# Ministry of the Environment Erimo Area Kuril Harbor Seal Management Project Implementation Plan, FY 2023

March 2023

Hokkaido Regional Environment Office

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## Background

The Ministry of the Environment establishes an "Erimo Area Kuril Harbor Seal Management Project Implementation Plan" (hereafter the "Implementation Plan") every fiscal year in order to appropriately implement the project in accordance with the "Erimo Area Kuril Harbor Seal Specified Rare Wildlife Management Plan (hereafter the "Management Plan") (Phase II)", which was established in March 2021.

The goal of the Management Plan is to establish procedures for population management, damage prevention and the like in order to work toward present and future coexistence in the Erimo area between Kuril harbor seals and the local community, including the coastal fishing industry. The Ministry of the Environment will establish these procedures through partnership with various organizations, including the Hokkaido Government, Erimo Town, fishing industry associations, members of the fishing industry, local residents, related organizations, and universities and research institutions. Working toward the accomplishment of these goals, the FY 2023 Implementation Plan shall be defined as given below, taking into account the results of the projects implemented from 2016 to 2022.

# FY 2022 Project Implementation Results and Assessment

# 1. Damage Prevention Measures

The following initiatives were implemented in order to mitigate damage to the fishing industry.

(1) Improvement of fishing nets

Reduce damage to salmon trap nets caused by Kuril harbor seals, and in order to block entrance by Kuril harbor seals into bag nets, the Ministry of the Environment installed the damage preventing net (hereafter the "rope grids") at the tunnel entrance to the bag net in trap nets that were particularly susceptible to severe damage in the Cape Erimo area during the trap net fishing seasons in spring and autumn, and verified their effectiveness.



Fig. 1. Installation status of Rope grids



[Angled type]

[Horizontal type]

Fig. 2. Angled and Horizontal type of the rope grids

Salmon trap net	Sector name	Number of	Type of the rope grids	Period of time to verify
fishing season		nets with rope		effectiveness
		grids installed		
Spring	Тоуо	1	$20 \text{ cm} \times 20 \text{ cm}$ (horizontal)	5/9-6/28
	Тоуо	1	$20 \text{ cm} \times 20 \text{ cm}$ (horizontal)	
Autumn	Cape Erimo	3	18 cm × 18 cm	1 trap net:
			(horizontal • angled)	9/6-11/19
	Shoya	3	$18 \text{ cm} \times 18 \text{ cm} \text{ (angled)}$	

Table 1.	Fixed	trap	net with	the	rope	grids
1 4010 1.	1 IACU	uup	net with		rope	Silus

\*Trap net fishing is not practiced in the waters east of Cape Erimo during the spring fishing season.

<Effect verification of the rope grids>

© Spring fishing season (Toyo sector)

The effectiveness of the rope grids was verified from May 6 to June 28, in one salmon trap net in the Toyo sector (West side of Cape Erimo), which was the same sector as in the spring fishing seasons from 2016 to 2021. The slit of the rope grids was 20 cm  $\times$  20 cm horizontal type (Dyneema - white).

The average weight of Salmon and Trout was calculated as 1.6 kg by extrapolating the catch provided by the Erimo Fishery cooperative to the number of catches recorded in the boarding survey. Based on the average weight of Salmon and Trout, the damage-to-catch ratio of Salmon and Trout during the period when the grid net was in place was calculated to be 1.5%. Compared to last year, which was the worst fishing year on record, the amount of damage increased, but the percentage decreased to about 1/3 due to the increased catch.



Fig. 3. Total catch size and damage-to-catch ratio of Salmon and Trout (Toyo sector seaward side)



Fig. 4. Total catch size and damage-to-catch ratio of Salmon and Trout (Toyo sector land side)

© Autumn fishing season (Cape Erimo sector)

The effectiveness of the rope grids was verified from September 6 to November 19, in one salmon trap net in the Erimo sector (Cape Erimo east side), which was the same sector as in the autumn fishing seasons from 2016 to 2021. The slit of the rope grids was mainly of  $18 \text{ cm} \times 18 \text{ cm}$  angled and horizontal type (Dyneema • white).

The average weight of salmon and trout was set at 3.3 kg/fish, and the damage rate of Salmon and Trout during the period when the grid net was set was calculated to be 0.6%. Compared to last year, the catch remained flat, but the amount of damage decreased to about 1/2. On the other hand, at the beginning of the fishing season when the grid nets were not set, the number of damaged fish exceeded the number of fish caught.



