

**Native Pinnipeds of the Galapagos Archipelago**

**Angelique K. Wanek**

**Stockton University**

**Abstract:**

The Galapagos Archipelago is valued for being a very important biodiversity hotspot yet it is also very vulnerable to environmental and anthropogenic forces. The Galapagos Archipelago also has some of the most unique animals in the world. The Galapagos sea lion (*Zalophus wollebaeki*) as well as the Galapagos fur seal (*Arctocephalus galapagoensis*) are both endemic pinnipeds to the Galapagos Archipelago. Both of these species face numerous environmental and anthropogenic threats that affect the size of these populations. In the past, there have been numerous organizations and management techniques put into place to try and save these endangered species; however, due to unexpectant threats the effort to save these species could be potentially futile.

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**II. Introduction:**

What is a Pinniped? A pinniped can be defined as “marine mammals that have front and rear facing flippers” (The Marine Mammal Center, 2018). The three branches of families of pinnipeds consist of seals (*phocids*), seal lions (*otariids*) and walruses (*odobenidae*) (The Marine Mammal Center, 2018). Pinnipeds are mainly marine based; however, all three of these families are able to live both in land and in water. Although based on their weight, diet and range of motion (flippers) their movement on land can often be limited.

There are over 34 species of pinnipeds in the world; however, there are only two pinnieds that are native to the Galapagos Archipelago (Lariviere, 2018). The Galapagos Archipelago consist of twenty individual islands. This paper will focus on the pinnipeds that live in the Galapagos Archipelago; the Galapagos Sea Lion (*Zalophus wollebaeki*) and the Galapagos Fur Seal (*Arctocephalus galapagoensis*), as well as the threats and current management practices put into place to protect them.

**III. Difference in Morphology: Earless Seals (True Seals) V.S. Eared Seals (Sea Lions & Fur Seals)**

Truthfully, seals and sea lions are so similar that they are often confused for one another. The appearance of seals may differ among species; however, there are numerous physical characteristics that make true seals unique. One of the main identifying characteristic of a true seal is that it lacks an external ear flap (The Marine Mammal Center, 2018). Instead true seals

only have a hole on each side of their head. Sea lions on the other hand do in fact have external ear flaps. Also, fur seals are also considered eared seals for they have small external ear flaps.

Additionally in the concept of movement, true seals have limited movement on land in comparison to sea lions and fur seals. This is mainly due to the fact that their front flippers are shorter than their rear flippers (The Marine Mammal Center, 2018). This makes it quite difficult for true seals to pull themselves out of the water. That being said, when in water true seals tend to use their back flippers more when swimming (The Marine Mammal Center, 2018). Sea lions on the other hand have very large front flippers and can use all four flippers for onshore movement (The Marine Mammal Center, 2018). Unlike true seals, sea lions put more of a point to use their front flippers to swim than their back (The Marine Mammal Center, 2018). They do however; use both their front flippers and back flippers to swim.

On the contrary, fur seals have physical traits of both true seals and sea lions. They tend to have larger flippers than both seal lions and true seals (The Marine Mammal Center, 2018). They also have heavy coats of fur and are small like true seals. It is because of these mix of traits that fur seals are mistaken as both true seals and sea lions, especially depending on the actual size of the seal.

Another major difference true seals and sea lions is that sea lions have claws; however true seals do not (M, 2011). One misconception about pinnipeds is that when they are beached, that they are hurt. This is not always the case. Pinnipeds often come onshore when, breeding, molting or resting as well as if they are sick or injured.

Associated with this misconception is another misconception that pinnipeds, especially true seals and fur seals are not dangerous. Yes, pinnipeds are usually not really predatory

towards humans unless they are frightened or protecting their young. This is why in the United States and most places in the Galapagos where the memo of “let nature happen as it happens” natives try to warn tourist away from these animals, for pinnipeds tend to be vicious when faced. They have sharp teeth, they weigh a lot, they are strong and some have claws, but this subject will be discussed more down the line.

