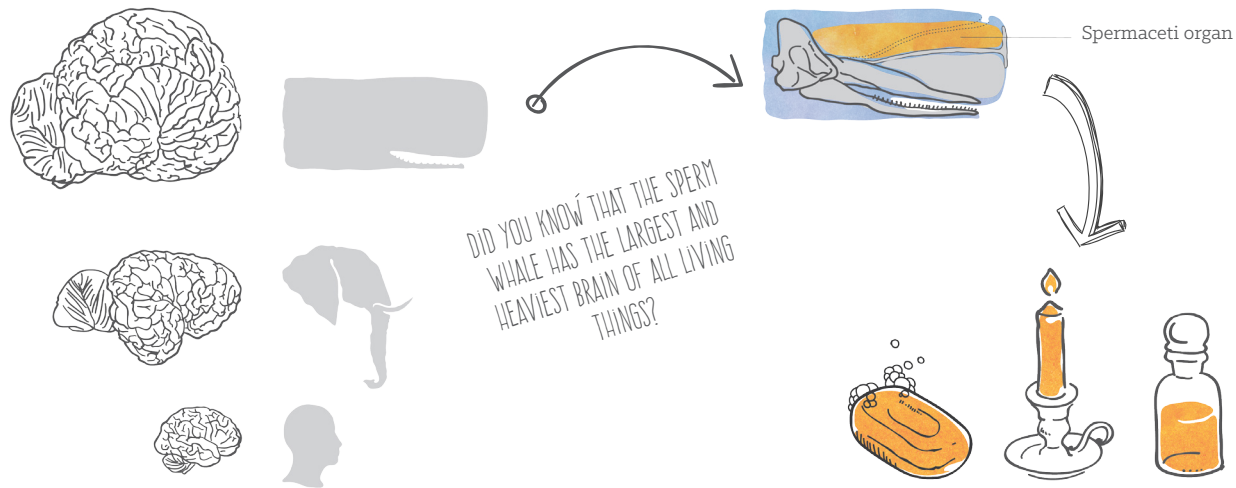
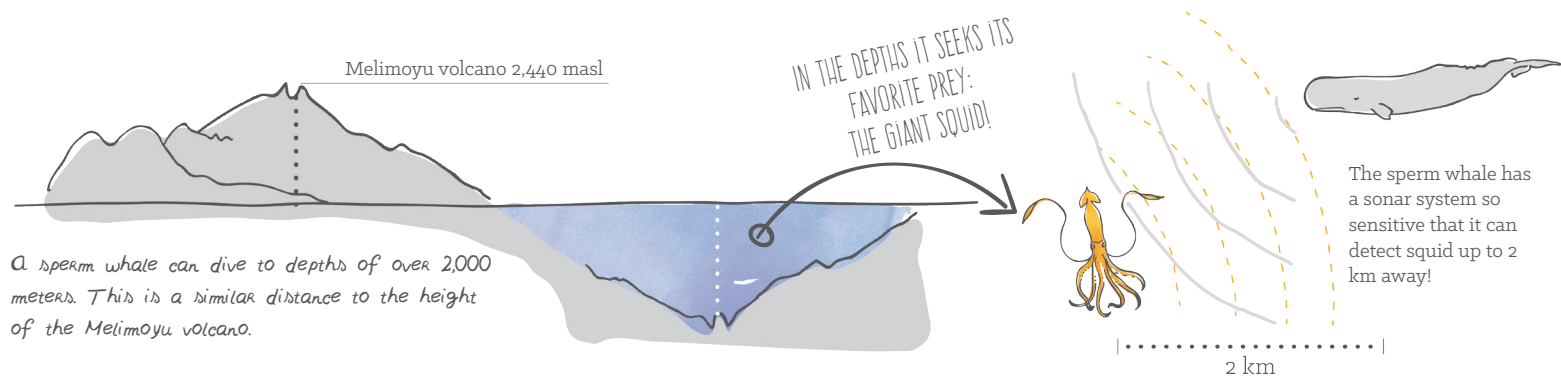
Appearance: between 12 and 18 m long, with the females being smaller; calves range from 3.5 to 4.5 m in length. Pigmentation varies from dark gray to brown, and the skin on the last two thirds of the body usually has a wrinkled appearance. The head is quadrangular and occupies one third of the whale's total length, making it the largest head in the animal kingdom.

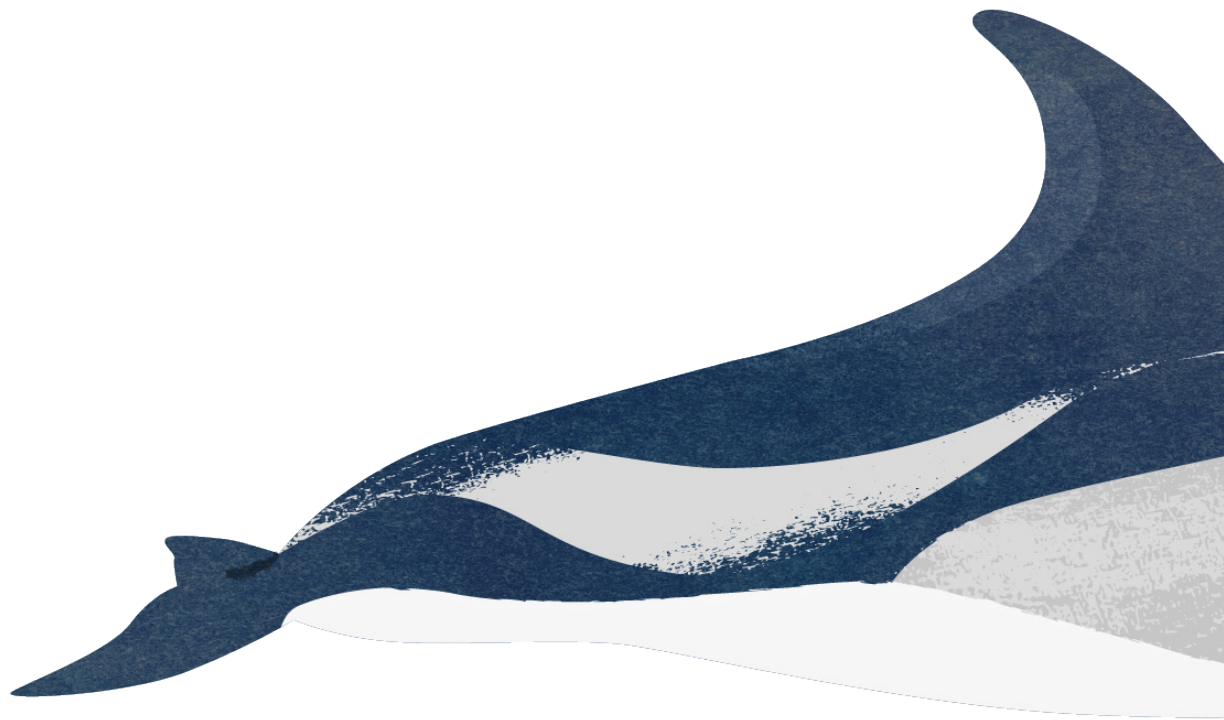


Caudal fin: triangular with a well-defined "V" shaped notch.