Fig. 5. Total catch size and damage-to-catch ratio of Salmon and Trout (Cape Erimo sector, net: southern seaward side)



Fig. 6. Total catch size and damage-to-catch ratio of Salmon and Trout (Cape Erimo sector, net: northern seaward side)



Fig. 7. Total catch size and damage-to-catch ratio of Salmon and Trout (Cape Erimo sector, net: southern land side)



Fig. 8. Total catch size and damage-to-catch ratio of Salmon and Trout (Cape Erimo sector, net: northern land side)

- (2) Assessment of damage control measures
  - The installation of rope grids can be confirmed to be effective in reducing fishery damage.
  - In recent years, there have been cases where the effect cannot be fully exerted due to damage to the bag
    net, which is thought to be caused by Kuril harbor seals, and damage to the grid net by large creatures such
    as Bluefin tuna, and blockage by Sunfish. Therefore, it is necessary to devise a usage method such as
    attaching a fishery fastener so that the grid net can be removed depending on the situation.

# 2. Population Management

The Ministry of the Environment captured seals using salmon trap nets, gillnets, in order to perform population management aimed at both mitigating damage to the fishing industry and maintaining a sustainable Kuril harbor seal population level. Further, attempts were made to capture seals alive to the greatest extent possible, and research data necessary for developing future measures was gathered, after which 2 of the captured individuals were fitted with EM transmitter tags attached to examine their behavioral zones, released and some others were euthanized by a veterinarian.

# (1) Capture using salmon trap nets

### © Spring fishing season (Toyo sector)

The effectiveness of rope grids was verified in one set net in the Toyo sector (West side of Cape Erimo), In order to catch Kurel harbor seals, a funnel-type capture net (hereafter the "capture net") with a funnel attached to a rope grid was installed. A total of 18 seals were captured in 38 days between May 12 and June 27, and one was released with an EM transmitter tag attached. The number of seals captured was up from 14 last year. Of the 17 Kuril harbor seals, excluding the released seals, 11 seals were adults. This is thought to be the result of working with fishermen to check underwater camera images and improving the capture nets to make it easier for Kuril harbor seals to get in but harder for them to get out. However, as in the previous year, there have been cases of fishing nets being broken. For the first time this year, damage to the rope grid part of the capture net was observed.

In order to reduce feeding damage and damage to fishing nets by Kuril harbor seals that enter into the bag nets, the pocket nets were tried again last year. The pocket nets installed this year are thought to be able to maintaintheir shape in the expected tidal currents, and the attachment points have been changed to prevent fish from accumulating and to make it easier to collect the Kuril harbor seals. Both last year and this year, the nets are drawstring in shape, the exit point is tied with a string, and when Kuril harbor seals are caught, the string is untied, and the seals are retrieved from the exit point. Last year, the only Kuril harbor seals we were able to collect from the exit were small ones that were thought to have been born that year, and we had to pull out the larger ones from the entrance to collect them, this year, the exit was made larger so that even large individuals could be collected through the exit, and the pocket nets were made thinner overall to better restrict the movement of seals in the nets. Also, the material used last year was difficult to collect because it became entangled in the seal's body hair, and this has been changed for this year.

In addition, an underwater camera was installed in the vault net to check the conditions under which the Kuril harbor seals enter the pocket net. The pocket nets are designed to allow the harbor seals to remain in the nets for an extended period of time, but images taken by the underwater camera did not show that the Kuril harbor seals remained in the nets for long periods of time. The Kuril harbor seals were allowed to progress up to halfway into the pocket net, but then they backed up and exited the pocket net. As a result, we recovered nine Kuril harbor seals from the pocket net. Two harbor seals were observed entering a pocket net after being startled by the sound of a ship's engine approaching the fixed net to lift the net, but many other Kuril harbor seals could not be seen entering the area due to poor images caused by silt and other factors. Thepocket nets were set to crawl on the ropes holding the fixed nets in place, but this had the detrimental effect oftangling the pocket nets in the ropes. In addition, it became difficult to install large buoys to ensure the

breathing of seals that had entered the pocket nets, and many small buoys were installed.



Fig. 9. Pocket net structure







X captured on the pocket net are as "●"

Fig.10(2) Shape of spring capture nets and duration of installation

### © Autumn fishing season (Erimo sector)

The effectiveness of rope grids was verified in one set net in the Erimo sector (East side of Cape Erimo), capture nets were set up between September 7 and November 23. The shape of the capture nets and the installation period are shown in Fig.11. A total of 10 seals were captured in 59 days, and one was released with an EM transmitter tag attached. In addition, nets were also set in 3 districts in the Cape Erimo and Cape Toyo, and a total of seven seals were captured in 18 days. Therefore, we were able to catch 16 seals, excluding released seals, in a total of 77 days in 4 districts.