#### IV. Pinnipeds Of The Galapagos Islands

The two species of native pinnipeds that travel between the Galapagos Islands include; the Galapagos sea lion (*Zalophus wollebaeki*) *image 1* and the Galapagos fur seal (*Arctocephalus galapagoensis*) *image 2*.

*Figure 1: Sea Lion*

(Paul, 2011)



*Figure 2: Fur Seal*

(Palo)



**A. Galapagos sea lion (*Zalophus wollebaeki*)**

Figure 3: Galapagos Sea Lion Pup  
("seal lion puppy")

**Taxonomy:**

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Carnivora	Otariidae

(Trillmich, 2015)

**Morphology:**

Sea lions (*image 3*) although not named ‘fur seals’ do in fact have fur. The only major difference when it comes to sea lions coat verus ana actual fur seal, is that seal lions do not that fur on their front flippers. For the Galapagos sea lion, the color of their fur depends on the sex and age of the sea lion. Typically the fur color, when dry tends to be brown, black or grey and more dark when in water (Trillmich, 2015). When a sea lion is born, it is born with a dark brown fur. These pups will eventually lose this fur when they are about 3-5 months old (Trillmich, 2015). Mature males of the this species tends to be a darker black/ brown compared to females. “Mature females”, juvenile males/females which tend to be a lighter tan/brown color (OBIS-SEAMAP, 2015).

As far as size goes , male seal lions tend to be larger than female sea lions. Full grown males tend to be about 80- 100 inches in length, while females tend to be slightly under this size at about 70-90 inches (Huhtasaari, 2011). Males and females do have similar body structures; but there are some slight differences. Buildwise, males have a thicker neck and “ stouter shoulders and chest” whereas female sea lions have a more “ wide upper body” and a more thin, long neck compared to male sea lions (OBIS-SEAMAP, 2015). Male seal lions are also denoted by the title ‘bull’. Overall seal lions tend to be between 100-600 pounds, with male sea lions being on the higher end of this spectrum.

For years, the Galapagos seal lion (*Zalophus wollebaeki*) was thought to be a subspecies of the California sea lion ( *Zalophus californianus*). However, after numerous research trial by several scientists looking directly at the genes of the California sea lion and the Galapagos species, they were ultimately deemed as separate species (Jane, 2017). The species are very closely related though!

### **Conservation Status:**

Based on past trends, the Galapagos sea lions are currently considered to be enderge by the IUCN Red List Assessment (Jane, 2017). This listing was posted in 2015 the population with the reasoning being that the Galapagos seal lion population “declined by 60-65% from 1978 to 2001” and it was estimated that the population size of this species would continue to decline in the years to come (Trillmich, 2015). However the current trends of the population aren’t really known due to lack of assessment of this species.

There is evidence that supports the claims of the current status of the size of the population of the Galapagos sea lions by its past assessments. For instance in 1996 the species was listed as vulnerable (VU) and in 2008 the species was temporary listed as endangered (2008) (Trillmich, 2015). Considering that the listing for this species has been deemed more and more vulnerable- from vulnerable to temporary endangered to endangered- shows that the population size of the Galapagos sea lions has been downsized and that this species does in fact have numerous threats to it.

### **Geographic Range:**

The Galapagos sea lion tends to migrate around the islands of the Galapagos Archipelago. Some colonies of the Galapagos sea lion have also been spotted off the the coast of Costa Rica beached on an nearby island called Coco ( Jane, 2017).

### **Habitat:**

Although strong swimmer, the Galapagos sea lion tends to stay very close to shore. From past recordings as well as several observations, this species is noted to only be found about 10-15 miles off the coast (Huhtasaari, 2011). That being said, like most pinnipeds, when the Galapagos sea lion is not swimming, it can be found resting, feeding or breading in rocky shore areas or in small tide pools.

### **Behavior:**

Compared to male sea lions are more solitary; whereas female sea lions tend to be more social. Female sea lions live in a colony with their pups of about 20-30 other female sea lions.

