Ministry of the Environment
Erimo Area Kuril Harbor Seal Management Project
Implementation Plan, FY 2025

March 2025

Hokkaido Regional Environment Office

Contents

Background

The “Project Implementation Plan for the Erimo Area Kuril Harbor Seal Management Project of the Ministry of the Environment” (hereinafter referred to as “the Implementation Plan”) is formulated annually by the Ministry of the Environment in order to implement management actions appropriately, in accordance with the “Erimo Area Kuril Harbor Seal Specified Rare Wildlife Management Plan (Phase III)” (hereinafter referred to as “the Management Plan”), which was established in March 2025.

The Management Plan aims to establish methods for population management, damage prevention measures, and monitoring through collaboration between the Ministry of the Environment and a wide range of stakeholders, including Hokkaido, the Town of Erimo, fishery organizations, fishers, local residents, relevant associations, and universities and research institutions. The objective of the Plan is to promote long-term coexistence between the Kuril harbor seal population in the Erimo area and the regional community, including coastal fisheries.
In pursuit of this objective, and based on the results of projects implemented from FY2016 to FY2024, the Project Implementation Plan for FY2025 is hereby established as follows.

The project activities implemented in FY2024 for the management of the Kuril harbor seal in the Erimo area are summarized as follows.

Table 1. Project activities implemented in FY2024 for Kuril harbor seal management in the Erimo area

Category	Activity	Implementing Body
Damage Prevention	Installation of rope grids in salmon set nets (spring and autumn)	Ministry of the Environment; Fishers
Population Management	Spring capture: Capture in salmon set nets; trial use of pocket nets; capture using gillnets	Ministry of the Environment; Fishers
	Autumn capture: Capture in salmon set nets	Ministry of the Environment; Fishers
Monitoring	Study on movement range	Ministry of the Environment; North Ocean Animal Center
	Questionnaire survey on salmon fishery damage (autumn)	Ministry of the Environment; North Ocean Animal Center; Fishers
	On-board survey of salmon fishery damage (spring and autumn)	Ministry of the Environment
	Ecological examination of captured and bycaught individuals (sex, measurements, age, stomach contents, etc.)	Ministry of the Environment; North Ocean Animal Center
	Survey of hauled-out individuals (UAV/drone and visual counts)	Ministry of the Environment; North Ocean Animal Center; Obihiro University of Agriculture and Veterinary Medicine Kuril Harbor Seal Research Group
	Automatic counting system for haul-out individuals	Ministry of the Environment; Rakuno Gakuen University (Assoc. Prof. Ogawa)

Category	Activity	Implementing Body
Monitoring	Evaluation study of the Kuril harbor seal population	Ministry of the Environment; Tokyo University of Marine Science and Technology (Prof. Kitakado)
Outreach and Education	Publication of Council materials on the official website (including English versions)	Ministry of the Environment
	Wildlife observation tours	Erimo Town Tourism Association
	Outreach lessons at schools within Erimo Town	Ministry of the Environment; Erimo Town Board of Education; Schools
	Transfer of Kuril harbor seal individuals	Ministry of the Environment; Tokyo University of Agriculture (Prof. Kobayashi); Otaru Aquarium
	Educational observation events	Hidaka Promotion Bureau; Erimo Town; Erimo Town Board of Education; Erimo Town Historical Museum; Ministry of the Environment
Other	Collection of literature and information (damage prevention, infectious diseases, etc.)	Ministry of the Environment; Committee Members

1. Damage Prevention Measures

In order to mitigate fishery damage caused by Kuril harbor seals, the following measures were implemented.

(1) Improvement of fishing nets (installation of rope grids)

To establish effective methods for reducing fishery damage caused by Kuril harbor seals (hereinafter "seals"), rope grids were installed at the entrance funnels of the holding chambers of salmon set nets in the vicinity of Cape Erimo during the spring and autumn fishing seasons. The effectiveness of these installations was examined (Fig 1 and 2).

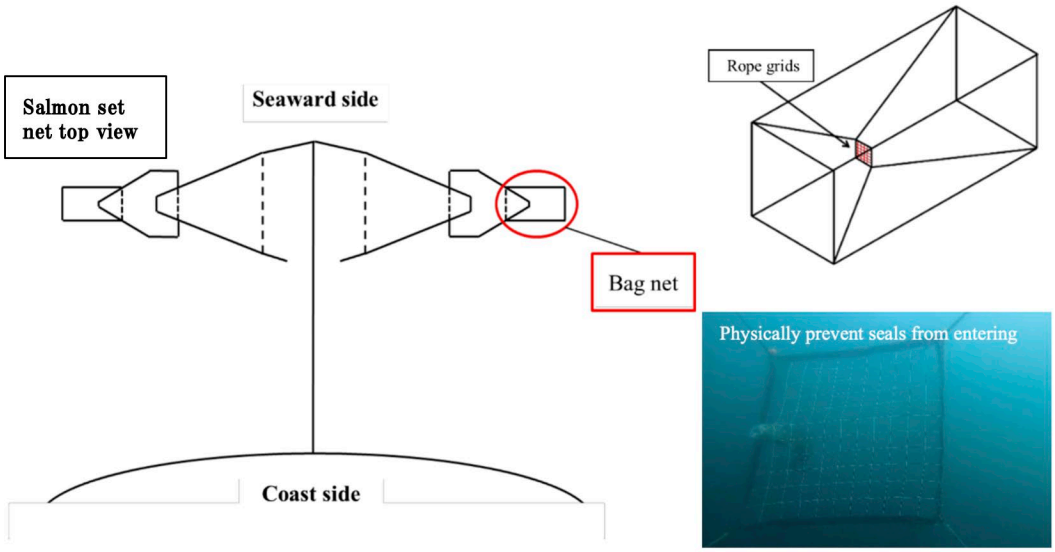


Fig 1. Installation position of the Rope grids

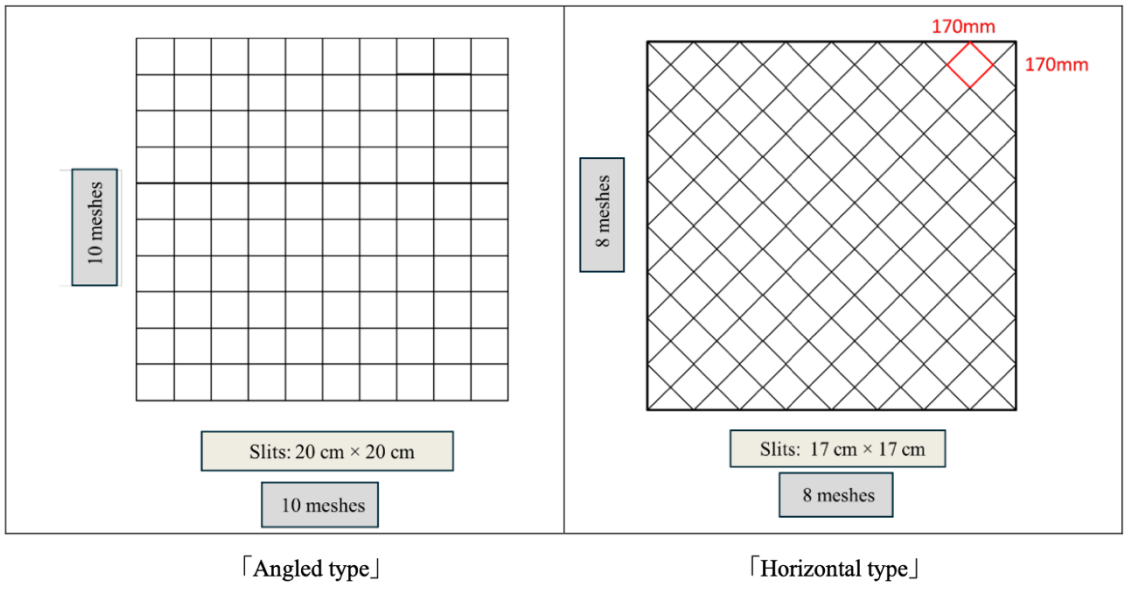


Fig. 2. Specification of Rope grids

<Effect verification of the rope grids>

Spring fishing season (Toyo sector), A rope grid was attached to one salmon set net in the Toyo sector (West side of Cape Erimo). The slit of the rope grids was 20 cm × 20 cm horizontal type (Dyneema, white).