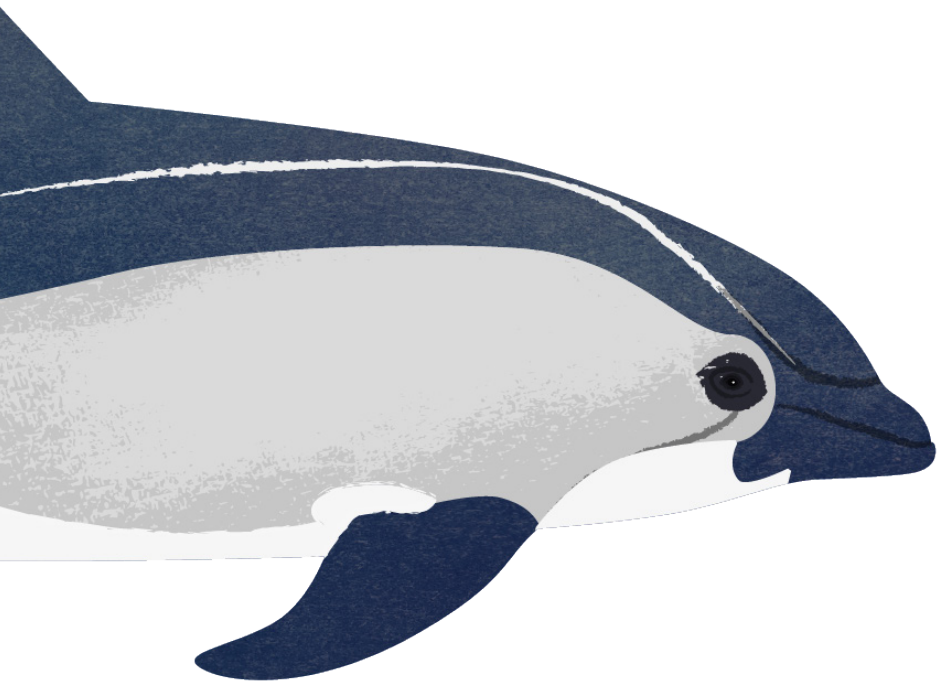
Dive profile:

The sperm whale's dives can last up to 1 hour.





FAMILY DELPHINIDAE



This is the most diverse and numerous family of cetacean, and comprises the dolphins, pilot whales and orcas. They differ from the Ziphiidae [beaked whales] (another family of cetaceans) because of a notch on the trailing edge of their caudal fin and their conical teeth.

Peale's dolphin (*Lagenorhynchus australis*) | FAMILY DELPHINIDAE



Appearance: adults measure up to 2,20 m. Their skin is dark with pale gray stripes on the sides of the caudal peduncle, separated from the ventral zone by a thick, dark line. In the ventral region and behind the pectoral fins there are circular white patches. They have a dark line running from the pectoral fins to the jaw. Their entire face is black. Their rostrum is short and separated from the forehead by a furrow.

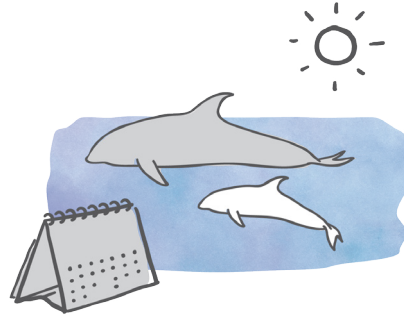


Dorsal fin: prominent, concave, with dark grayish pigmentation and lighter in the back. The calves are sighted in spring-summer. They prefer the underwater kelp forests.

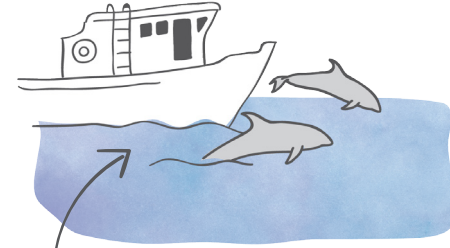
Pod size: from 3 to 20.
Population: unknown
Threats: nets, hunting.
Diet: krill or other crustaceans, fish, squid or octopus.
Conservation status:
Data deficient



Peale's dolphin is endemic to South America

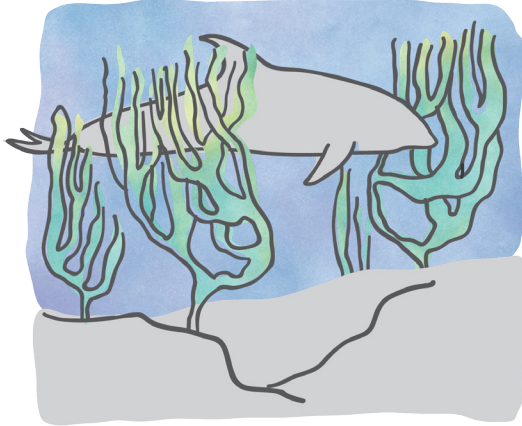


The calves are sighted in spring-summer

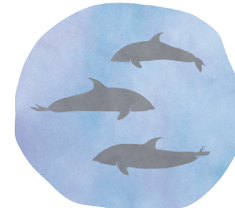


THEY ARE OFTEN SEEN PLAYING IN THE BOW WAKE OF BOATS

They prefer the underwater kelp forests



Feeding



Socialization



Appearance: their size varies, ranging from 1.9 to 4 m in length. The calves can also vary widely in size, measuring anywhere from 85 cm. to 1.3 m. Pigmentation varies greatly, but generally is grayish blue on the back and white in the ventral zone. Their rostrum is short and separated from the forehead by a furrow.



Dorsal fin: centrally located along the body; gray in color and strongly concave trailing edge.

Pod size: 1-10 along the coast / 1 -25 offshore. Groups of up to 500 individuals can be seen when offshore.

Population: unknown

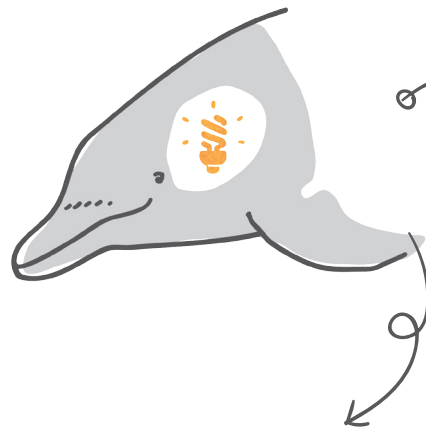
Threats: nets, pollution, hunting, habitat destruction.

Diet: fish, squid or octopus (krill or other crustaceans).

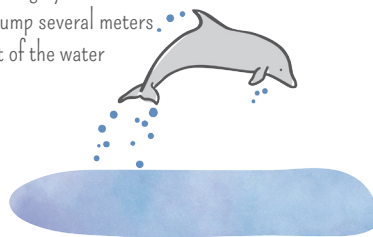
Conservation status:

Low risk

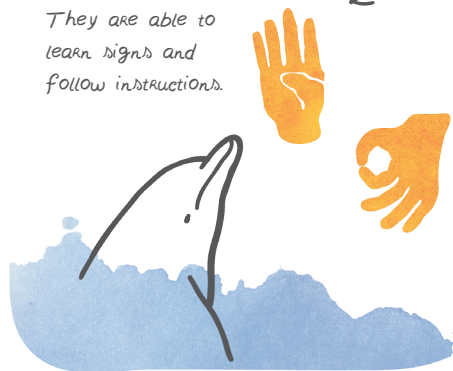
DID YOU KNOW THAT THE BOTTLENOSE DOLPHIN IS CONSIDERED BY MANY TO BE THE MOST INTELLIGENT ANIMAL AFTER HUMANS?



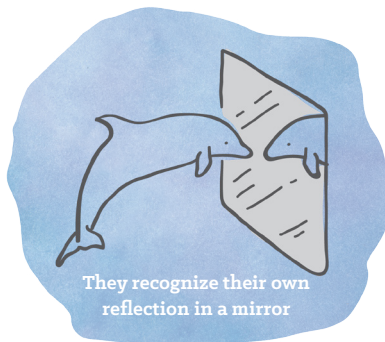
They are highly acrobatic and can jump several meters out of the water



They are able to learn signs and follow instructions.