Compared to last year, the number of large seals captured was low. One reason for this may be that Kuril harbor seals noticed that a portion of the vault nets in the fixed nets where capture operations are conducted every year were renewed and strengthened in FY2021, and Kuril harbor seals learned that it is difficult for them to enter the fixed nets. In addition, underwater camera images did not reveal many large individuals of Kuril harbor seals that were attached to the fixed nets, suggesting that the frequency of visits to the nets may be declining, Previous trapping programs may have reduced the population of the frequently visited Kuril harbor seals. To be able to capture the Kuril harbor seals even under these conditions, we worked with fishermen to improve the capture nets many times by checking the images from underwater cameras.







Fig. 11(2). Autumn fishing season capture nets

# (2) Capture using gillnets

On June 19, 15 seals were captured by gill nets in the rocky shore reefs of Cape Erimo.

### (3) Capture results

A total of 48 seals were captured using salmon trap nets, gillnets, etc. (This number does not include 2 individuals which were fitted with EM transmitter tags/patches and released.)

Until now, the age composition has been tabulated into four categories: juveniles (< 1 year old), juveniles (1 year old), sub-adults (2-4 years old), and adult seals (5 years old-). 1 year old and over, totaled in 3 categories of adults. However, the data was calculated in three categories: Pup / current year, 1 year old and over, and adults.

	Pup / < 1 year		Subadults	over 1 year	Ad	Total	
	Male	Female	Male	Female	Male	Female	Total
Spring salmon trap nets	1 1		1	3	1	10	17
Autumn salmon trap nets	1 2		4 7		1 1		16
Subtotal	5		15		13		33
Gillnets	4	8	0	2	0	1	15
Total	17		17		1	48	

Table 2. Kuril harbor seal capture results by capture method

### (4) Bycatch results

With the cooperation of fishermen, a total of 95 seals were recovered from the trap net. This is a large increase from the 55 seals recovered in the previous year. One reason for this increase may be that some fixed nets had their bag nets submerged several meters below the sea surface, resulting in an increase in the number of individuals that suffocated to death.

Table 3. Kuril harbor seal bycatch results by capture method

	Pup / < 1 year		Subadults	over 1 year	Ad	Total	
	Male	Female	Male	Female	Male	Female	Total
Spring salmon trap nets	0	0	2	0	0	0	2
Autumn salmon trap nets 28 2		21	16 23		1	4	93
Total	49		41		:	95	

#### (5) Assessment of population management

The result of the capture was 48 seals, which is close to the guideline for the number of seals to be captured of 53. Continuing from the previous year, we prioritized capture by trap nets, which is thought that the number of seals attached to the trap net could be reduced, which led to the reduction of fishery damage.

The spring fixed netting captured more seals than last year and was able to capture a high percentage of adult seals. However, the pocket nets were not as effective as expected. Therefore, it is necessary to make improvements such as changing the position of the pocket netting to make it easier for seals to enter and avoid suffocation. The number of Kuril harbor seals captured in the trap nets in the fall has decreased in recent years, suggesting that the trend of Kuril harbor seals may be changing.

# 3. Monitoring

- (1) Population size and structure
- Largest number monitoring

A monitoring survey was conducted using a drone (UAV). The largest population of Kuril harbor seals ashore on reefs is shown in Fig. 12.

# [Visual data]

<1983 – 2010> Survey report of one week during molting season (Kobayashi et al. 2014)

<2011 – 2019> Results of Tokyo University of Agriculture Long-Term Census – July through November (Kobayashi, unpublished data)

# [UAV data]

- <2017 2022> Census results from April to November centered on low tide time (Ministry of the Environment)
- \*\* UAV's have the advantage of being able to find hard-to-see individuals hidden in reefs, but they also have the disadvantage of not being able to fly in bad weather, such as under strong winds or in the rain. However, since it is considered difficult for harbor seals to come ashore during inclement weather, the drone census may be useful in determining the number of seals that have come ashore.



Fig. 12. Largest number of Kuril harbor seals ashore on reefs at Cape Erimo

- \* Largest number of Kuril harbor seals ashore on reefs, it seems that it has been on a downward trend since 2012. However, the results of wildlife census vary greatly from year to year, and it is necessary to consider changes in survey frequency and accuracy (Survey subject is not constant), landing frequency and detection rate due to capture (Implemented from 2016). Therefore, it is considered that the increase and decrease in the maximum landing population and the increase and decrease in the number of individuals in this graph do not always match.
- <Census method using UAV>

In conducting censuses by UAV, the Ministry of the Environment used video recording (ii. below), which enables the effective and efficient measurement of the population size in a short time, in addition to the still image recording (i. below) to generate orthographic images.

i. Still image recording settings to generate orthographic images (Measurement of individual population and size):

Still images were recorded with the altitude set at approx. 60 m, the front overlap ratio at 90% and the side overlap ratio at 40%.