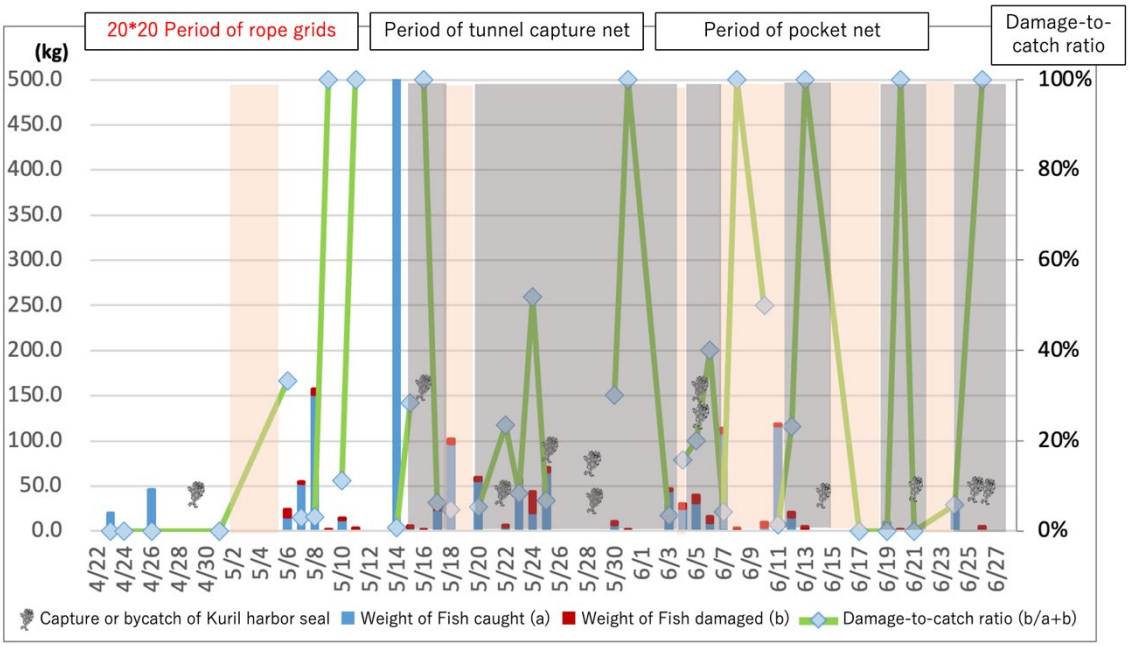


Fig. 3. Total catch size and damage-to-catch ratio of salmonids
(Toyo sector land side)

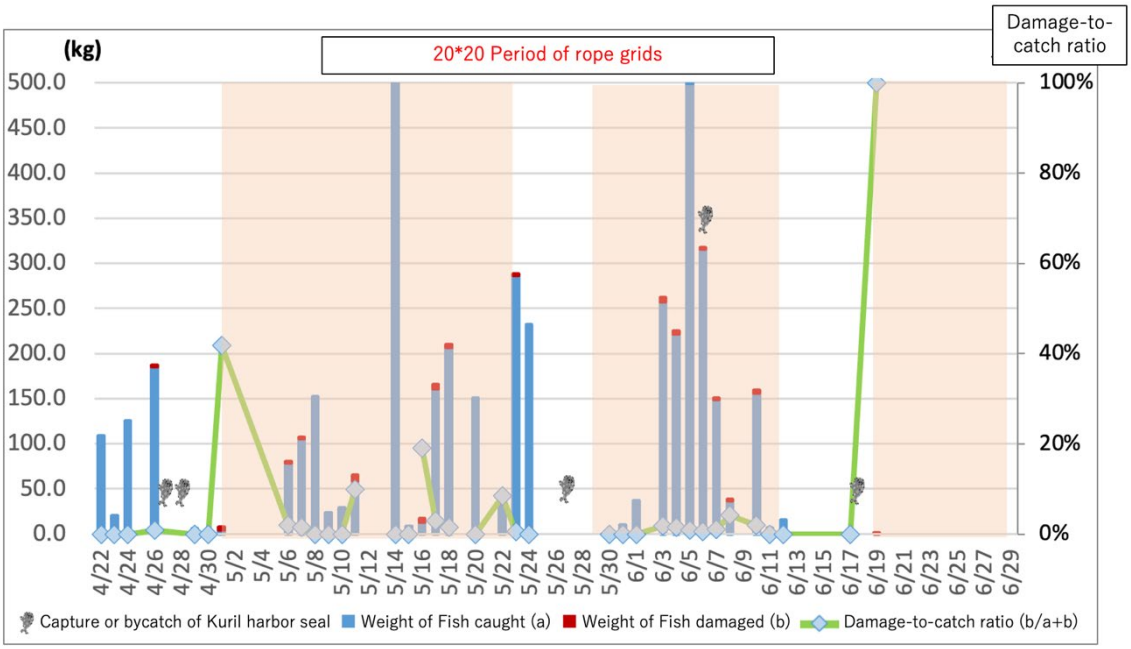


Fig. 4. Total catch size and damage-to-catch ratio of salmonids
(Toyo sector seaward side)

<Verification of the effectiveness of the rope grid> Autumn season

Among the salmon set nets in the Erimo-misaki area (east side of Cape Erimo) where rope grids (mesh size as shown in the figure; made of Dyneema; white) were installed, the results from the trap net located closest to Cape Erimo are presented.

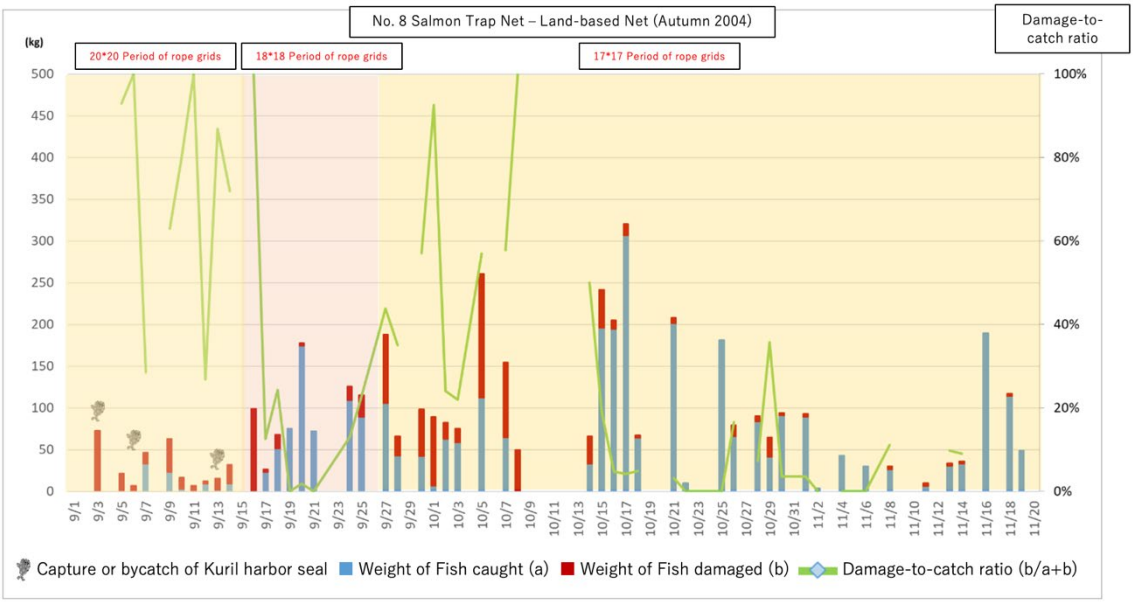


Fig. 5. Total catch size and damage-to-catch ratio of salmonids
(Autumn 2004, Cape Erimo sector, net: southern land side)