They recognize their own reflection in a mirror



Chilean dolphin (*Cephalorynchus eutropia*) | FAMILY DELPHINIDAE



Appearance: one of the smaller cetaceans; adults measure between 1.2 and 1.7 m. Their pigmentation is dark gray, slightly lighter on the melon (upper part of the head). They have lips, a white throat and abdominal area; semicircular white spot under fins. The rostrum is not clearly distinguished as there is no furrow separating it from the forehead.



Dorsal fin: rounded.

The Chilean dolphin is the only cetacean endemic to our country.

Pod size: from 2 to 10.

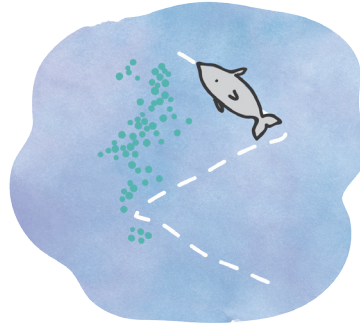
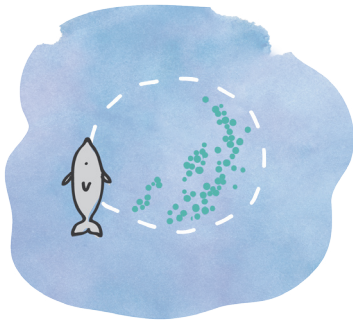
Population: unknown

Threats: nets, hunting.

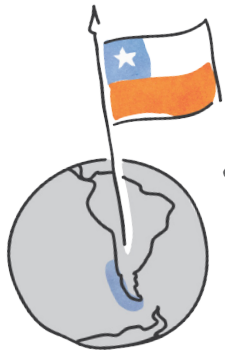
Diet: fish, squid or octopus, krill or other crustaceans.

Conservation status: Almost endangered

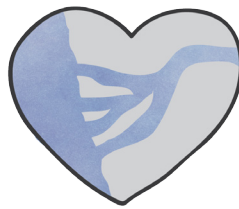
HOW CHILEAN DOLPHINS FEED?



They move in circles or zig-zags to “herd” their food

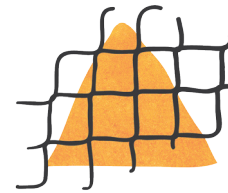


The Chilean dolphin is endemic! That means that you can only find it in Chile.



They frequent the mouths of rivers and channels.

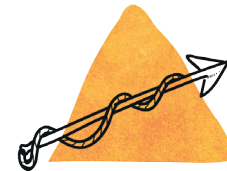
THREATS



Nets

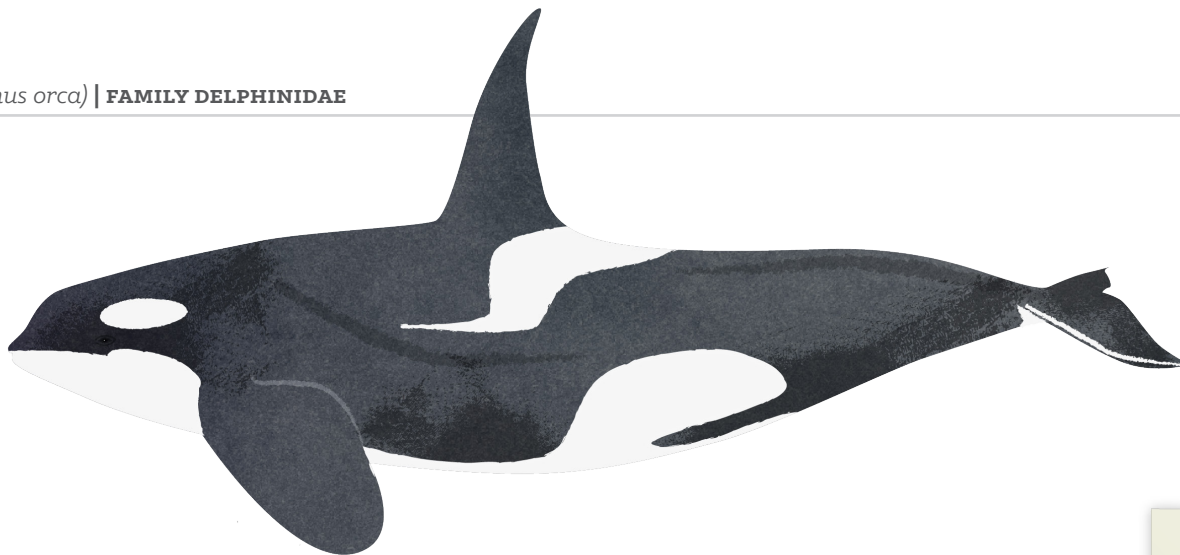


Shipping traffic



Hunting

Orca (*Orcinus orca*) | **FAMILY DELPHINIDAE**



Appearance: they are the largest member of the dolphin family, the males can measure up to 9 m, and the females 6 m. The calves' length varies from 2 to 2.15 m. Their overall color is black with three characteristic white areas: an oval behind and above each eye, another from below the mandible to the anal orifice, and the third under the caudal fin. They also have a yellowish mark behind the dorsal fin. They do not have a facial furrow.

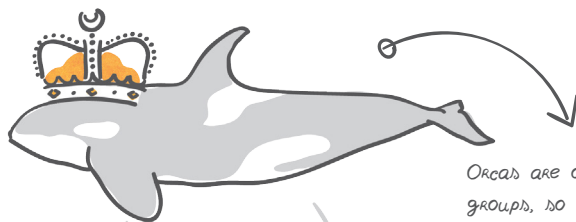


Dorsal fin: the male has a very distinctive dorsal fin; pointed, triangular, taller than it is wide, located in the middle of the body. In the case of females and calves it is concave and smaller.

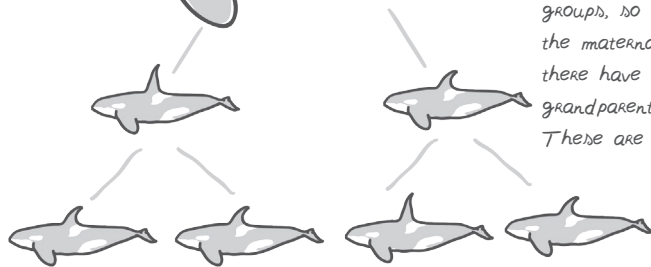


Yes! The orcas, or so called “killer whales” belong to the dolphin family. Remember that the whales don’t have teeth

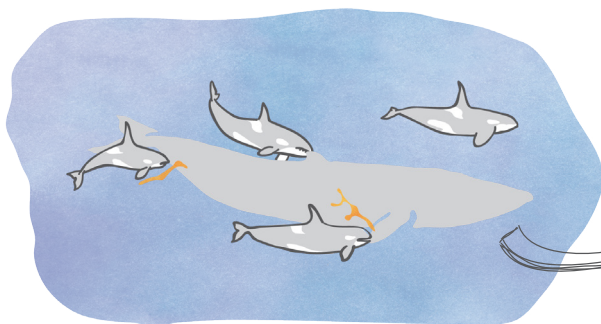
Pod size: from 3 to 50
Population: unknown
Threats: hunting, habitat destruction.
Diet: fish, mammals, squid or octopus
Conservation status: Data deficient



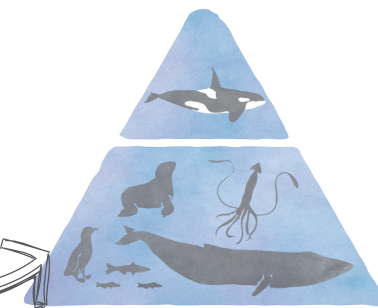
Orcas are organized into matrilineal groups, so their progeny are defined by the maternal lineage. In other words, there have families like ours with grandparents, children and grandchildren. These are called "PODS".



THEY LIVE IN THE MOST STABLE ORGANIZATION OF ALL NONHUMAN MAMMALS, AND ARE CAPABLE OF HAVING 4 GENERATIONS ALIVE AT ONCE!