Male sea lions fight to have dominance over these female colonies, resulting in each colony having one male ‘bull’ (Jane, 2017). The Galapagos sea lions follow this same trend as all other sea lions. The remaining male sea lions can form a “bachelor colony” to travel in a pack (Jane, 2017).

### **Diet & Lifespan:**

On average, the lifespan of the Galapagos sea lion in the wild is about 20 years (Huhtasaari, 2011). There are numerous threats to this species that can limit the lifespan that is later discussed in this paper (disease, el nino). The Galapagos sea lion also has a wide variety of diet and feeding habitats. In general this species tends to eat but is not limited to: squid, fish and crustaceans (Huhtasaari, 2011).

### **Reproduction:**

The reproduction process of the Galapagos sea lion is quite complicated and complex. Female Galapagos sea lions tend to be able to reproduce at around age 4-5 years old, which is around the same time for male sea lions (Huhtasaari, 2011). This species tends to reproduce between the months May and January (Huhtasaari, 2011). Also, the gestation time period of female Galapagos sea lions is around 11 months and tend to only have one offspring at a time (Huhtasaari, 2011). Like most pinnipeds the female sea lion tends to the newly born pup. They feed and nurse their young for up to three years after giving birth (OBIS-SEAMAP., 2015). Mother and pup communicate with each other through “distinct calls and voice calls”

(OBIS-SEAMAP., 2015). Mother sea lions tend to be very protective of their young and can get quiet vicious when defending the pups.

### B. Galapagos fur seal (*Arctocephalus galapagoensis*)



Figure 4: Galapagos Fur Seal

(Tui De Roy, 2017)

#### Taxonomy:

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Carnivora	Otariidae

(Trillmich, 2015)

#### Morphology:

Similar to the Galapagos sea lion, the Galapagos fur seal (*Arctocephalus galapagoensis*) species is sexually dimorphic. Meaning that the male fur seals and female fur seals of this species differs from each other in weight, color and size. On average, the male fur seals tend to be around 60 inches long and weigh about 140 lbs (Jane, 2017). Again, the Galapagos fur seal (image 4) tend to be larger than the female sea lions. Female Galapagos Fur Seals tend to measure in around 50 inches long and weigh about 60 pounds (Jane, 2017).

Males and Female Galapagos sea lions both are shades of dark brown- grey color; however, another similarity is that for both sexes, have a light tan face and light tan stomach (Jane, 2017). Female fur seals tend to lose weight during their lactation period; hence why they are so much smaller than male fur seals. The overall appearance of the Galapagos fur seal, make it more sea lion like than seal like!

### **Conservation Status:**

Much like the Galapagos sea lion, the exact status of the Galapagos fur sea is known but not exactly too accurate, due to lack of evaluations on the species size. Their has not been a change to the status of this species since the IUCN Red List Assessment in 2008, deeming the species as endangered (Trillmich, 2015). The Galapagos fur seal has quiet the complex past for in 1965 the species was deemed “ Very rare but believed to be stable or increasing” and then in 1982 it was deemed to be “out of danger” (Trillmich, 2015).

Later in 1996 the Galapagos fur seal was listed by the IUCN as “vulnerable” and that leads to the 2008 listing of “endangered” (Trillmich, 2015). So as seen from past trends, the Galapagos fur seal has always been small in numbers and at the time when their numbers were increasing they were being threatened (mainly by hunting) and so there numbers started to increase dramatically. With more effort into locating this species their assessment of their true status could be known!

### **Geographic Range:**

The Galapagos fur seal is not a migratory species. Similar to the Galapagos sea lion, fur seals tend to just hang around the islands that make up the Galapagos Archipelago. Although

they are not a migratory species, there have been sightings of the Galapagos fur seal near an island (Foca Island) near Peru (Widescreen Archive, 2017).

**Habitat:**

The Galapagos fur seal can be relatively close to the coast - less than 20 miles . That being said, like most pinnipeds, when the Galapagos fur seal is not swimming, it can be found resting, feeding or breading in rocky shore areas or in small tide pools (Jane, 2017). All in all the Galapagos fur seal has a very similar habitat as the Galapagos sea lion.