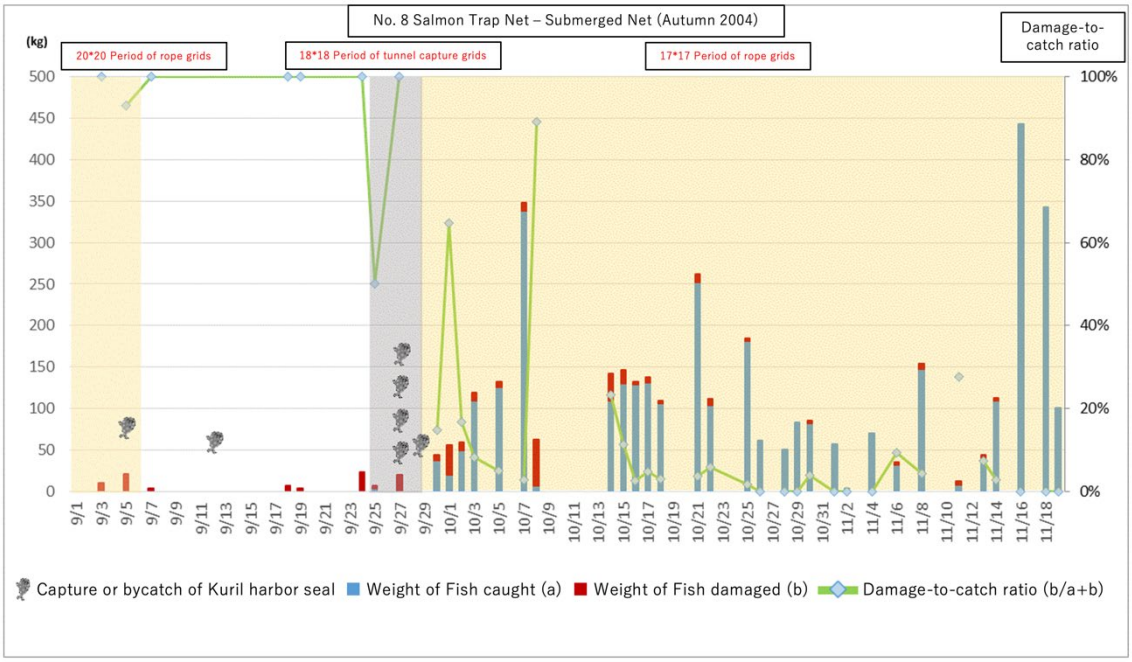


Fig. 6. Total catch size and damage-to-catch ratio of salmonids
(Autumn 2004, Cape Erimo sector, net: northern land side)

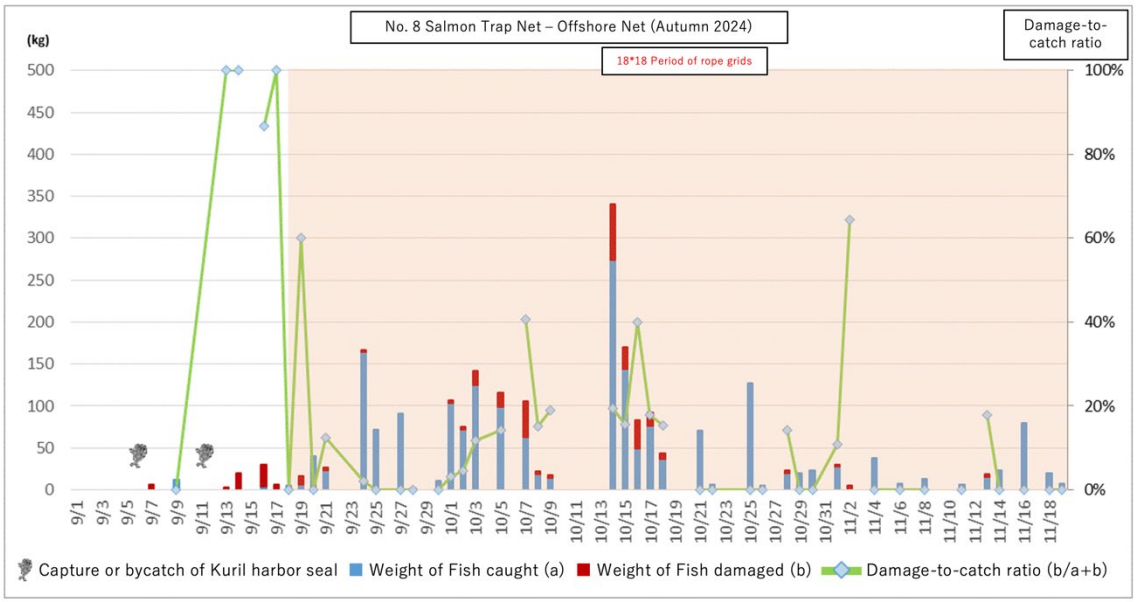


Fig 7. Proportion of catch weight and damage weight for salmonids
(Autumn 2024, Erimo-misaki area, offshore net)

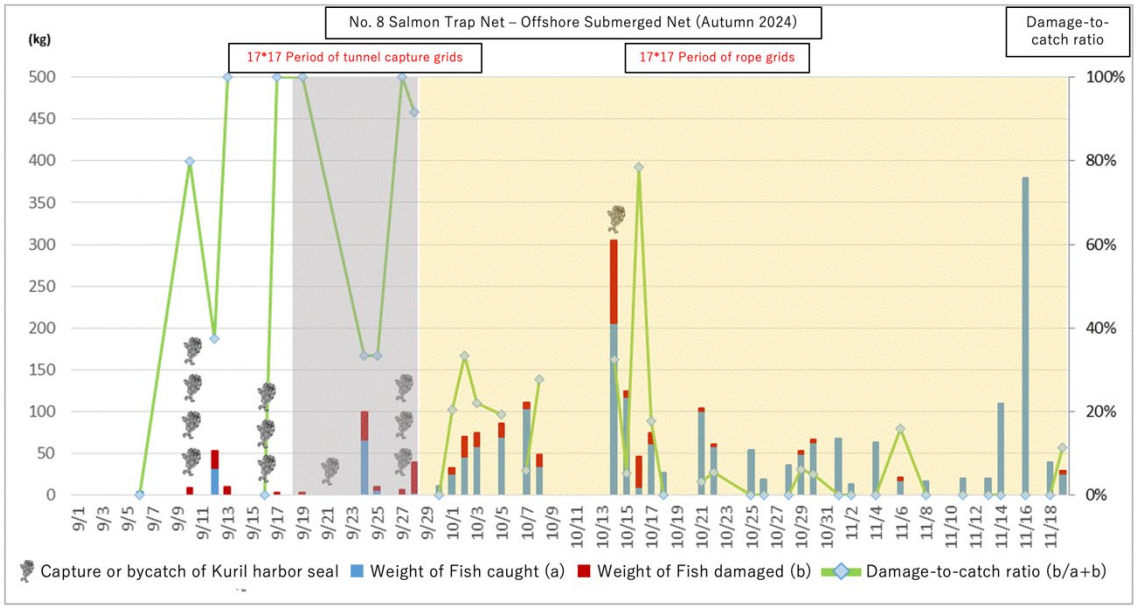


Fig 8. Proportion of catch weight and damage weight for salmonids
(Autumn 2024, Erimo-misaki area, offshore submerged net)