Time required: approx. 1 hour

- ii. Simple settings only for population size measurement (Counting the number of individuals):Videos were recorded with the altitude set at approx. 110 m and the speed at10.5 m/sec.
- Population composition

The Ministry of the Environment captured drone images of rocky shore reef haul-out sites at Cape Erimo and to its west between March and November 2022, and based on measured data on the head-and-body lengths (from the tip of the snout to the base of the tail) of all individuals confirmed in those images, clarified the body lengths of Kuril harbor seals on the rocky shore reefs of Cape Erimo by season. Seasons were categorized as March, May-June, July-August, and September-November (Fig. 13).

In the spring breeding season, drone images captured numerous small individuals less than 100cm in length, and many seals born that year had come ashore. Further, a large number of individuals considered adults and measuring 140 cm or longer were also hauling out, it showed bimodal characteristics.

In the summer fishing season (July-August), the proportion of seals less than 100cm decreased. On the other hand, the autumn fishing season (September-November), the proportion of those less than 100cm further dropped, and that of those about 140cm became the highest, in particular, suggesting that many individuals of about 150cm use the haul-out sites.

Niizuma reported in 1986 that adult females appeared at haul-out sites after the pupping season began and their appearance rate plummeted after the molting season ended, suggesting that the haul-out frequency of adult females varies with season. The Ministry of the Environment surmised that the drop in the proportion of a smaller adult seals of 140cm in the autumn fishing season was due partly to a decline in the haul-out frequency of adult females.





Fig. 13(1). Histogram of body lengths by season





Fig. 13(2). Histogram of body lengths by season

# (2) Population trends

# • Autopsy examination of captured and by caught seals

Ecological data necessary to ascertain population trends (body length, body weight, age, sex, breeding conditions, etc.) was obtained from by caught and captured seals. Most of the captured individuals were subadults over 1 year and adults, and the bycatch seals have a relatively high proportion of juveniles (<1years old) (Fig. 14).



Fig. 14. Estimated age and sex of captured and bycaught individuals

Ages	Individual No.	Vivian No.	Data	Capture Bycatch	Full length	Body length	Bodyweight	Primary sperm cell	Sperm
0	EZ2211	EZ220603-1	2022/6/3	Captured	136.4	119.4	56	×	×
1	EZ2215	EZ220616-1	2022/6/16	Captured	144.3	126.2	60	×	×
1	EZ2242	EZ220903-1	2022/9/3	Bycaught	147.9	131.8	52	×	×
1	EZ22111	EZ220927-2	2022/9/27	Captured	150.2	132.9	59	×	х
1	EZ2248	EZ220905-6	2022/9/5	Bycaught	143	133.9	52	×	х
1	EZ22114		2022/9/28	Bycaught	149.7	134	55	×	×
1	EZ2295		2022/9/17	Bycaught	152.8	134.5	52	×	×
1	EZ2239		2022/9/3		152	134.6	51	×	х
2	EZ22131		2022/10/12	Bycaught	157	136.4	59	×	×
2	EZ2271		2022/9/8	Bycaught	155.6	136.7	51	×	×
2	EZ2292	EZ220917-1	2022/9/17	Captured	157.5	137.2	52	×	×
2	EZ2255		2022/9/5	Bycaught	156.5	137.9	55	×	×
2	EZ22106	EZ220924-1	2022/9/24	Captured	157.9	138.8	57	×	×
3	EZ2297	EZ220919-2	2022/9/19	Bycaught	167.9	144.9	75	0	×
5	EZ2284		2022/9/13	Bycaught	166.1	150	64	×	×
6	EZ22136		2022/10/17	Bycaught	170	149.5	62	×	×
12	EZ22120	EZ221001-1	2022/10/1	Captured	190.5	170.4	125	0	×
15	EZ2234		2022/6/24	Captured	208.7	186.2	132	0	0