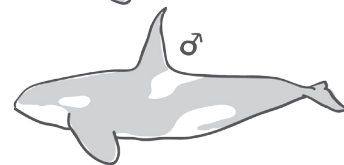
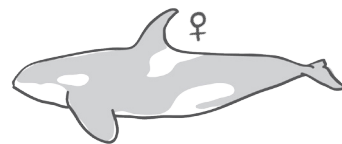


They attack large mammals in groups.

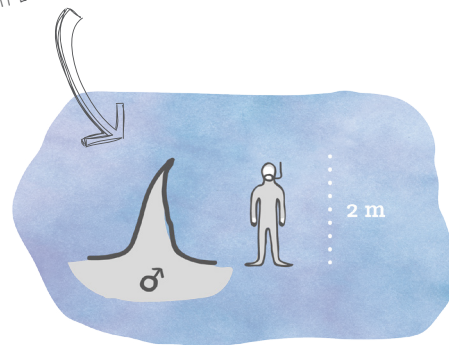


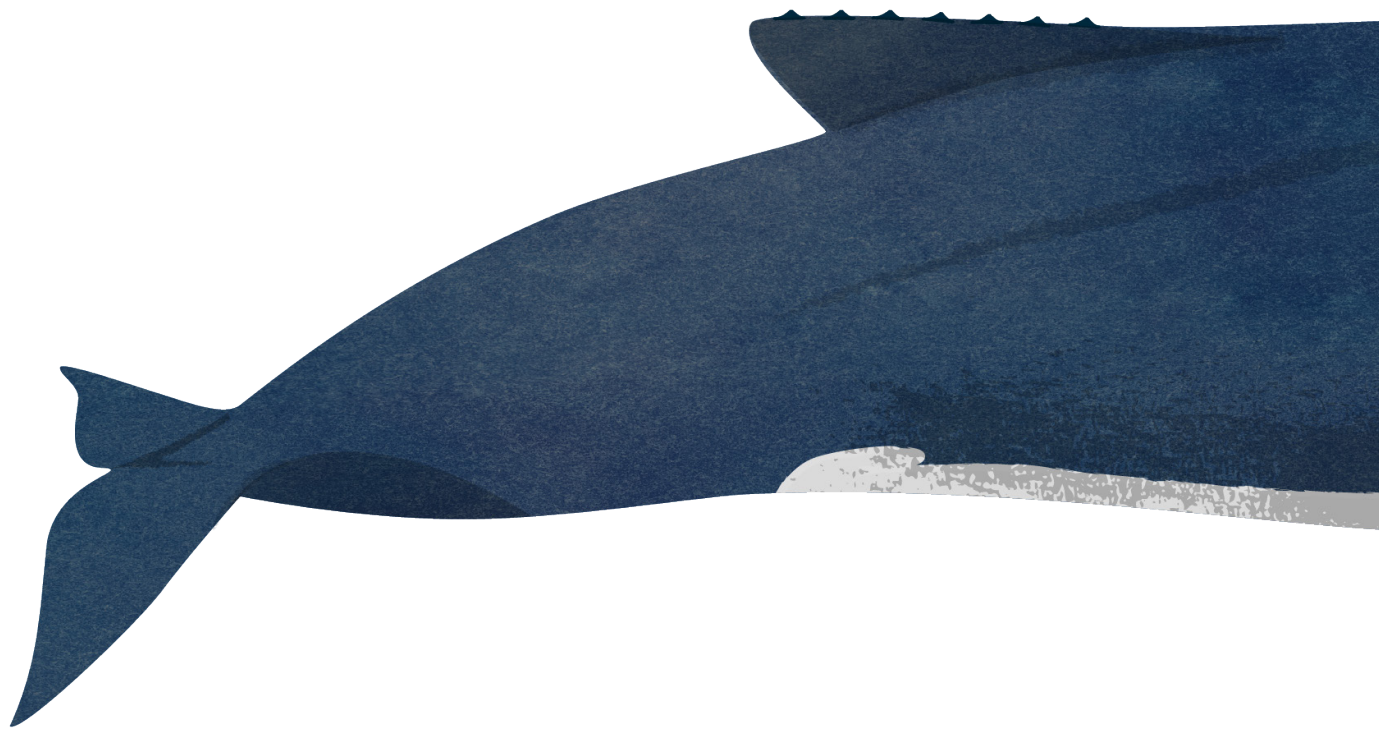
The orca is a "super predator."
It has no natural enemies

Males and females can be told apart by their dorsal fin.

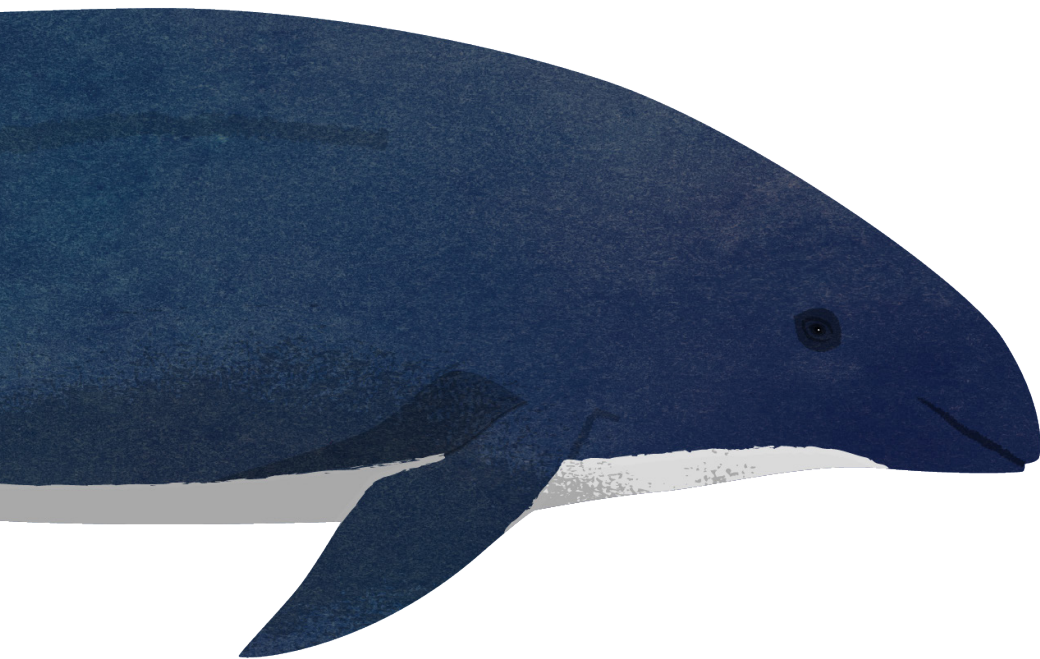


DID YOU KNOW THAT A MALE'S FIN CAN BE UP TO 2 M LONG?

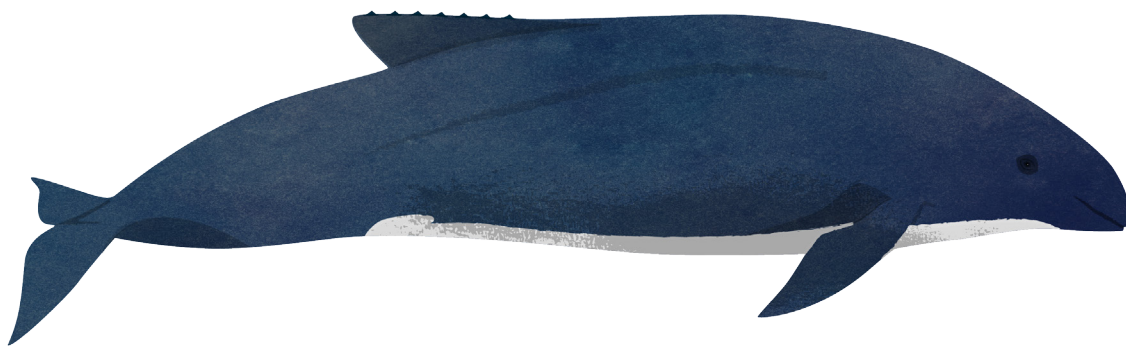




FAMILY PHOCOENIDAE



This is the family of what are commonly called porpoises. Their main features are flattened teeth and, like the cetaceans of the Family Delphinidae, they have a notch at the back of their caudal fin. The only species from this family that has been recorded in the Melimoyu area is the Burmeister's porpoise.