**Behavior:**

The Galapagos fur seal spends a large majority of its time laying on the beach or rocky area resting. It has been recorded that these fur seals “as much as 30% of an individual’s time may be spent on land” (Kolodziejski, 2017). So most of their time is fixated on staying cool; either in the water or in the shade.

One unique characteristic of the Galapagos is that it can dive up to 30 meters when foraging and can forage for up to 16 hours a day (Kolodziejski, 2017). For small little things, they do use up a lot of their energy foraging, no wonder why they rest on land for so long! Most of this foraging occurs at night and is highly influenced by the lunar cycle (Kolodziejski, 2017).

**Diet & Lifespan:**

For both sexes, the Galapagos fur seal tends to live an average of about 22 years in the wild (Kolodziejski, 2017). Since they forage for such a large amount of time the Galapagos fur

seal has a wide range of diet. For instance they eat a variation of cephalopods and different types of fish (Kolodziejski, 2017). Again these fur seals are highly influenced by the lunar cycle and all sorts of threats (hunting, el nino) which influence their overall health and diet.

### **Reproduction:**

Similar to many pinnipeds ‘bulls’ meaning male fur seals mate with several females in their colony during breeding season (Kolodziejski, 2017). Males often challenge each other to show dominance and to have the chance to mate with the female fur seals within a colony. These male fur seals are so protective over their females and their ‘leadership’ that they will defend their colony for days until they physically have to leave (foraging for food) (Kolodziejski, 2017).

The Galapagos fur seals tend to reproduce between the months of August- November (Kolodziejski, 2017). Similar to the Galapagos sea lion, fur seals have a gestation period of a year and are typically only pregnant with one seal at time (Kolodziejski, 2017). These fur seals have the tend to have the same lactation period of the Galapagos sea lion , of two to three years. Many marine scientists believe that this is due to environmental factors such as El Nino; however, more evidence is needed to support this hypothesis (Kolodziejski, 2017).

## **V. Threats To The Native Pinnipeds**

### **A.Plastic/Waste:**

One of the most challenging issues the different islands of the Galapagos Archipelago has is waste and knowing where it is coming from. Trash, especially plastic has been found in both the Pacific ocean surrounding the Archipelago and in land. Numerous attempts have been

made to reduce the amount of trash that both natives and tourists have accumulated on the islands; however, there is no real way of stopping the trash that is brought to the islands during storms.

Perhaps an even bigger issue than the trash itself, is the microbes of plastic that accumulate in the ocean, similar to the instance with the pacific garbage patch.

Trash and microbes of plastics in the ocean affect wildlife worldwide. The Galapagos have not been able to get passed this issue either. In relation to the effects of the Galapagos Sea Lion and Galapagos Fur Seal plastic has a huge affect on the decline of these organisms. Seals and Sea Lions tend to mistake trash and plastic in the water as food. Often, plastics that are eaten by these organisms accumulate in the stomach and eventually block up their organs. This kills the animals from the inside out (Marine Mammal Stranding, 2017).

Another way in which plastic can harm sea lions and fur seals is that they can get entangled in it. This is especially true when it comes to fishing gear. Often times several different types of fishing lines can get entangled in each other. Often items such as fishing line and soda can rings can get stuck around an organism in such a way that the organism has to grow with the trash around them. For example, often fishing hooks can get caught and stuck fur seals and seal lions. This is something that through Ecuadorian law and marine reserves in the Galapagos try to minimize through their practices.

## B. Oil spills

Oils spills are beyond harmful to marine life, especially in an location that is so valuable yet so fragile. Oil spills are not only harmful because they release law amounts of oil and toxins

into the ocean, but oil spills are hard to be contained. Since both of the Galapagos fur seal and sea lion spend a majority of their time in the water, the chance of them being affected by an oil spill is highly likely, considering the fact that they could potentially swim through it. This was the case when it came to Oil Spill Jessica in the Galapagos Archipelago in 2001.