Table 4. Breeding status of males

Ages	Individual No.	Vivian No.	Data	Capture Bycatch	Full length	Body length	Bodyweight	Presence or absence of fetus.	Corpus luteum	Corpus albicans
0	EZ2208		2022/5/21	Bycaught	127.9	111.4	55	Х	×	Х
1	EZ2206	EZ220521-1	2022/5/21	Captured	139.3	119.8	58	х	×	х
1	EZ2202	EZ220512-1	2022/5/12	Captured	135.7	120.4	52	Х	×	Х
1	EZ2266		2022/9/8	Bycaugh	139.1	123.2	52	Х	Х	Х
1	EZ2260	EZ220906-5	2022/9/6	Bycaugh	146.5	126.9	57	Х	×	Х
2	EZ2281	EZ220912-1	2022/9/12	Captured	145.2	129.1	51	Х	×	Х
2	EZ22141		2022/11/4	Bycaugh	141.7	131.8	54	Х	×	х
2	EZ2279	EZ220913-1	2022/9/13	Captured	149.4	132	52	Х	х	х
4	EZ22128		2022/10/12	Captured	149.2	135.9	59	Х	х	х
4	EZ2238		2022/9/2	Bycaugh	156.7	137.5	54	Х	х	х
5	EZ2249	EZ220905-7	2022/9/5	Bycaught	155.5	138.4	57	Х	х	×
5	EZ22110	EZ220927-1	2022/9/27	Captured	145.4	139.2	51	Х	×	×
5	EZ2291	EZ220916-1	2022/9/16	Captured	156.1	140.3	63	Х	×	х
7	EZ2232		2022/6/22	Captured	161.2	144.1	102	Х	Δ	0
8	EZ22113	EZ220927-2	2022/9/28	Bycaugh	165.5	144.5	76	Х	х	Δ
10	EZ2210	EZ220602-1	2022/6/2	Captured	170	148.5	98	Х	Δ	0
12	EZ22104	EZ220922-1	2022/9/22	Captured	172.8	151	77	Х	×	Δ
12	EZ2207	EZ220521-2	2022/5/21	Captured	169.5	152.6	114	Х	Δ	0
13	EZ2203	EZ220518-1	2022/5/18	Captured	174.9	154.3	99	Х	Δ	0
16	EZ2230	EZ220619-15	2022/6/19	Captured	174.2	158.9	87	Х	Δ	0
16	EZ22108	EZ220926-1	2022/9/26	Bycaugh	178.5	159.6	99	0	0	0
17	EZ2209	EZ220527-1	2022/5/27	Captured	184.9	161.7	109	Х	Δ	0
18	EZ2205		2022/5/18	Captured	182	163.2	115	Х	Δ	0
19	EZ2231		2022/6/19	Captured	191.2	166.1	103	Х	Δ	0
19	EZ2212		2022/6/14	Captured	188.1	166.6	102	Х	Δ	0
19	EZ22121	EZ221003-1	2022/10/3	Bycaugh	190.1	167.5	104	0	0	0
19	EZ2204	EZ220518-2	2022/5/18	Captured	190	169.5	97	х	Δ	0
19	EZ22115	EZ220929-1	2022/9/29	Bycaugh	189.5	169.8	102	0	0	0
20	EZ2233		2022/6/23	Captured	196.7	172.4	102	Х	Δ	0

Table 5. Breeding status of females

# • Investigate the range of activity of Kuril harbor seals

Two Kuril harbor seals captured by a trap net were attached with EM transmitters and released. Individual 1 (female 117kg) began investigation on June 18, but the transmission ceased on June 23 (Fig.15). Individual 2 (female 48kg) was attached with EM transmitters on October 27 and has been under investigation as of February 2023 (Fig.16). Individual 2 stayed around Cape Erimo.



Fig. 15. Behavior history of individual 1 (June 18-23)



Fig. 16. Behavior history of individual 2 (October 27 – February 2023)

# (3) Survey of the stomach contents of captured and bycaught individuals

The top three prey organisms in terms of the Proportion of Index of Relative Importance (IRI %) for each prey in capture were Salmonidae spp. (53.2%), Pleuronectidae spp. (30.5%) and Clupeidae spp. (15.4%) (Fig. 17). Also, the top three prey organisms in terms of the Proportion of Index of Relative Importance (IRI %) for each prey in bycatch were Osmeridae spp. (67.3%), Moridae spp. (19.3%) and Pleuronectidae spp. (3.9%) (Fig. 18).

A characteristic of this year's stomach content results is that many *Oncorhynchus keta* were detected in thecaptured individuals, indicating that individuals with a preference for *Oncorhynchus keta* were captured. The stomach contents of bycatch individuals were occupied by *Hypomesus japonicus* and *Physiculus japonicus* (*Physiculus maximowiczi*), and the previously important prey species, Octopodidae spp., tended to be unusually scarce. In recent years, *Scomber japonicus* and *Sardinops malanostictus* have been appearing. In addition, many undigested crustaceans were detected.



