

Protective Measures for Dalian Spotted Seal Reserve

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Abstract. Dalian Spotted Seal Reserve is one of the eight harbor seal breeding areas in the world. Leopard seals in the Liaodong Bay breeding area lack genetic gene exchange with other breeding areas in the world, and there is a phenomenon of reproductive isolation. They belong to a branch of the world's independently evolved leopard seals and have their own unique genetics, so are of high conservation value in this regard. This paper highlights the benefits that aquaculture and captive breeding bring to protected areas. The focus of aquatic products is mainly on the bottom-sown varieties. There is a foundation for artificial breeding, and what people need to do is to continue to expand the number and scope when there is sufficient funding. At the same time, this paper will clarify the relationship between them, and explain the measures and development of seal protection from the biological and economic perspectives. Both focus studies could help further protect seals.

Keywords: Spotted seal, aquaculture, artificial breeding.

1. Introduction

Dalian Spotted Seal National Nature Reserve was established in 1992. It is located on the west coast of Liaodong Peninsula. It covers an area of 561,975 hectares, ranging from 120°50' to 121°55' 50 "east longitude and 38°55' to 40°05' north latitude. The sea area under the jurisdiction of Lvshun Kou District, Ganjingzi District, Jinpu New District, Changxing Island Economic Zone and Wafangdian City of Dalian is mainly protected for harbor seals and their ecological environment.

Spotted Seal Reserve has rich biological resources, there are 26 species of phytoplankton, 25 species of zooplankton, 35 species of swimming animals, including harbor seal, fin whale, minke whale and national second-class protected animal killer whale, false killer whale, true dolphin, bottle nose dolphin, East Asian finless porpoise, northern sea lion and other rare species [1].

As the flagship species of the Bohai Sea, the harbor seal is the only pinniped mammal that can breed in Chinese waters. The ecological isolation between harbor seals in the Bohai Sea and those in other regions of the world is of great significance in biodiversity conservation [2].

From January 1 to April 30 each year, it is a special action period for the management and protection of winter and spring harbor seals during their migration and breeding period. During the special operation in 2022, the Administration sent more than 1,000 inspectors, the total mileage of patrol vehicles reached 17,000 kilometers, and rescued three harbor seal cubs, one of which had the ability to survive in the wild and was released on the spot, and the other two were released into the sea on June 9, 2022, after professional treatment and wild training. At present, the special action for the management and protection of 2023 has begun, and the National Conservation area Administration, the territorial governments and relevant departments are working intensively to carry out publicity, patrol, law enforcement inspection and other work, effectively strengthen the protection of harbor seals during the critical period of migration and breeding, and severely crack down on the illegal hunting, killing, transportation and operation of spotted seals[3].

In addition to special operations, during the daily management period, the Conservation area Administration continues to carry out patrol work in the conservation area. Along the 370 kilometers of coastline, an average of more than three times a month to complete the whole area patrol. In the face of adverse factors such as the novel coronavirus epidemic, the administration has efficiently deployed personnel and vehicles and flexibly adjusted schedules to ensure the smooth completion of the leopard seal patrol work [1].

With the gradual improvement of the ecological environment of the harbor seal reserve, the population of harbor seal has gradually recovered, and some harbor seals even gave up their migration and chose to "settle" in the wetland. The two main landing points of harbor seals on the stone line Reef of Ant Island and the West pile stone of Huping Island can be observed almost all year round. In the survey work in 2021, the patrol personnel observed more than 200 harbor seals at one time on the Shixian Reef of Ant Island and nearby waters, reaching the largest single observation and measurement of the centralized landing point of harbor seals in Dalian Sea area in recent years. Through continuous efforts, the population of harbor seals has gradually recovered from less than 1,000 at the beginning of the establishment of the reserve to about 2,000 at present, and the population has become stable [1].

In addition to the above, the development of captive breeding of harbor seals can also help to protect them, which is currently extremely lacking and needs innovation and improvement. But that has led to not having enough money to start the thing, so other ways to do it, like aquaculture, can be developed. All the current ideas are theoretically feasible and need to be further tested.

The number of spotted seals in the wild today is very small, only about 2,000, so captive breeding can be used to increase their numbers [4]. It can also help protect harbor seals. Captive breeding is now not carried out in the reserve, but at Dalian Shengya Aquarium. Seal rescues also did not appear, mainly at the Dalian Academy of Marine Sciences. One could consider setting up a breeding base and a rescue base at two sites in the reserve, which would better protect the seals. But at the same time, it will also expose a very serious problem is the funding problem, they do not have enough funds to build a new base, including new equipment for the reserve, hardware facilities required for artificial breeding and so on. So, people can make money by aquaculture, developing tourism and other things. With the money, they can better help the seals. Therefore, the next step will focus on the captive breeding and breeding of harbor seals.