(2) Evaluation of Damage Prevention Measures

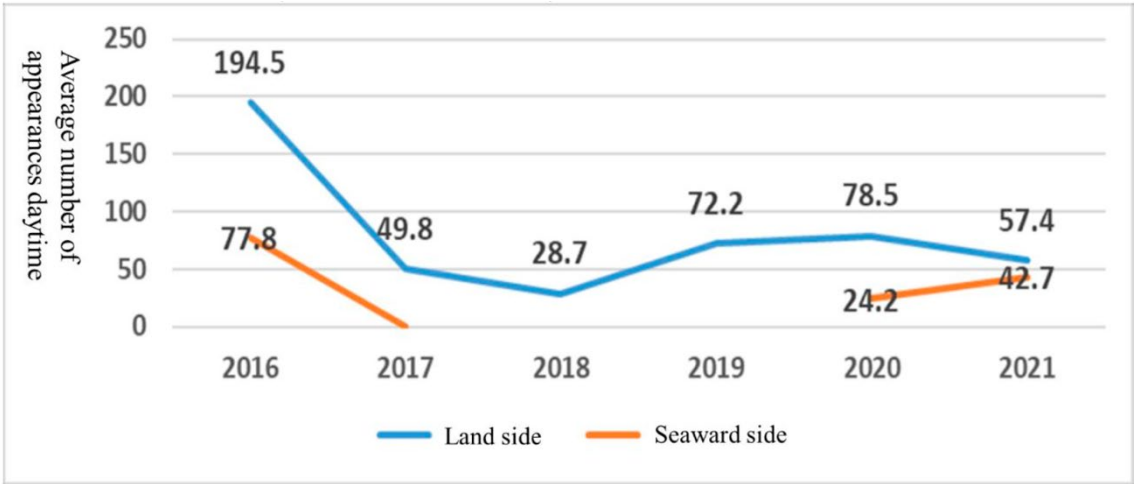
- It was confirmed that the rope grid can physically prevent seals from entering the holding chamber of the salmon set net, and is therefore considered effective in reducing fishery damage to fish that have entered the chamber.
- In salmon set net fisheries, which rely on the natural behavior of fish, there is concern that fish may avoid the rope grid and turn back. Given the current decline in returning salmon, which has also reduced the number of fish entering the holding chamber, such

concerns may increase. For this reason, it is desirable that the rope grid be used flexibly, installed or removed at the discretion of fishers, rather than being applied continuously throughout the season.

- In some cases, the grid sections became clogged with ocean sunfish or seaweed, preventing seal intrusion but also obstructing fish entry. Removing these obstructions required considerable time. Under current conditions, the rope grid is considered effective for preventing damage to fish.
- In recent years, damage to fishing gear caused by seals, such as breakage of the holding chamber or rope grids, has become more noticeable. It is believed that when a seal enters the holding chamber and fails to exit through the same entry point, it attempts to escape by tearing the chamber. In addition, the following comments were received from cooperating fishers involved in the damage prevention trials:
- "The exclusion grid net provides reassurance that seals cannot enter the bag net."
- "Recently, fish believed to be tuna that occasionally enter the salmon set net have torn through the rope grid while passing through, reducing its effectiveness. Is there no type of grid that would be suitable for all fish species?"
- "When the rope grid is installed, seals cannot enter the holding chamber and instead wait directly in front of the grid. Because fish turn back upon encountering the grid, their movement slows, and they are eaten by seals at that moment. Therefore, the rope grid is not always beneficial."

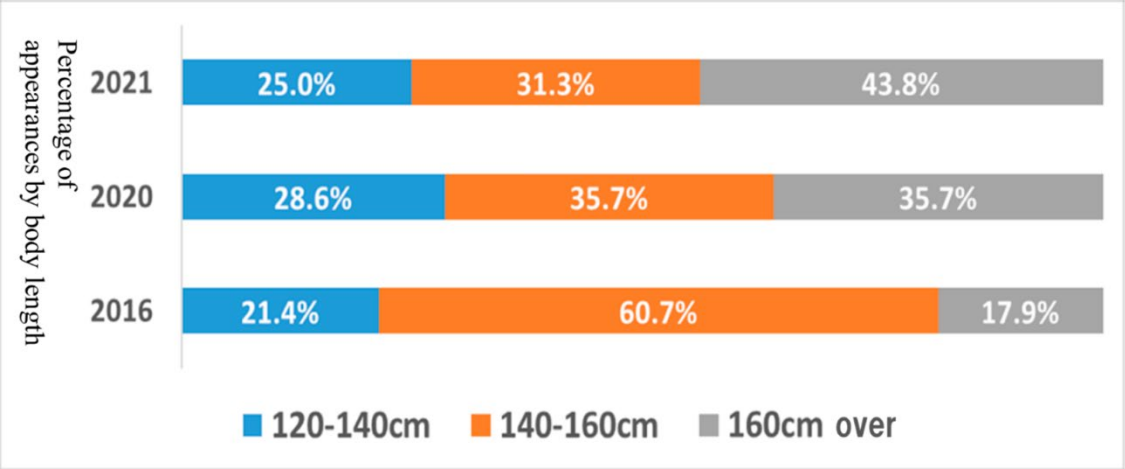
  → Regarding the material and design of the grid, further examination is needed. In addition, it is necessary to collect more underwater video footage to analyze the turning-back behavior of fish and develop appropriate countermeasures.

(ref.) Analysis of seal behavior using underwater cameras in No.9 salmon set net-1



→
- The decrease in appearances may be a result of the capture program.
- It is possible that the seals learned that entry to salmon set net was not possible due to the grid net being attached.

(ref.) Analysis of seal behavior using underwater cameras in No.9 salmon set net-2



→
- The proportion of small individuals (120–140 cm) was approximately 20–30%.
- Occurrence of medium-sized individuals decreased, while occurrence of large individuals increased.

*Although the number of "site-faithful" individuals repeatedly appearing at the same trap net has shown a declining trend, the number of individuals that appear to be visiting for the first time has increased.

2. Population management

In order to maintain a sustainable population level of seals and to implement management aimed at reducing fishery damage, two methods were carried out with the cooperation of fishers: "capture in salmon set nets," in which a capture net is attached to part of the trap net system, and "capture using gillnets," in which nets are set at the main bottleneck sections of the haul-out reefs at Cape Erimo where seals become entangled as they attempt to pass through.

In both methods, efforts were made to retrieve individuals alive whenever possible, and live animals were euthanized by a veterinarian before obtaining all necessary research data from each individual.