Fig. 17. Proportion of Index of Relative Importance (IRI %) of prey organisms among of captured individuals



Fig.18 Proportion of Index of Relative Importance (IRI %) of prey organisms among of bycaught individuals

\*IRI:

$$IRI_{i}(\%) = \frac{\{I_{i}(\%) + W_{i}(\%)\} \times Fo_{i}(\%)}{\sum[\{I_{i}(\%) + W_{i}(\%)\} \times Fo_{i}(\%)]} \times 100$$

Frequency of occurrence (Fo%): an index showing prey organisms being consumed at a high frequency = (Number of stomachs in which organism was found / number of individuals checked, excluding individuals with no stomach contents)  $\times 100$ 

Proportion of all prey represented by a particular species of prey organism (I%): an index showing prey organisms being consumed in large numbers = (number of particular organisms found / total number of organisms found)  $\times$  100 Weight ratio (W%): an index showing prey organisms being consumed in large amounts = (weight of particular organisms found)  $\times$  100 organisms found / total weight of organisms found)  $\times$  100

- (4) Assessment of monitoring
  - Since 2012, a declining trend has been seen in the number of individuals hauling out. However, because the results of population surveys of wild seals vary greatly from year to year, the frequency and accuracy of the surveys, variation due to capture, etc. must be taken into consideration. In addition to future longterm population monitoring, the frequency and accuracy of surveys need to be improved.
  - It is necessary to accumulate continuous data about population structure, genetic diversity, infectious disease, etc. Further, investigate the range of activity of Kuril harbor seals, in addition to working toward the accumulation of information about large individuals, both of which are currently insufficient, it is necessary to continue monitoring and fully understand sea conditions and any variation in seal activity accompanying population management.

# 4. Survey of the Damage Done to the Fishing Industry

(1) Survey of damage done to the fishing industry of trap net in autumn

An understanding of the damage done to the fishing industry was gained through the analysis of questionnaires completed by autumn salmon trap net fishermen in the Erimo area (representing a total of 21 nets) which recorded the number of fish damaged on each fishing day. In the Erimo area as a whole, the number of Salmon catches and the number of Salmon fish damaged have continued to decline since 2018. The percentage of damaged fish is 1.9% in 2021, but increased to 2.4% in 2022 (Fig.19). By sector, the Toyo sector showed a marked increase in the percentage of affected fish (Fig.20).



Fig. 19. Changes in damage done to the fishing industry of trap net in autumn across the Erimo area.



# (2) Assessment of the damage done to the fishing industry

Regarding the catch, the record poor catch that has continued since 2016. The percentage of affected fish has increased since 2020, However, existing studies suggest a negative correlation between catch and the percentage of affected fish. The percentage of affected fish in the Toyo sector has increased significantly, and the damage situation in each sector has also changed. Further studies on the damage should be continued and a long-term assessment should be made.

# 5. Public Awareness

(1) Communicating information both inside and outside the Erimo area, and public awareness

- Traveling to Erimo Elementary School to give classes, we explained the ecology of the Kuril harbor seal and its relationship to the fishing industry.
- In order to disseminate accurate information abroad, the FY 2022 Implementation Plan was translated into English and made available on our website: <u>http://hokkaido.env.go.jp/post\_34.html.</u>

# (2) Transferring seals to aquariums and zoos

In order to make effective use of individuals captured in living organisms and to disseminate information on this project, we will respond as much as possible to requests for transfer to zoos and aquariums, but no seals were transferred, due to a lack of requests in 2022.

	Institution	Number of individuals transferred		
	Noboribetsu Marine Park Nixe (Noboribetsu City, Hokkaido)	1 (1 female juvenile)		
	New Yashima Aquarium (Takamatsu City, Kagawa)	4 (3 female juveniles and 1 male juvenile)		
2016	Ueno Zoological Gardens (Taito City, Tokyo)	1 (1 female juvenile)		
	Kamogawa Seaworld (Kamogawa City, Chiba)	1 (1 male juvenile)		
	Yokohama Hakkeijima Sea Paradise (Yokohama City, Kanagawa)	3 (3 female juveniles)		
2017	Yokohama Hakkeijima Sea Paradise (Yokohama City, Kanagawa)	2 (1 female juvenile and 1 male juvenile)		
	Total transferred to date	12 (9 female and 3 male juveniles)		

# Table 6. Kuril harbor seals transferred to date

\*Additionally, a weakened individual (1 male juvenile) that washed ashore in Erimo Town in 2016 was transferred to Ouchiyama Zoo (Taiki Town, Mie Prefecture) in November 2017.

- (3) Assessment of public awareness
- The effort to gain the understanding of local residents and foreign countries were furthered through communicating information inside and outside the Erimo area. Further, communicating information outside of the area created opportunities for information exchange with experts and others. It is necessary to continue to find good opportunities for communicating information in the future.
- It is considered difficult to transfer a large number of individuals due to institutional issues including the conditions of individuals to be transferred and limits to the number of individuals that can be accepted by host institutions. However, it is necessary to continue working to raise public awareness in partnership with related organizations.

# 6. Interim Evaluation

Based on scientific findings, an interim evaluation of the Interim Evaluation (2nd period) was prepared. In preparing it, we comprehensively analyzed and evaluated the past projects, including the results before the Interim Evaluation (2nd period).