In 2001 right off the coast of San Cristobal, a cargo ship filled with about 160,000 gallons of diesel and 80,000 gallons of bunker fuel was agrounded (“The *Jessica* Oil Spill”, 2016). Immediately the ship began to leak oil. Through the efforts of the Galapagos National Park as well as several US experts to remove the rest of the oil from the ship and then to contain the spill (“The *Jessica* Oil Spill”, 2016). However, most of the efforts to contain the spill such as netting, was pretty futile. The oil spill which began off the coast off San Cristobal , then slowly but surely spread out around the Galapagos Archipelago (“The *Jessica* Oil Spill”, 2016). Santa Fe, Santa Cruz and San Cristobal had the “highest density levels of contamination” (“The *Jessica* Oil Spill”, 2016). Surprisingly this oil spill had a bigger impact on marine iguanas than the sea lions or fur seals of the islands. In fact, oil spill jessica has a large impact on killing of a large amount of the marine iguana population (“The *Jessica* Oil Spill”, 2016). Fur seals and seal lions were affect to the point that they needed the water washed off of them and that numerous sea lions and seal pups had eye infections (“The *Jessica* Oil Spill”, 2016).

One aspect of oil, is that it only truly changes form it never really goes away. Studies have shown that to this day on the shores of Santa Fe, Santa Cruz and Isabela Hydrocarbon levels in sediments from oil spill Jessica were found at 0.4 and 48.9 ppm (“The *Jessica* Oil Spill”, 2016). These levels are typically considered low; however, this just supports the fact that

oil does not go away and that being said it is important to have regulations and practices in place to avoid this situation all together.

### C. Hunting:

In the early 20th century the Galapagos fur seal (*Arctocephalus galapagoensis*) was hunted almost to extinction (Trillmich, 2015). The main reason why this species was hunted so intensely, was the the fur of these fur seals were often used for clothing, purses and boots. The fur of the pups of the Galapagos fur seal was more valued for it's dark color and thickness. This resulted in the fur seal population plummeted and resulted in this species being deemed “vulnerable” in 1996 and “endangered” in 2008 by the in the IUCN red list assessment (Trillmich, 2015).

### D. Tourism:

The sea lions and fur seals of the Galapagos Archipelago are often disturbed by the presence of humans. The main issue with tourism and wildlife in the Galapagos, is that there is wildlife everywhere. Whether on the beaches, on a boat or inland there are signs of wildlife everywhere. This is both beautiful but dangerous because of the amount of tourist going on in the islands. As previously stated, the Galapagos fur seal and sea lion tend to lay on beaches and on docks when they are resting, breeding and feeding. So there is always a chance of random tourist going up to these animals and either getting injured, stressing out the animals or hurting these animals.

One misconception about sea lions and especially fur seals is that they are cute and cuddling and not dangerous at all (Marine Mammal Center, 2018). This is false for sea lions have claws and both fur seals and sea lions have very sharp teeth. When agitated both of these species will attack, especially if there are pups around (Marine Mammal Center, 2018). Most people do not take this into consideration when taking photos or bothering these animals. Tourists often do not also realize that by coming close to these animals does also stress these animals out; henceforth, why they get aggressive.

Another big issue with tourism in the Galapagos Archipelago is that there is a lot of traveling involved to get from place to place. The main way of travel, from island to island is by boat. The issue with traveling by boat is, not only are the boats polluting the water by all the chemicals they release but often times the sea lions and fur seals found in the waterways of these islands, are hit by these boats unintentionally. It only takes one hit in the wrong way, from a fast traveling boat to seriously hurt an animal (Marine Mammal Center, 2018). While numerous attempts of regulations of the amount of boats in the water at a time, there is no real way to regulate every boat in the Galapagos Archipelago.