Appearance: the adults measure between 1.4 and 2 m, the calves about 50 cm. Their dorsal pigmentation is black or dark gray; the belly is lighter in color, and may have a white longitudinal line. The rostrum is not clearly distinguished, as there is no furrow separating it from the forehead.



Dorsal fin: located on the back third of the body, it is their most distinguishing feature; it points rearwards with a convex back edge. The males have a row of “thorns” on the leading edge of their fins, which is why they are also known as thorny porpoises.

Pod size: from 1 to 12

Population: unknown

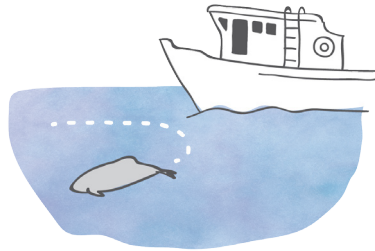
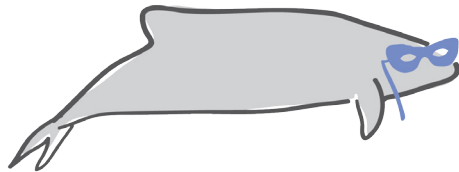
Threats: nets, pollution, hunting, habitat destruction.

Diet: fish, squid or octopus, krill and other crustaceans.

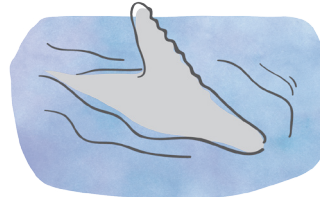
Conservation status:

Data deficient

THEY ARE VERY SHY AND
DIFFICULT TO SIGHT



*These porpoises avoid
human contact.*



*They hardly disturb the
water 's surface when they
come up to breathe.*



*They are believed to approach
the coast at night.*

DESCRIBED IN 1865 BY
GERMAN SCIENTIST HERMANN
BURMEISTER



*Spade-shaped teeth,
unlike the dolphins
cone-shaped teeth.*

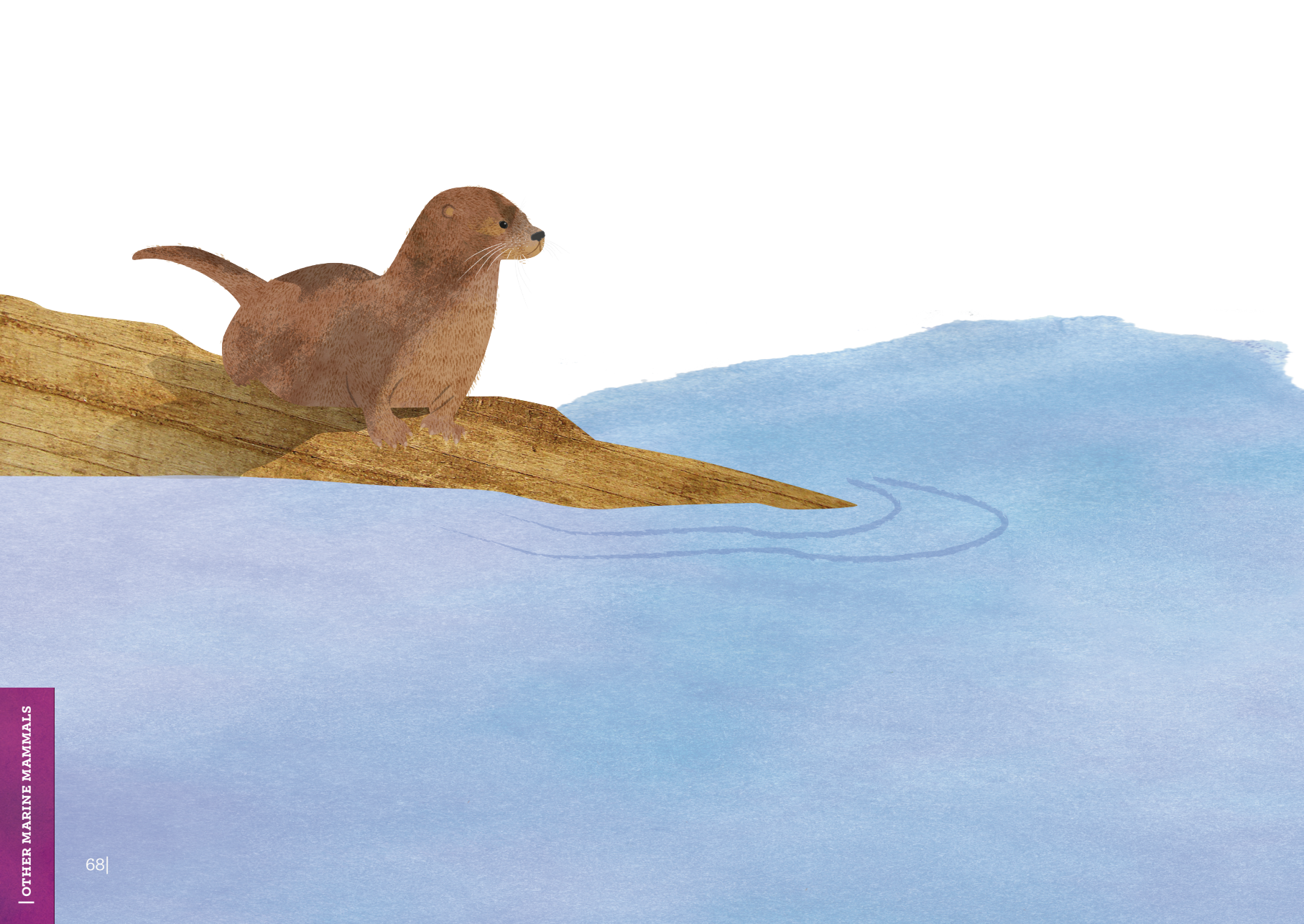
OTHER MARINE M



AMMALS

In addition to the cetaceans, there are “other marine mammals” that inhabit the environs of Melimoyu. Although these creatures are dependent on the aquatic environment for survival, they have adapted to it to a lesser extent than the cetaceans, and they must spend at least a part of their day out of water, whether for sleeping, raising offspring or mating.





FAMILY MUSTELIDAE

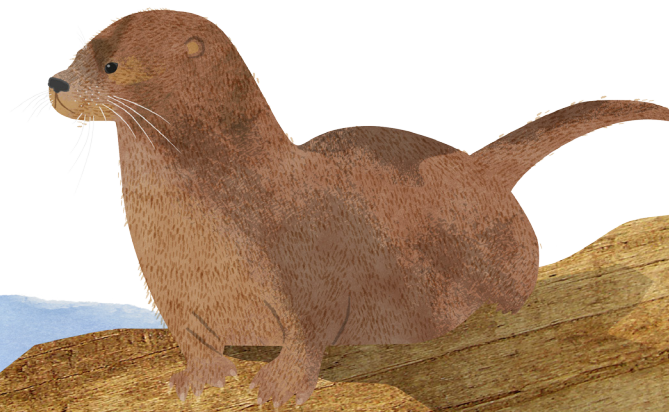
This is the otter family; both the terrestrial and freshwater and marine varieties.