### FY 2023 Project Implementation Plan

#### 1. Damage Prevention Measures

Based on results of the various damage prevention measures that have been implemented to date, the following initiatives will be implemented to establish new and improved methods for mitigating damage to the fishing industry.

Furthermore, these methods will be implemented in collaboration with researchers and other related parties, and with adequate consideration of opinions from local fishermen; in addition to presenting the results of experimentation to the community at reporting and conference meetings, etc., advice and suggestions will be gathered for more effective damage prevention efforts, etc., and these will be reflected in the Implementation Plan for the following fiscal year.

#### (1) Improvement of fishing nets

Promote further improvement of trap nets through methods (e.g., installation of rope grids, pocket nets) that are expected to reduce fishery damage and improve capture efficiency. Regarding improvements to nets, During the salmon trap net fishing seasons in spring and autumn, effect verification will be conducted on damage preventing trap nets, where damage is particularly severe in the Cape Erimo area.

#### (2) Gathering information on damage management

• We will collect other examples of measures to prevent fishery damage using marine mammals, such as chasing away, learning seals, and repellent devices for the purpose of preventing fishery damage.

#### 2. Population Management

The following initiatives will be implemented in order to perform population management aimed at both mitigating damage to the fishing industry and maintaining a sustainable Kuril harbor seal population level.

- (1) Because damage prevention alone is not enough to prevent increases in the scope of damage, Kuril harbor seals will be captured in cooperation with members of the fishing industry, with the aim of mitigating damage to the fishing industry (preventing increases in the scope of the damage, reducing the severe damage to salmon trap nets, etc.), while also preserving the sustainability of the seal population. Furthermore, research has clarified that juvenile seals, which are susceptible to bycatch, but particular sub-adults and adults cause damage to salmon trap nets, the following methods will be employed toward establishing techniques to capture subadult and adult individuals preferentially.
  - In salmon trap nets where damage is particularly severe, seals will be captured using trap nets which may be capable of preferentially capturing individuals that come into or near to the trap nets.
  - Depending on the population management situation, individuals in the Cape Erimo area will be captured, as a supplementary measure, using gillnets (nets will be raised immediately after any Kuril harbor seal is caught) primarily.
  - In order to be able to preferentially capture damage-causing individuals, methods for distinguishing individuals that persistently attack salmon trap nets will be considered.

- Implementation of capture experiments using small trap nets, etc, by fisheries organizations in the Cape Erimo fishing port will be considered.
- More effective yet still feasible capture methods will be considered through exchanging ideas with members of the fishing industry, other experts, and so on.
- In recent years, when installing fishing nets with capture nets and damage preventing nets, direct damage to the fishing nets by Kril harbor seals has begun to be seen, and in response to this, fishing nets aimed at reducing damage when installing capture nets.
- (2) The number of individuals to be captured will be determined based on the following considerations.

<Current habitat situation>

In recent years, the largest number of Kuril harbor seals hauling out at a single time in the Erimo area has been on a growing trend, rising from 400 individuals to around 600 individuals. The estimated population size, taken from the largest number of individuals hauling out at a single time corrected using the haul-out ratio and discovery rate, is approximately 1,000 individuals. Further, the average population growth rate over the past 30 years has been 5% (Matsuda et al. 2015).

<Considerations essential for determining the number of individuals to be captured>

- Examination will be conducted based on the number of individuals captured over the course of seven years from 2016 to 2022 and the number of individuals to be captured will be determined based on the findings.
- The following will be considered when determining the number of individuals to be captured: mitigating damage to the fishing industry, while also guaranteeing population sustainability so that the Kuril harbor seal does not once again become threatened and keeping the probability of extinction within 100 years to under 10%, all with continuing management beyond 2023 as a necessary condition.
- In light of the reality that the Kuril harbor seal was only recently reassessed from the status of Threatened to Near Threatened, that the Erimo population is highly occlusive, and that there are a number of uncertain elements in the estimates of population size, population structure and ecology, it is necessary to sufficiently account for the safe sustainability of the population.
- The number of individuals to be captured must be adjusted flexibly in consideration of the number of bycaught individuals and imbalances in sex and age among captured individuals (for example, in cases when a high number of adult females, who strongly influence population trends, have been captured, or in cases when the number of juvenile bycatch deaths has decreased).