## E. Disease

The Galapagos fur seal and seal lion are prone to disease, like most pinnipeds. It has been proven that people can transmit diseases to animals (especially marine organisms) almost as easily as that animals can transmit diseases to humans (Marine Mammal Center, 2018). In the Galapagos specifically, the main concern is with feral dogs transmitting diseases to the fur seals

and seal lions of the islands and then having an outbreak amongst each species and making the population decrease even more than it already has. (Favara,2016)

The main issues with wild dog populations is mainly on Isabela Island. As of 2018 there is a lack of information on the exact size of the feral dog population of the island but in 2004 it was believed that the size was about 320 dogs (Favara,2016). As way to manage the dog situation on the island several different management techniques had been put into place including: Trap-neuter-release, adoption and euthanasia (Favara,2016). Each of these methods have been put into place to helpfully stop the spread of disease amongst the Galapagos fur seal and sea lion populations.

## **VI. Potential Solutions**

### **A. Plastic**

In an effort to reduce the amount of plastic found on the beaches and the ocean, the Galapagos Conservancy has started a project titled “A Plastic Free Ocean” (The Galapagos Conservancy, 2017). This project’s mission statement is to not only educate the native people of the Galapagos Archipelago about the harm plastic and waste can do, but to actually have clean ups to collect the waste on the islands.

The Galapagos Conservancy started a mission to get plastic bags reduced on each of the islands that have people ( 5 out of 20 islands) (The Galapagos Conservancy, 2017). The Conservancy's ultimate goal was to get rid of a large majority of plastic bags on all the islands by 2017. In order to reach this goal, people from the Conservancy as well as volunteers handed out free reusable bags to local business to give out, instead of plastic bag (The Galapagos

Conservancy, 2017). Until today, the Galapagos Conservancy is still working to meet its goal of getting plastic bags out of the hands of people visiting the islands.

### **B. Hunting**

Due to the population of the Galapagos fur seal decreasing dramatically in the 19th century, this species was listed as “endangered” in 2008 on the IUCN red list. Around this time the hunting of the Galapagos fur seal was made illegal by Ecuadorian law (Marine Mammal Center, 2018).

### **C. Wildlife Management**

Due to the Galapagos fur seal and sea lion both being endemic to the Galapagos Archipelago and endangered, they are protected by both Ecuadorian law, several marine reserves and several environmental organizations. For instance, the Galapagos Marine Reserve protects these species by not only setting up protected locations for them to eat/sleep/breed but also regulate boat traffic by limiting fishing in these protected areas (Keeney, 2016).

Also, both the Galapagos fur seal and Galapagos sea lion are protected under Ecuadorian law. The Galapagos Conservancy has also had an impact on cleaning up the habitats of these species as well as monitoring their overall wellbeing.

## **VII. Conclusion**

Overall, the biodiversity of the Galapagos Archipelago is very unique and needs to be protected. The Galapagos fur seal and the Galapagos sea lion are both very unique types of pinnipeds; morphology wise and behavior wise. Each of these species are endemic to the the

Galapagos Archipelago and yet both have been listed as endangered by the IUCN Red List. Both of these species suffer from threats including assumption of trash, disease, tourism and hunting; therefore, it is of utter importance that these species are protected as any means necessary.

So far both the Galapagos fur seal and Galapagos sea lion are protected by Ecuadorian law, the Galapagos Conservancy and the Galapagos Marine Reserve, but in order to ensure the survival of both of these species, more organizations need to take place in the management of these animals.

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**IX. Appendix:**

Figure 1: Galapagos Sea Lion

Paul, D. (2011, April 11). Galápagos Sea Lion (Zalophus wollebaeki) [Digital image]. Retrieved March 12, 2018, from <https://www.flickr.com/photos/jedi58/5723629090>



Figure 2: Galapagos Fur Seal

Palo, H., Jr. (n.d.). Galapagos fur seal (Arctocephalus galapagoensis) [Digital image]. Retrieved March 12, 2018, from <https://www.arkive.org/galapagos-fur-seal/arctocephalus-galapagoensis/image-G32597.html>



Figure 3: Galapagos Sea Lion pup

<http://www.sealion-world.com/sea-lion-puppy-in-galapagos-islands/>



Figure 4: Galapagos Fur Seal

<http://www.arkive.org/galapagos-fur-seal/arctocephalus-galapagoensis/image-G32230.html>