(3) Capture in salmon set nets, spring season (Toyo area)

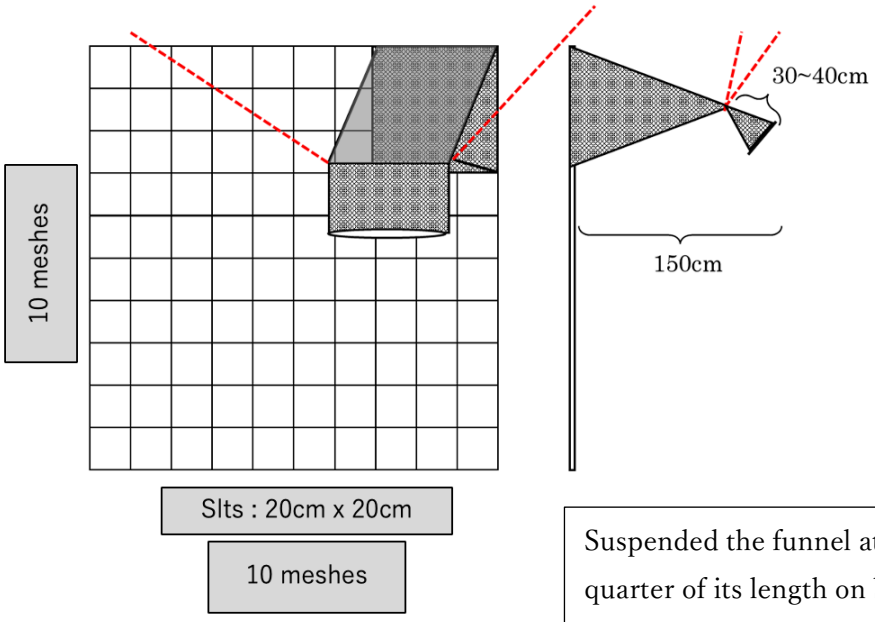
In one set of salmon set nets in the Toyo area (west side of Cape Erimo), a net specifically designed for capturing Kuril harbor seals was installed and used for capture. Two types of nets were used, and their specifications and installation periods are shown in Table 2.

Table 2. Nets used for capture in set-net operations and their specifications

	Capture net	Pocket net

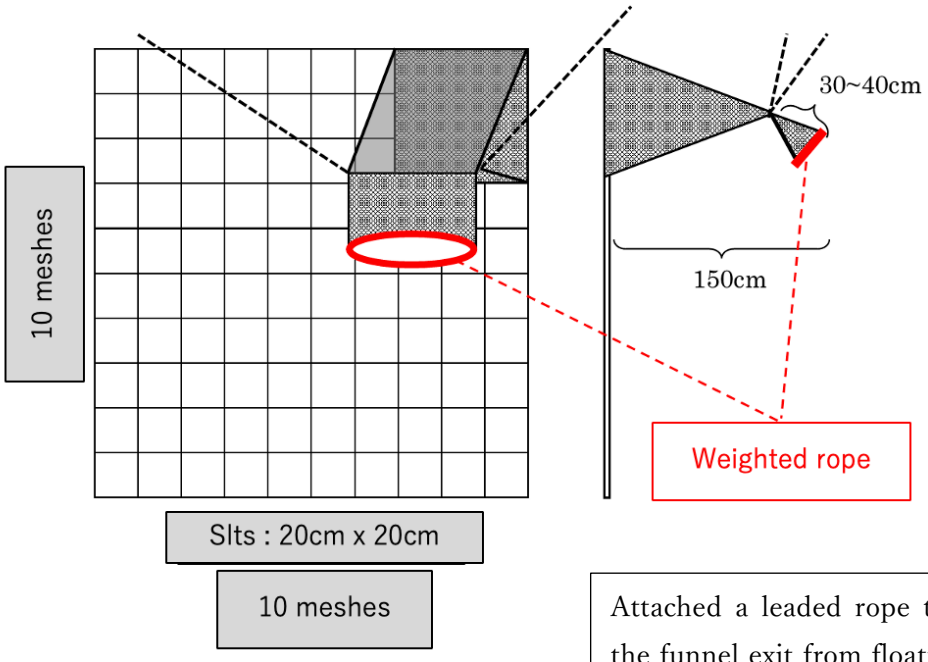
	(installed at the entrance funnel of the holding chamber)	(installed to extend outward toward the open sea from the holding chamber)
Specifications	This net consisted of a 200 cm × 200 cm grid net (20 × 20 cm square mesh) provided by the Ministry of the Environment, modified by attaching a funnel. The funnel entrance measured 60 × 60 cm and the exit 20 × 20 cm.	This net was made using a Russell-style stitch with mesh corresponding to “two-sun” size. The total length was 300 cm, with an entrance of 60 × 60 cm and an exit of 30 × 30 cm; the exit was pouch-shaped. The pouch was used in a tightened state and loosened when removing captured individuals.
Total number of installation days	30 days	39 days
Details	May 15–17, 20–June 3, 5–6, 12–14, 19–21, 24–27	May 21–June 27

Using the underwater camera installed simultaneously with the capture net, it was confirmed that individuals entering the holding chamber through the funnel were able to escape back out through the funnel, and therefore repeated modifications were made so that the funnel would allow entry more easily while making exit more difficult, resulting in the capture of a total of 11 individuals. The modifications applied are shown in chronological order.



Suspended the funnel at about one-quarter of its length on both sides, forming a shape in which the tip bends downward like a bow.

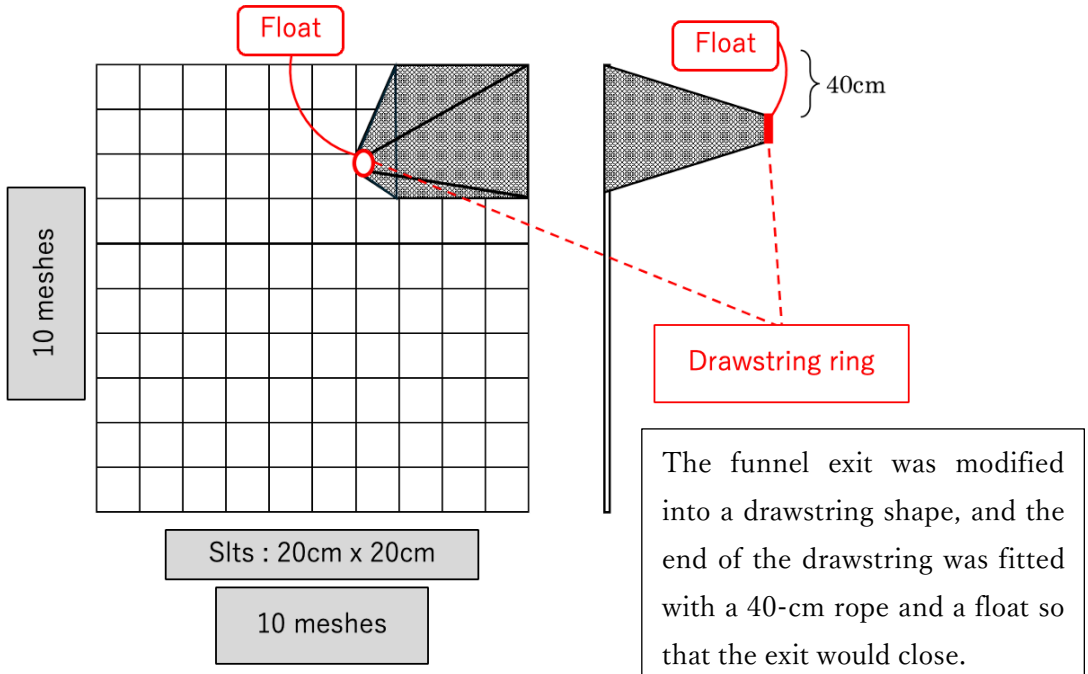
【Installation period】 May 15–May 18　　【Capture record】 1 individual