Otters inhabit every continent, and there are over fifty species of them. Most are carnivorous or carrion eaters. There is a presence of two species in the vicinity of Melimoyu, the huillín and the chungungo, and both are in danger of extinction.





Appearance: medium body, up to 110 cm. in length, plus 40 cm of tail. Their fur is brownish black and the belly is beige.

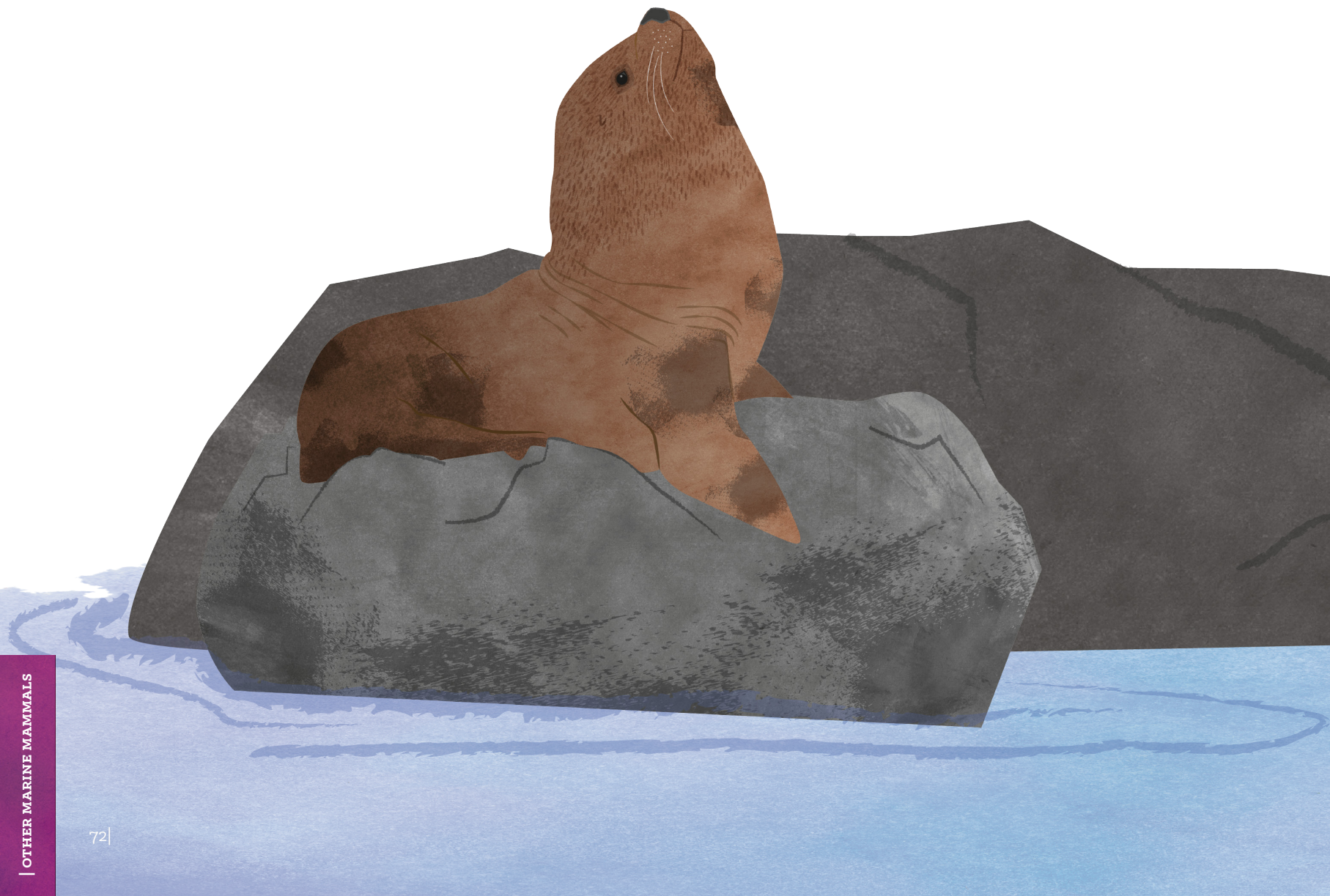




Appearance: approximately 70-80 cm long, plus another 30 cm for the tail; weight about 5 kg. They are the smallest species of the *Lontra* genus. Their fur is dark brown.

To differentiate the chungungo from the huillín, you need to look at its nose. The top of the chungungo's nose is flat, while that of the huillín is shaped like an inverted "V." Another difference is that the huillín usually inhabits rivers and fjords, while the chungungo frequents coastal areas that are more exposed to waves.





FAMILY OTARIIDAE



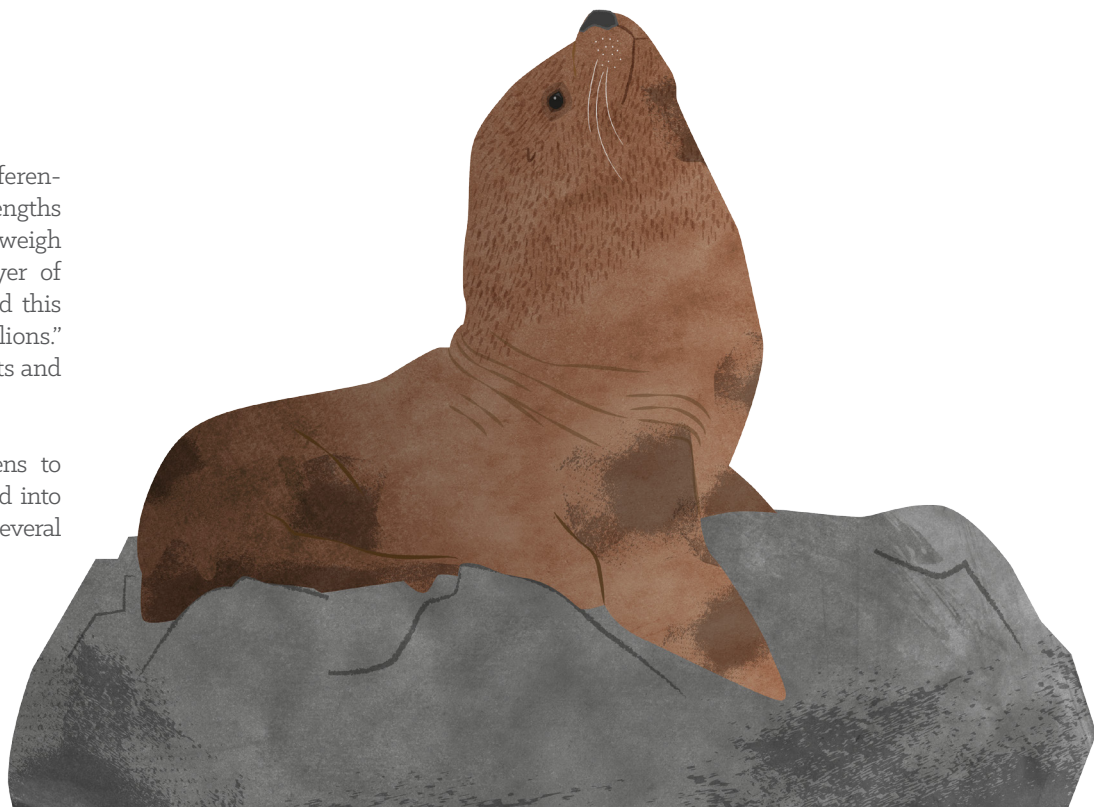
This is the sea lion family. They are different than seals (Family Phocidae) because they have visible ears and the ability to walk on land. Their hind extremities face forward and are functional for movement on land, although they are better suited for swimming.