- <Determining the number of individuals to be captured>
  - In the current resource management simulation, which takes the number of bycaught individuals, infectious disease outbreaks and the like into account, the probability of extinction within the next 100 years is nearly 0% if the population in 2024—when Phase II of the Management Plan ends—is managed at a level that is 80% of the population at the time the Management Plan was established (March 2016), and if this level is maintained from 2024 onward (Kitakado 2019). Therefore, the Ministry of the Environment has determined, through an estimation of population dynamics taking the population growth rate and other factors into account, that 50 seals are to be captured annually during Phase II of the Management Plan (Fig. 23). In the event that the number of individuals captured in a single year is too low or too high, we will listen to the opinions of the Scientific Committee and adjustments will be made in the number of individuals to be captured in the following year.
  - Approximately 55 seals (excluding released and bycaught individuals) are to be captured in 2023. This number was calculated by adding to the annual 50 seals a shortfall of 5 from the 53 which had been estimated for 2022.
  - When the number of catches reaches 55 individuals, which is a guideline, individuals attached to the salmon trap net are confirmed, and if there is concern about fishery damage, the salmon trap net will continue to be caught from the viewpoint of reducing fishery damage. However, the maximum number of individuals is 20% of the total number of catches.



Fig. 21. Results of the reassessment of the number of individuals caught

\*Population dynamics were predicted when 50 individuals were captured over the next year, taking into account the 2022 cature record.

<Adjustments and changes to the number of individuals to be captured, etc., and procedures for determining the number in future years>

- The number of individuals to be captured in 2024 and beyond will be approximately 50 per year, in principle, and adjusted according to the excess or deficiency in the number of individuals captured up to the previous year.
- The maximum number of individuals to be captured each year will be reexamined after hearing the opinion of the Science Committee.
- From a viewpoint of adaptive management, the information necessary for reexamining the plan will be gathered, a sustainability assessment will be performed, and a new Implementation Plan with the number of individuals to be captured will be established every year.
- (3) The following other considerations will be made regarding population management.
  - In the event that sudden changes in population conditions due to an unforeseen circumstance, such as an epidemic outbreak, are discovered in the population, the number of individuals to be captured may be flexibly reassessed even during a year in which capture is being conducted.
  - To the fullest extent possible, the Ministry of the Environment will effectively put captured individuals to practical use, including use for research in order to gather data which will facilitate appropriate population management, and strategically raising individuals and transferring them to zoos and aquariums for educational and other purposes. Moreover, in cases when captured individuals are to be euthanized, a method will be employed which limits their suffering to the greatest extent possible.

### 3. Monitoring

Surveys covering the following items will be conducted in order to appropriately manage the Kuril harbor seals by verifying project implementation effectiveness and reflecting feedback about the population's situation into the Management Plan. Moreover, as a part of adaptive management, survey items may be added as necessity dictates.

Further, in order to examine project assessment and future management plans, the Ministry of the Environment will examine necessary surveys and assessment methods, through a monitoring working group, etc.

- (1) Population size and structure
  - Accurate haul-out numbers will be surveyed by performing counts of the number of individuals hauling
    out using visual observation from on land and images captured by drone or other unmanned aerial
    vehicles (UAVs). The detection rate will be calculated from the counts obtained by UAV and visual
    observation, and attempts will be made to improve the accuracy of these measurements.
  - Regarding the timing of the UAV survey, if the survey conditions are met, it will be conducted regardless of the season.
  - Images captured by UAV will be analyzed (measurements of body length, girth, etc.) and all efforts will be made to ascertain the structure of the population.
  - In shifting the landing number survey mainly to UAVs in the future, we will organize the observation parameters needed to assess population dynamics.

- (2) Survey of the damage done to the fishing industry and of the effectiveness of damage prevention measures
  - In addition to requesting members of the fishing industry to record the damage situation (number of fish damaged, number of individuals bycaught) on each fishing day, information from shipboard surveys, etc. will be gathered, and the degree and extent of the damage will be ascertained. Multiple indices will be used in the assessment of the damage situation, including the damage-to-catch ratio, total catch size, total catch value, and others.
  - Surveys will be conducted on the stomach contents of bycaught and captured individuals to clarify the general situation of salmon predation by seals.
  - In trap nets where population management and damage control measures are being implemented, underwater cameras will be installed to survey the behavior of Kuril harbor seals and the status of salmon entering the nets.
- (3) Population trends
  - Ecological data which is necessary to ascertain population trends (body length, body weight, age, sex, blubber thickness, breeding conditions, etc.) will be obtained from bycaught and captured individuals.
  - Surveys will be conducted on Kuril harbor seal range, etc., using EM transmitters.
  - Specimens necessary for the analysis of infectious diseases, the population's genetic diversity and the like will be collected.

#### (4) Habitat

The Ministry of the Environment will gain the cooperation of members of the fishing industry and consider how to build a system for collecting and analyzing information which is necessary to gain a complete understanding of coastal ecosystems, including fish fauna as the seal's food sources.

(5) Assessment of sustainability

Population dynamics will be assessed based on quantitative analysis of monitoring results.

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