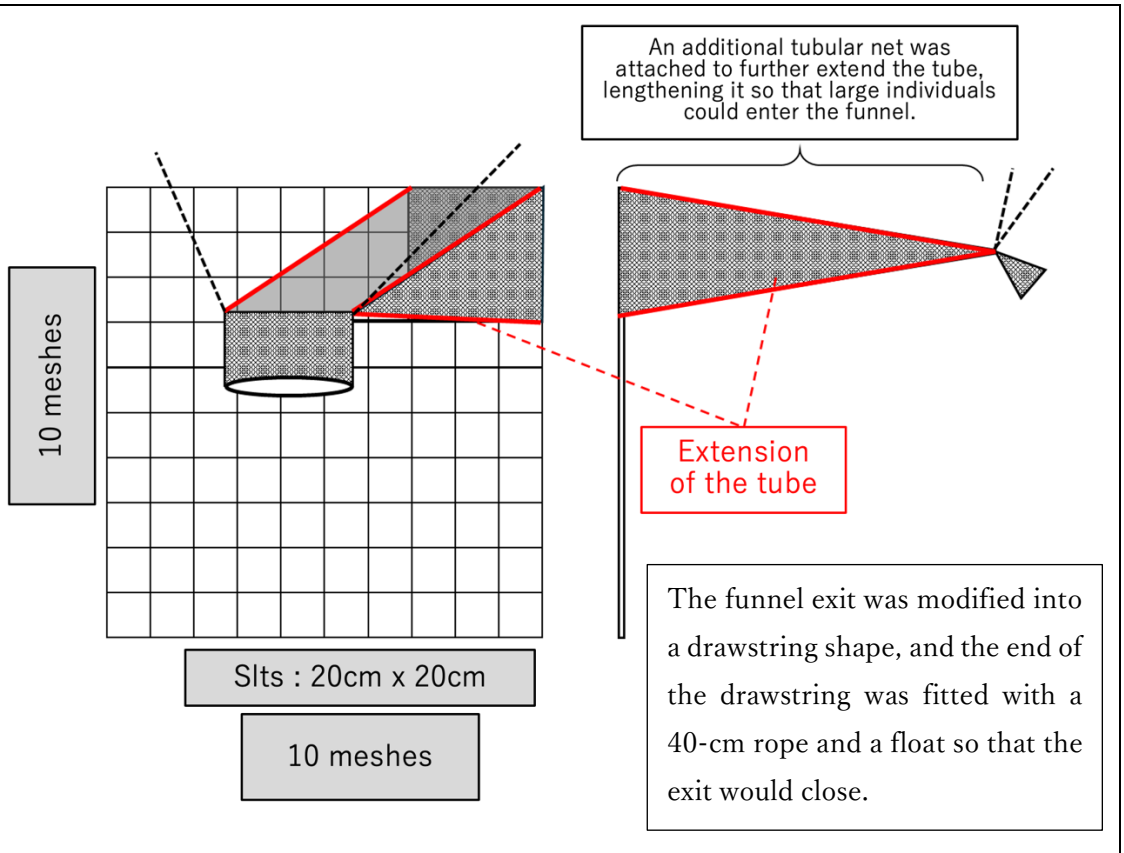
Attached a leaded rope to prevent the funnel exit from floating due to water flow.

【Installation period】 May 20–June 3

【Capture record】 4 individuals (including 1 individual in the pocket net)



【Installation period】June 5–June 6　　【Capture record】2 individuals



【Installation period】June 5–June 6　　【Capture record】2 individuals

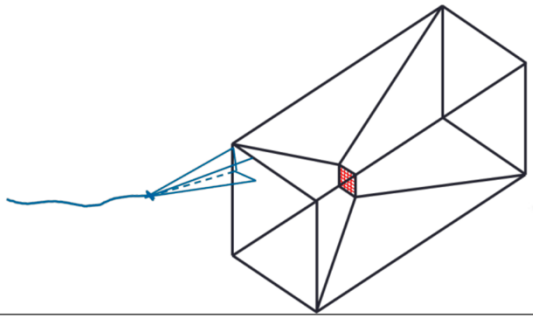
Figs 9–12. Shape of the capture net

The pocket net has been installed at the same location since 2022, taking into account tidal currents and ease of retrieval by operators. In addition to securing the pocket net with ropes to prevent twisting, floats were attached to ensure that seals entering the pocket net could continue to breathe. Weather and sea conditions caused delays before installation could be completed. Considering that no captures occurred during the short installation period last year, the installation period was extended.

	2021	2022	2023
Slts	121mm	60mm	60mm
Sewing method	Special node (unknotted)	Russell	Russell
Length	300cm	300cm	300cm
Entrance	60cm × 60cm	60cm × 60cm	60cm × 60cm
Exit	20cm × 20cm	20cm × 20cm	30cm × 30cm

【For 2024】

- The method of tension should be devised so that the net itself does not twist.
- Attach floats and Improve the tube wider so that seals in pocket nets do not have difficulty breathing.



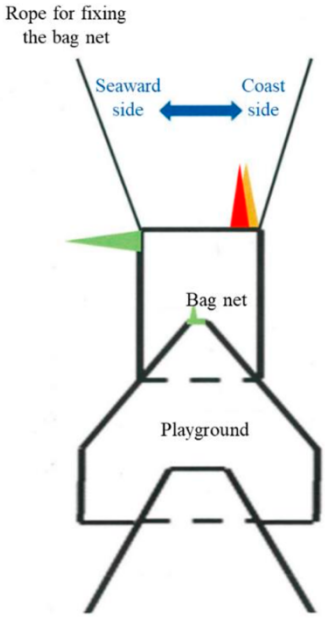


Fig 13. Structure and installation period of the pocket net

(3) Capture results

- Capture in salmon set nets

	Number of individuals	Age class / Sex ratio
Spring	11 (males 4, females 6, unknown 1)	Age 0: male 1, female 0 Age 1+: male 1, female 2, unknown 1 Adults: male 2, female 4
Autumn	16 (males 4, females 12)	Age 0: male 1, female 0 Age 1+: male 2, female 10 Adults: male 1, female 2 The two individuals that were released are not included in the capture total, as they were returned to the wild.
Total	27 (males 8, females 18, unknown 1)	Age 0: male 2, female 0 Age 1+: male 3, female 12, unknown 1 Adults: male 3, female 6

- Capture using gillnets

Two capture operations were conducted near the reef area of Cape Erimo on May 22 and June 21.

Date	Number of individuals	Age class / Sex ratio
5/22	20 (males 10, females 10)	Age 0: males 9, females 10 Age 1: male 1
6/21	15 (males 5, females 10)	Age 0: males 2, females 8 Age 1+: males 3, females 2
Total	35 (males 15, females 20)	Age 0: males 11, females 18 Age 1+: males 4, females 2

- Total number of captures

The capture target for FY2024 was 62 individuals, but a total of 64 individuals were captured, consisting of 29 individuals from salmon set nets and 35 individuals from gillnets. However, because the two released individuals are regarded as having been returned to the wild and therefore not counted as captured individuals, the total number of captures is 62, obtained by subtracting 2 from 64.

(3) Bycatch results

	Number of individuals	Age class / Sex ratio
Spring	10 (males 6, females 1, unknown 3)	Age 0: males 4, females 0 Age 1+: males 2, females 1 Adults: males 0, females 0, unknown 3

Autumn	60 (males 23, females 26, unknown 11)	Age 0: males 18, females 23 Age 1+: males 5, females 3 Adults: males 0, females 0, unknown 11
Total	70 (males 29, females 27, unknown 14)	Age 0: males 22, females 23 Age 1+: males 7, females 4 Adults: males 0, females 0, unknown 14

(4) Evaluation of population management

The capture target for fiscal year 2024 was 62 individuals. By September 28, a total of 64 individuals, including two designated for release, had been recovered as captured animals. Of these, the two individuals released during the home-range survey are considered to have been returned to the wild, and therefore are deducted from the capture total, resulting in a final capture count of 62 individuals.

Regarding captures in the set nets, 25 of the 27 individuals captured were aged one year or older, indicating that larger individuals, which are believed to cause greater fishery damage, were being selectively captured.