2. Artificial Breeding

Dalian Shengya Sea World is the most important spotted seal breeding base in Dalian.

In spotted seals' breeding season which is January to March, people put one male seal and one female seal in one room which has a water pool like 9meters long and 4 meters wide, it also needs cameras. Leopard seals are very energetic when they are in oestrus, and males and females chase each other in the water, often resulting in fights and injuries. When mating, the male animal with the PAWS of the forelimbs tightly clasped the female on both sides of the body, prostrate on the female's back, bites the female's neck muscle with the mouth and floats in the water motionless for mating. The number and time of male mating decreased with the increase of age [5]. About 9-10 months later, the baby seals would be born. Seals usually start shedding their long white fur 16 days after birth and finish molting 5-10 days later.

Table 1. The survival rate of captive-bred spotted seals from 2007 to 2010 in Shengya Sea World [6]

year	2007	2008	2009	2010
Birth individual	1 female and 1 male	1female and 5 males	3 females and 7 males	4 females and 8 males
Survival individual	0	2	7	8
Survival rate/%	0	33.3	70	66.6

The table 1 is data of the survival rate of captive-bred spotted seals from 2007 to 2010 in Shengya Sea World. In the first year, there are no seals surviving in the end, but year by year, the numbers are increasing, but it still stops in unit digits. The number of seals that have been born these years is not increasing because they don't have enough money and strict supervision. In table 2, the spotted seals bred data can help us know more about the details of feeding seals.

Table 2. Lactation of young spotted seals bred in captivity in 2009[7]

Date of birth	Birth body length/cm	Sex	Colostrum time/h	Daily lactation time/h	Breastfeeding time/min	Lactation time/d	Birth weight/kg	Weaning Weight/kg
2-18	70	male	28	4 to 6	3 to 10	18	8.3	25
	8.5	female	20	3 to 6	3 to 8	17	71	23
	8.3	male	6	3 to 7	5 to 8	18	69	29.1
	8.8	male	12	2 to 6	5 to 10	15	72	27.9
	7.65	female	15	2 to 4	3 to 7	22	67	16.9
3-01	8.95	male	9	3 to 5	4 to 12	16	73	24
3-15	8.45	female	9	3 to 5	5 to 13	15	71	18.2

Table 3. Artificial feeding of spotted seal pups in 2009[8]

Date of birth	Date of feeding	Feeding weight/kg	Bait amount kg/d	Number of feedings/d	Opening date
2-18	3-6	25	1.0-2.0	2-3	4-19
2-23	3-10	23	1.0-2.0	2-3	4-11
2-24	3-12	29.1	1.0-2.0	2-3	4-1
2-25	3-10	27.9	1.0-2.0	2-3	4-15
2-28	3-20	16.9	1.0-2.0	2-3	4-30
3-01	3-16	24	1.0-2.0	2-3	5-10
3-15	3-29	18.2	1.0-2.0	2-3	5-22

There is an important period during the growth of baby seals, their weaning period, which requires artificial feeding, people need to force them to feed small fish or fish pieces to help them wean, and at the same time, people put drugs, such as vitamins, amoxicillin, cephalosporin into the fish. It will take about a month to do. There are some data in table 3 can show the particular data of the spotted seals.

Young seals live alone for 6 months, when the weight reaches 50-60kg, they can be raised in a group of 3-5 seals so that the seals slowly adapt to the group life and exercise their ability to grab food [9]. After careful observation and short-term adaptation, the young can survive on their own. The decline in the number of spotted seals in the wild makes artificial breeding particularly important, and it will help to increase the population. It is better to set up the breeding bases and rescue centres in the two stations of the reserve, so the release and rescue can be more convenient and timelier. In this case, people can help increase the number of spotted seals and maintain the balance of the ecosystem. People should also be careful that some genetic mutations may cause seals are hard to survive in the wild [10]. There is an example, a spotted seal was born in another oceanarium in Dalian last year, and it remains of hair is not waterproof, which means that it will affect its underwater activities. This is the problem with captivity, and if he were to be released into the wild, he would be in serious trouble. At the same time, because seals are migratory animals, the seals released by humans may not be able to catch up with the large troops heading north, although it does not affect the survival of seals, it is different from their normal life.