The species that can be found around Melimoyu are the South American sea lion and the South American fur seal, which differ physically in size, fur color and shape mainly.



Appearance: adult males are clearly differentiated from females by size, reaching lengths of up to 3.5 m, and at 300 kg males weigh twice as much. They also have a layer of reddish brown hair on their necks, and this “mane” is the reason they are called “sea lions.” In general, they are dark brown as adults and black when young.

They live in colonies ranging from tens to hundreds of individuals that are grouped into harems composed of a dominant male, several females and a few juveniles.





Appearance: males reach 2 m in length and weigh up to 200 kg, while females can be 1.50 m long, at most, and will weigh no more than 60 kg. The predominant skin color is leaden gray to pearl gray. Females may have a reddish-gray coloring on their abdomens.

The males have longer hair on the back of their necks and heads which forms a kind of “crest,” although it is not like the South American sea lion’s mane.

Their snouts are pointy compared to those of the South American sea lion.



GLOSSARY

Albino: an individual with a congenital absence of pigmentation, so the skin, hair, iris, feathers, flowers or other features are whitish in color and thus unlike the colors native to their species, variety or race.

Amphibians: variable temperature aquatic vertebrate which breathes through gills during early life stages and breathes through lungs as adults.

Asymmetrical: lacking an exact correspondence in the regular arrangement of parts or points of a body or figure in relation to a center, an axis or a plane.

Bodily: belonging or relative to the body.
Bone structures: the rigid structures primarily composed of calcium that make up the skeleton of vertebrate animals.

Buoyancy: the ability of a body to float.

Carnivore: an animal whose main food source is animals of another species.

Changos: Amerindian people who inhabited the northern coasts of Chile.

Concave: curved inward like the inside of a bowl.

Conservation status: a measure of the probability that a species will continue to exist in the present or in the near future, not only in view of the current size of its population but also of the trend over time, the existence of predators or other threats, the expected changes in its habitat, etc. The 7 categories are: Least concern, Near threatened, Vulnerable, Endangered, Critically endangered, Extinct in the wild, and Extinct.

Convex: curved outwards, like the outside of a bowl.

Crustaceans: members of the arthropod groups, having a variable number of appendages, two pairs of antennae, body covered by a shell which is usually calcified and gill respiration.

Dominant: that excels, prevails or is superior among others of its order and class.

Dorsal: belonging or relative to the back or spine.

Dump sites: places where something is deposited or dumped

Ecosystem: a biological system consisting of a community of living beings and the natural environment in which they live.

Endemic: native and exclusively confined to certain localities or regions.

Equivalent: that a thing or person is equal to another in estimation, value, power or effectiveness.

Extremities: extreme or last part of something, such as the heads, feet, hands and tails of animals.

Family: one of the subdivisions of the biological classification, constituted by several natural genera that share a large number of common features.

Flanks: each of the two lateral parts of a body viewed from the front; for example, the right flank or the left flank.

Flow: amount of a fluid (water) that flows in a place per unit time.

Folds: creases, a kind of furrow or unevenness that happens in any part of a flexible cloth or fabric that is no longer smooth or extended.

Freshwater: belonging to or relating to fresh water and, in particular, to the organisms living in it.

Fur: mammal hair or wool.

Genus: taxon that groups species that share certain features.

Gestation: pregnancy; the process of being carried in the womb.

Gulf: a deep inlet of the sea surrounded by land.

Harem: a group of females living with a single male.

Immersion: act of introducing something into a liquid.

Interdigital: that is between the fingers.

Jurisdiction: power or authority that a person or body has to govern.

Krill: part of the Euphausiacea order, this is the name given to the species of small crustaceans, very similar to shrimp. They feed on phytoplankton and zooplankton and are food for other marine species such as fish, birds, penguins, whales and others.

Length: the largest distance of the 3 main dimensions of a body. For example: the distance between the rostrum and the fluke of a whale.

Lethal: deadly.

Matrilineal: said of a social organization. Means that it is based on the dominance of the female line of breeding.

Maxillary: pertaining to or relating to the jawbones or mandible.

Melimoyu: from the Mapudungün (language of the Mapuche native peoples) meaning “four teats.” It is a stratovolcano with a burnt caldera, and lies 40 km NW of Port Puyuhuapi, in the Cisnes commune of the Aysén Region of Chile.

Membrane: tissue or aggregation of tissues which together have a laminar structure and a soft consistency.

Migrations: Migrations are periodic and active moves from one habitat to another. Migrations are made by all different kinds of animals including birds, invertebrates, fish, amphibians, reptiles and mammals. The length of the migrations varies by species.

Natural Monuments: Regions, objects or living species of animals or plants of aesthetic interest or historical or scientific value that are granted absolute protection. Natural Monuments are created in order to preserve a specific object or a particular species of flora or fauna by declaring a region, an object or an isolated species to be a natural monument, and to therefor be protected from any purpose other than duly authorized scientific research or government inspections (Decree 531/1967).

Oral: relating to the mouth.

Outlet: a place where a river, a canal, etc. drains into another of the same or into the sea or a lake.

Pancoras: the common name for a group of the Family Aeglididae endemic to South America. They are frequent in sloped rivers, and are similar to small crabs; they are the dietary basis of freshwater fish and herons.

Pattern: a model that serves as a sample to be repeated.

Pectoral: pertaining to the chest.

Pictographs: “Picto” from the Latin adjective

“pinctus” which can be translated as “painted.” “graphs” comes from the Greek root “grafía,” which is the quality of carving or writing. They are rock art intended to communicate stories or places.

Pigmentation: coloration on the skin and other tissues.

Population: a group of individuals from the same species occupying a certain geographical area.

Prominent: something that rises or stands out above whatever is in its vicinity or surroundings.

Scavenger: feeds on dead animals, often without having participated in the kill.

Shipwreck: when a boat sinks or is destroyed.

Sight (v): to spot something visually at a distance.

Sonar: an electronic acoustical device that detects the presence and location of submerged objects by means of sound waves produced by the object itself or from the wave's reflection from the object.

Sovereignty: the supreme political power belonging to an independent State.

Specimen: sample, model, or exemplar, usually with very well defined features of the species.

Thermal insulation: material that provides a barrier to the passage of heat between two media.

Sail (v): a boat leaving the place where it was anchored or moored.

Tributary: a secondary stream or river that flows or empties into a main river.

Tubercles: a protuberance appearing on the exoskeleton or the surface of various animals.

Ventral: belonging or relative to the belly.

Vessel: vehicle capable of moving through the water propelled by oar, sail or a motor.

BIBLIOGRAPHY

ACOREMA, s.a. ¿Por qué no delfines en cautiverio?. (Why not dolphins in captivity?) Áreas Costeras y Recursos Marinos (Coastal Areas and Marine Resources) (ACOREMA), Pisco, Peru.

Andriolo A. , Zerbini A., Moreira S., Pizzorno J., Danillewicz d., Maia Y., Mamede N., de Castro F. & Clapham P. (2014). What do humpback whales *Megaptera novaeangliae* (Cetartiodactyla: Balaenopteridae) pairs do after tagging?. *Zoología (Curitiba)*. vol.31, n.2, pp. 105-113

Canto, J., Yáñez, J. 2000. Order Cetaceans. 127-151. In: *Mammals of Chile*. Muñoz Pedrero, A. y Yáñez, J.

CEA Ediciones. Santiago, Chile. 463 pages.

Carwardine, M. 2002. Whales, dolphin and porpoises. Second Edition. Smithsonian Handbooks. Dorling Kindersley Books, New York, USA. 256 pages.

Cressey, D. 2015. World's whaling slaughter tallied: Commercial hunting wiped out almost three million animals last century. *Nature, International Journal of Science*, Vol. 519, pp. 140–141.

Day, T. 2006. Whale watcher, a global guide to watching whales, dolphins and porpoises in

the wild. Firefly books Ltd, Richmond Hill, ON, Canada. 160 pages.