The pocket net used alongside the capture net in the set nets was meant to further restrict seals' movement by having them enter the pocket section after passing through the cod-end, thereby reducing fishery damage inside the cod-end. However, many recovered seals were found inside the cod-end, showing that the pocket net was not working effectively. Even seals recovered while inside the pocket net had been swimming within the cod-end until just before being caught and seemed to have fled into the pocket net in surprise upon hearing the approaching vessel. Continuing to use the pocket net would lead to time-consuming removal of jellyfish and seaweed that gather inside it, so fishers have requested that its use be discontinued in the future.

Regarding catches with gill nets on the rocky reefs of Cape Erimo, although five individuals aged one year or older were caught out of 35, the remaining 30 were pups, showing the same trend of a high proportion of pups seen in previous years.

In addition, bycatch totaled 70 individuals,10 in spring and 60 in autumn, with many age-0 pups caught in early September, consistent with trends observed in previous years.

3. Monitoring

(1) Population size and population structure

- Monitoring of maximum hauled-out individuals

In the population survey using drones (UAVs), besides capturing still images for orthorectification, video recording, which can be done quickly, was also performed when stormy weather was forecasted. The annual maximum number of hauled-out individuals is shown in Figure 14.

【Visual Observation Data】

- Obihiro University of Agriculture and Veterinary Medicine Harbor Seal Research Group

＜1983–2010＞

Survey results from one week during the molting season (Kobayashi et al., 2014)

＜1983–2023＞

Survey results including unpublished data

- Tokyo University of Agriculture

＜2011–2019＞

Results from long-term censuses conducted from July to November (Kobayashi, unpublished data)

【Drone (UAV) Data】

＜2017–2023＞

Census results centered on low-tide periods (Ministry of the Environment)

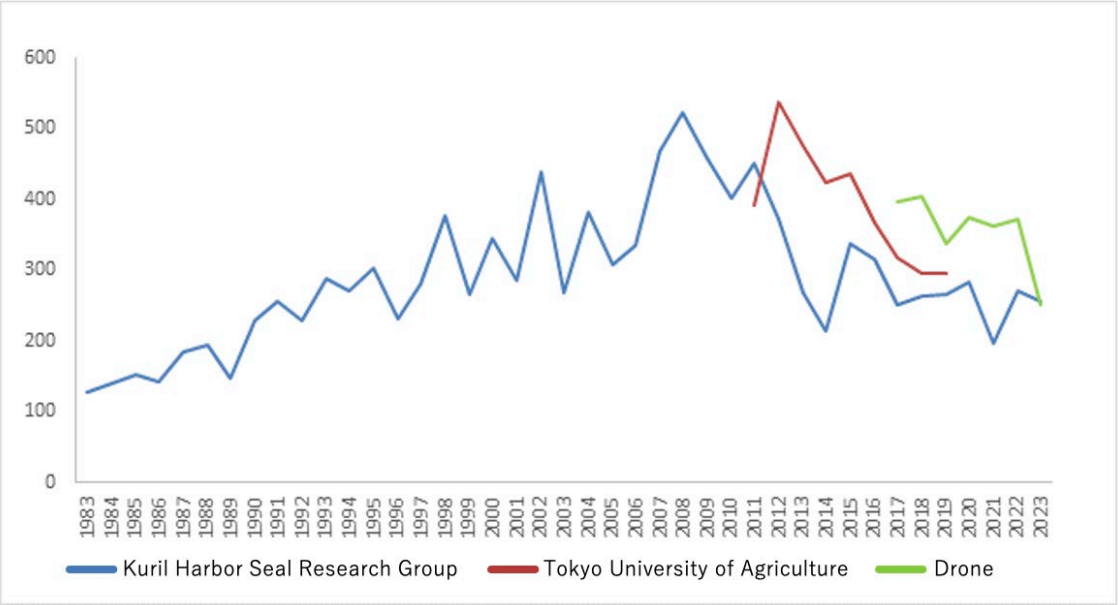


Fig 14. Maximum number of hauled-out Kuril harbor seals at Cape Erimo

※ Although the maximum number of hauled-out individuals seems to decline after 2012, population survey results for wild animals show significant annual fluctuations, influenced by factors such as survey frequency, survey accuracy (including variations among surveyors), and changes in the proportion or detection rate of hauled-out individuals caused by capture activities (implemented since 2016) must also be taken into account. In addition, in recent years, climate change has resulted in increased rainfall during seasons previously considered suitable for surveys, making surveys difficult to conduct. Therefore, increases or decreases in the maximum number of hauled-out

individuals do not necessarily correspond directly to increases or decreases in the actual population size.

※ The drone (UAV) method has the advantage of capturing images from above in areas that are physically unobservable from ground-based observation points, thereby reducing oversight; however, it cannot operate in windy, rainy, or stormy conditions. Since adverse weather often prevents flights at Cape Erimo, both visual and drone surveys will continue.

(2) Tracking range survey

Among the live individuals captured or bycaught and recovered in autumn this year, two seals that were estimated to be at least one year old and weighing at least 70 kg were scheduled to be released with satellite transmitters attached. In practice, an adult female captured on September 21 was released on September 25, and a male of at least one year old captured on October 3 was released on October 4, each fitted with a satellite transmitter and a flipper tag, from Erimo Misaki fishing port. Regarding the male of at least one year old, he was recovered several days after release as a bycatch mortality, and therefore currently only the adult female is being tracked.

(3) Establishment and verification of an automatic counting method for hauled-out individuals

The number of hauled-out Kuril harbor seals can be automatically detected with over 90 percent accuracy by using drone images captured under favorable conditions. The system is currently under trial operation and is expected to be operational starting in FY2025.

4. Survey of the Damage Done to the Fishing Industry

(1) Survey of damage status in fall set-net fishing

An analysis was conducted for the purpose of understanding the damage status based on a questionnaire in which all 20 fall chum salmon set-net fishery operators in the Erimo area recorded the number of fish damaged per fishing day. The most recent proportion of damaged fish was 1.9% in FY2021, 2.4% in FY2022, and 0.17% in FY2023 (Fig 15).

The catch of salmon species in the Erimo area as a whole has shown a declining trend from 2,752.7 tons in FY2018 to 130.9 tons in FY2023, which was the lowest catch ever recorded (Table 3). Alongside the significant decline in catches not only of salmon species but also of other species, the number of damaged fish has also continued to decrease.

Table 3. Number of fish caught (t) in the Erimo area autumn salmon set net fishery

	Total	Salmon	Yellowtail	Other
2023年	880.9	130.9	500.1	249.9
2022年	952.1	478.8	387.9	85.4
2021年	2,189.9	713.1	890.7	586.1
2020年	2,504.8	1,228.6	993.3	282.9
2019年	1,714.6	1,469.0	222.5	23.1
2018年	2,879.1	2,752.7	72.6	53.9
2017年	1,070.2	972.3	72.7	25.2