Whether captive-bred seals are released into the sea depends on their viability, depending on the situation. But artificial breeding is still necessary. Because of global warming, the ice is moving north. Spotted seals rely on ice floes to breed, and now they lack places to breed in the wild. Artificial breeding could help increase their numbers. Just because it's risky doesn't mean people can't do it.

3. Solutions about the fund

3.1. Aquaculture

There are many ways in aquaculture, but this passage is focusing on the bottom seeding. Bottom seeding means that people put the net at the bottom of the sea and breed the aquatics. They don't affect the activities of the spotted seals and they also can bring us enough aquatic products. People can put it into the experimental area because, in this area, they can do more things than the other two. The differences between them are in the experimental area, people only can't do something, in the buffer area, people can only do something, in the core area, people can do nothing. It is the most effective way among others.

The farmed varieties are shrimp and mussels because the Bohai Sea area is rich in microbial nutrients, which is suitable for breeding these species. Dalian has a rich aquaculture foundation and experience. And shrimp farming accounted for 27% of global aquaculture production - the highest rate among all aquaculture species. This has naturally made shrimp farming one of the most lucrative and potentially profitable businesses out there. A new study by Sustainable Fisheries Partnership (SFP) finds that shrimp farming can be a driver for mangrove protection and restoration, and in turn, help combat climate change and protect coastal communities and wildlife [6].

Sea cucumbers are also a good choice because they are bred locally in Dalian and can bring us high profits. Sea cucumber farmers from the coastal village of Tamp Love in southwest Madagascar recently experienced their largest-ever monthly harvest of over 5,500 sea cucumbers. Together, 78 farmers earned a net profit of \$4,800 – an average of over \$60 per farmer – after paying all operational costs themselves. In a region where the average income is less than \$2 per day, this is a potentially transformative sustainable income [7].

The benefits of it are it can be easier to get money, they just use the sea in reserve, and people don't need to find other places. This is the only way that is not eradicated in the reserve, the other ways such as putting fish into the web that are on the water are not allowed to keep in the reserve. It needs to pay attention that people need to find suitable sponsors and people to sponsor their breeding.

People need to carefully choose investors who are willing to invest and cooperate with breeding, and investors need to have enough strength. The technical aspects also need to be carefully considered. The selection of the species in Bohai Sea can effectively avoid some possible accidental alien species invasion. For example, if a fishing net is broken, even if the farmed shrimp and mussels flow into the sea, there will be no damage to the ecological structure. These varieties also need to be highly productive and easy to farm, and many varieties of shrimp and mussels from the Bohai Sea can be used as options.

3.2. Tourism

People can develop the science hall about the spotted seals, and some seals that are born in aquariums. There are some flids near the reserve, we can also develop the camping near the Lvshun station. People can also take a boat out to sea to see the seals as they migrate to the sanctuary. But there are two problems. The first is that the reserve is huge, and people may not encounter seals. The second is that spotted seals have been overhunted in the past and are afraid of humans, so humans can't see them up close, which makes it very cheap to take a boat out to sea. But there is still a solution. Seals have two important breeding sites that we can spot and observe. At the same time, after a long run-in, the seal will gradually relax its guard against humans, making it possible to observe the seal up close. But this will take a lot of time to achieve.

3.3. Cultural and Creative Industries

Seal personification to develop dolls and logos based on anthropomorphic characters, network platform publicity, and textbooks. For example, people can draw a cartoon seal and name it, and open an amusement park around it, write picture books, make logos, and so on. This can help people remember that the seal has a certain publicity function, and the public will pay attention to the leopard

seal as a nationally protected animal and then make some donations to help the seal. Let more people realize that there is another animal here that needs to be protected.

4. Conclusion

Protecting seals is everyone's responsibility. Through aquaculture and other ways, artificial breeding projects can be better carried out to achieve the purpose of protecting harbor seals. At present, the laws and regulations on nature reserves are very strict, for example, many places are forbidden to enter, and there are some strict regulations. Many enterprises cannot afford to break the law or are not qualified to develop them at all. So there's a lot that can be developed that can't be implemented, but it's still possible to improve the situation while protecting nature and seals. The most important problem at present is that businesses and self-employed people may not be able to bear the consequences of their violations, and no one dares to apply for some measures. Therefore, the final implementation can be done by the state, but at the same time, there will certainly be various difficulties in the process of doing these practical operations. Talent is also necessary to deal with difficulties and cope with unexpected situations. With the publicity and other efforts in place, people gradually realize that the seals are getting to know them, and more people will come to protect them. There are a few places where the logic written in this article might be useful. In any case, when people start to realize the importance of protecting the environment and start to act, there will not be a species that will quickly, quietly, and tragically disappear from the earth.

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