Decree 531/1967. Decree No. 531.- Santiago, 23 August, 1967. Convention for the Protection of the Flora, Fauna and the Natural Scenic Beauty of America, signed in Washington on October 12, 1940.

Discovery of Sound in the Sea, 2015. Webpage: <http://www.dosits.org/resources/all/decisionmakers/decisiontutorial1/>

Espinosa-Miranda C. 2014. “A decade of research and community integration for the conservation of the small cetaceans of southern Chiloé, Chile,” at the XXXIV International Meeting for the Study of Marine Mammals SOMEMMA, Querétaro, Mexico.

Espinoza, C. 2015. Pequeños delfines del sur de Chile (Small dolphins of Southern Chile). Powerpoint presentation, Yagu Pacha.

Fernández-Casado, M. 2000. The Sperm Whale (*Physeter macrocephalus*). *Galemys*. 12 (2), pp. 3-22.

Folkens, P., Reeves R.R., Stewart B.S., Clapham P.J., Powell J.A. 2002. Guide to marine mammals of the world. National Audubon Society. 528 pages

Fordyce, E., Muizon, C. 2001. Evolutionary history of cetaceans: A review. 169-223. In: Mazin, J.-M. and Buffrenil, V. (eds.), *Secondary Adaptation of Tetrapods to Life in Water*. Verlag Dr. Friedrich Pfeil, Munich, Germany. 367 pages.

Gibbons, J., Capella, J. 2006. Our biological diversity. Marine mammals section. pp. 236-243. In: *Biodiversity of Chile, Heritage and Challenges*. National Commission for the Environment. Santiago, Chile. 639 pages.

Goldbogen, J.A. Southall, B.L. et al. 2013. Blue whales respond to simulated mid-frequency military sonar. *Proceedings of the Royal Society B: Biological Sciences*, 280, pp. 1-8.

Hucke-Gaete, R., Viddi, F., Bello, M. 2006. Marine Conservation In Southern Chile. Valdivia, Chile. 106 pages.

Hucke-Gaete, R., Osman, L.P., Moreno, C., Findlay, K.P., Ljungblad, D.K. 2004. Discovery of a blue whale feeding and nursing ground in southern Chile. *Proceedings of the Royal Society of London B (supplement)*, *Biology Letters*, 271, S170–S173.

Institute for Whale Conservation, 2015. Webpage: <http://icb.org.ar/>

- Hucke R. & Aguayo A. (2014) Informe sobre el sonido submarino (Report on underwater sound). Punta Arenas. Source: <https://www.cbd.int/doc/meetings/mar/mcbem-2014-01/other/mcbem-2014-01-submission-chile-es.pdf>
- International Whaling Commission, 2014. Webpage: <http://iwc.int/>
- Iriarte, A. 2008. Mammals of Chile. Lynx Ediciones. Barcelona, Spain. 422 pages.
- Laborde, M. 1988. Moby Dick, ballena chilena (Moby Dick, Chilean Whale). Sunday Magazine, 3 July. El Mercurio, Chile (newspaper).
- Laist, DW., Knowlton, AR. et al. 2001. Collisions between ships and whales. Marine Mammal Science, 17, pp. 35-75.
- Maier, G. 2006. Literatura y realidad: El desastre del Essex y la ballena blanca. (Literature and reality: The Essex disaster and the white whale. Magazine: Muy Interesante, year 21, Number 229. Chile.
- McDonlad M., Mesnick S. & Hildebrand J. (2006). Biogeographic characterisation of blue whale song worldwide: using song to identify populations. J. cetacean res. Manage. 8(1): pp. 55-56.
- Melcón, M.L., Cummins, A.J., Kerosky, S.M., Roche, L.K., Wiggins, S.M., Hildebrand J.A. 2012. Blue whales respond to anthropogenic noise. Plos one, 7 (2), e32681.
- Miethke, S., Gálvez, M. 2009. Towards the identification of high conservation value marine and coastal areas in southern Chile: final report for the Undersecretariat of Economy. 93 pages.
- Navarro, M. 2008. Human communities and populations of large whales: an anthropological approach to the natural and cultural heritage of the archipelago localities of the Chonos, Aysén Region, Chile. Thesis Universidad Austral de Chile. School of Philosophy and Humanities. 130 pages.
- Order Carnivora 193-230. In: A. Muñoz-Pedreros & J. Yáñez (Ed.) Mammals of Chile. Ediciones CEA, Valdivia, Chile. 571 pages.
- Pastene, L. y Quiroz, D. 2010. An outline of the history of whaling in Chile. Manuscript, pp. 73-98.
- Quintana, V. Yáñez, J. Valdebenito, M., Iriarte, A. 2009.
- Payne R., McVay S. (1971). Songs of Humpback Whales. Science. Vol. 173, Issue 3997, pp. 585-597.
- Reeves, R. Stewart, B.S. Clapham, P.J. & Powell, J.A. 2002. Marine Mammals of the World. 525 pages.
- Retorna, 2011. Garbage in the oceans, an international challenge. Most of the marine debris are plastic, mainly bags and packaging. 8 pages. <http://www.retorna.org/mm/file/Documentacion/BasuraOceanos.pdf>
- San Martín, H. s.a. Whale hunting. "Nosotros los chilenos" Magazine, Vol 21.
- Sayigh L. & Bocconcelli A. (2016) Sound and spectrograms. Curso comunicación de cetáceos (Course on cetacean communication). Organized by the MERI Foundation, the Universidad Nacional Andrés Bello, and the Woods Hole Oceanographic Institution (WHOI)
- Scowcroft, G., Vigness-Raposa, K., Knowlton, C., Morin, H. 2012. Discovery of sound in the sea. University of Rhode Island, Kingston RI, USA. Available at: <http://www.dosits.org>
- Sepúlveda, J. 1997. The epic story of the whaling industry in Chile. Revista marina de Chile. Read: June, 2009. Available at: <http://www.revistamarina.cl/revistas/1997/6/jorsepul.pdf>
- Sielfeld, W. 1983. Marine Mammals of Chile. Ediciones Universidad de Chile. Santiago, Chile. 189 pages.

Simmonds, M.P. 2011. Eating plastic: a preliminary evaluation of the impact on cetaceans of ingestion of plastic debris. Submission to the IWC Scientific Committee, pp. 1-14.

Thiel, M., Hinojosa, I. Vásquez, N., Macaya, E. 2003. Floating marine debris in coastal waters of the SE-Pacific (Chile). *Marine Pollution Bulletin*, 46, pp. 224-231. Whale and dolphin conservation, 2015. Webpage: <http://ar.whales.org/guia-de-especies/delfinchileno>

Tyack P. (1997). Development and social functions of signature whistles in bottlenose dolphins *Tursiops truncatus*. *Bioacoustics. The International Journal of Animal Sound and its Recording*. Volume 8, Issue 1-2.

Viddi, F. A., Hucke-Gaete, R., Torres-Florez, J. P., and Ribeiro, S. (2010). Spatial and seasonal variability in cetacean distribution in the fjords of northern Patagonia, Chile. *ICES Journal of Marine Science*, 67: pp. 959–970.

Wilson, B., Wilson A. 2006. The complete whalewatching handbook. A guide to whales, dolphins, and porpoises of the world. Voyageur press, 1st Edition, London, England. 256 pages.

Wright, A.J., Soto, N.A. et al. 2007. Do marine

mammals experience stress related to anthropogenic noise? *International Journal of Comparative Psychology*, 20, pp. 274-316.

Yáñez, P. 1948. Chilean Marine Vertebrates. I. - Mammals. *Revista de biología marina*. 1 (2), pp. 103-123.



FUNDACIÓN
MERI



RESERVA
NATURAL
MELIMOYU