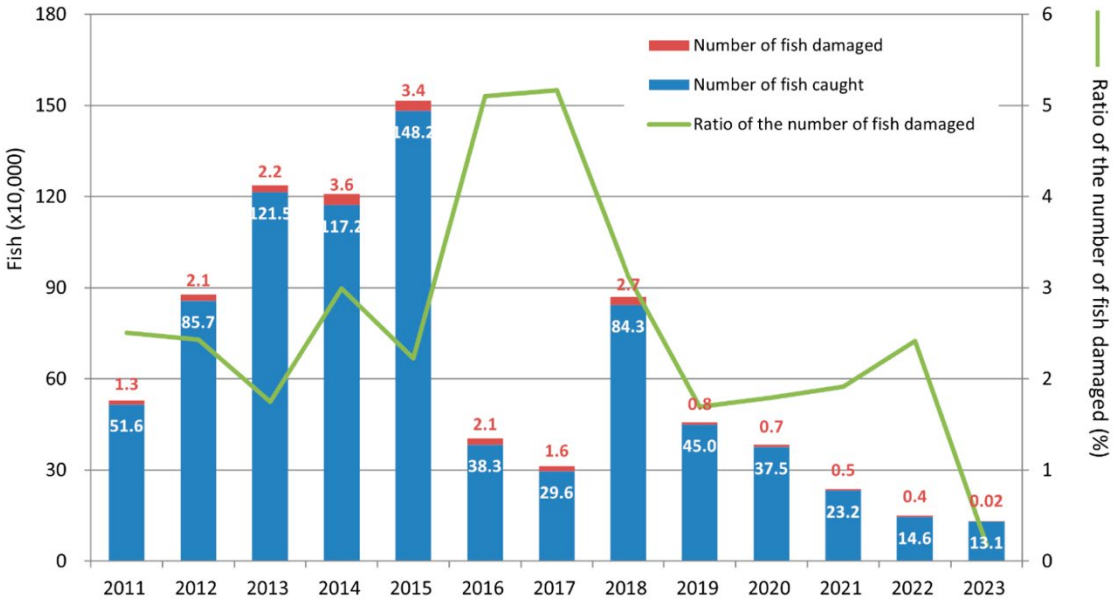


Fig. 15. Changes in damage done to the fishing industry of trap net in autumn across the Erimo area.

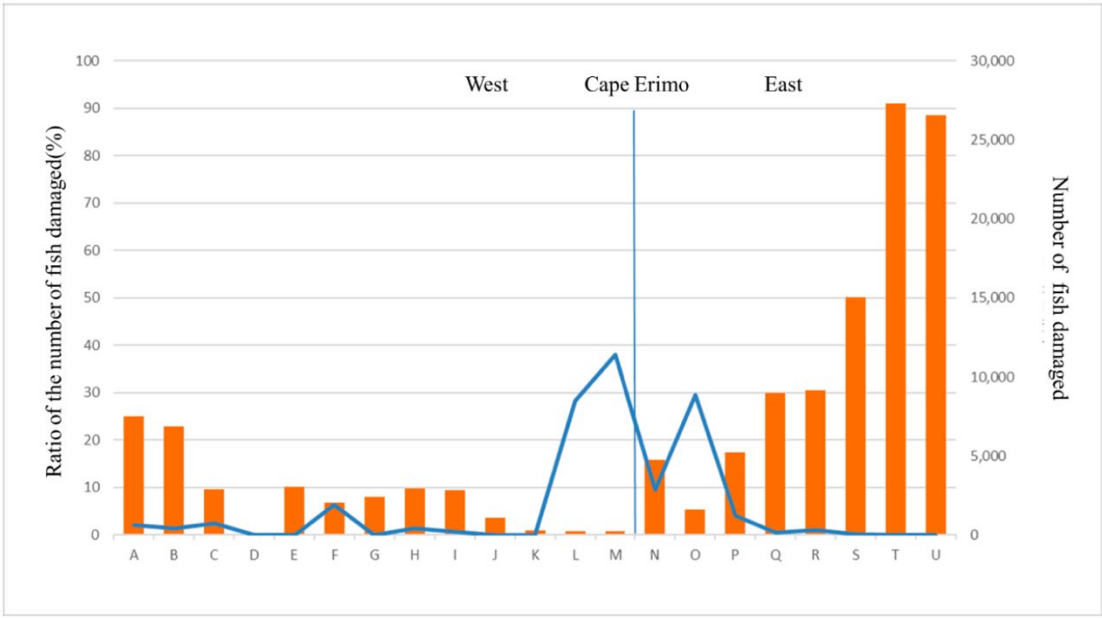


Fig16. Changes in damage to salmon in autumn salmon set net fisheries (by set net)

(2) Evaluation of the status of fishery damage

Catches have continued to be at historically low levels since around 2016, and since 2020 the proportion of fish damaged has increased. Because expansion of the fishery damage area is also suggested, and existing studies indicate a negative correlation between catch volume and the proportion of damaged fish, investigations of the damage situation will continue, and consideration will be given to whether region-specific countermeasures are necessary.

5. Public Awareness

(1) Transfer to aquariums and zoos

Captured or bycaught live individuals should be provided to animal care facilities upon request, as much as possible, to promote effective use and sharing of information related to this project. In fiscal year 2024, two pups caught on May 22 were transferred to the Otaru Aquarium through Professor Kobayashi of Tokyo University of Agriculture (see reference materials for details).

Table 4. Kuril harbor seals transferred to date

	Institution	Number of individuals transferred
2016	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)
	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)

※ 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.

FY 2025 Project Implementation Plan

1. Damage Prevention Measures

To reduce fishery damage, the following measures will be implemented based on the evaluations of non-lethal mitigation techniques conducted so far. These efforts aim to refine existing methods and develop new ones. During implementation, the opinions of fishers will be fully considered, and collaboration with researchers and other stakeholders will be ensured. The results of experimental improvements will be shared with local stakeholders at reporting sessions and council meetings, where advice and recommendations for more effective deterrence methods will be gathered and incorporated into the action plan for the next fiscal year.

(1) Improvement of fishing nets

○ Further efforts will be made to improve fishing nets, including installing exclusion grid nets and pocket nets that are expected to lessen fishery damage and increase capture efficiency in set nets. The effectiveness of these damage reduction measures will be tested in set nets around Cape Erimo, where significant damage was recorded during the spring and autumn fixed-net fishing seasons.

(2) Acoustic deterrents

○ Internationally, various acoustic deterrent systems, such as Acoustic Harassment Devices (AHDs), Acoustic Deterrent Devices (ADDs), and Acoustic Startle Devices (ASDs) utilizing Targeted Acoustic Startle Technology (TAST), have been reported to demonstrate measurable effects in reducing seal-induced fishery damage (Lehtonen *et al.*, 2022; McKeegan *et al.*, 2024; Veneranta *et al.*, 2024, etc.).

○ Regarding acoustic deterrents for reducing marine mammal interactions with fisheries, the most recent domestic and international case studies will be reviewed through literature surveys. Additionally, to prevent habituation, the use of acoustic deterrents in combination with other non-lethal mitigation techniques will be examined as part of a detailed plan for experimental implementation beginning in Fiscal Year 2026.

(3) Collection of information relevant to mitigation

○ Information will also be gathered on non-lethal methods besides acoustic deterrence, including hazing and conditioned taste or behavior aversion techniques.

○ Furthermore, behavioral analyses of Kuril harbor seals (*Phoca vitulina stejnegeri*) around fishing nets will be conducted using underwater camera footage obtained in previous years.

2. Population Management

To maintain the Kuril harbor seal population at a sustainable level and to reduce fishery damage, capture will be implemented with the cooperation of fishers, with the objective of reducing fishery impacts (e.g., preventing expansion of the damage area and reducing damage to specific set nets experiencing severe impacts) while ensuring population persistence.

(1) Capture methods

- ○ Based on previous investigations indicating that certain subadult and older individuals cause damage to set-net fisheries, priority will be given to capturing subadult or older seals that are either already exhibiting strong attraction to the set nets or are considered likely to develop such attraction in the future.
- ○ In principle, capture will be conducted in set nets where fishery damage has been reported and where the likelihood of capturing individuals responsible for the damage is high.
- ○ Efforts will be made to capture individuals identified as causing damage based on thorough observation of seals habituated to a specific set of nets.
- ○ Trials will be considered for small-scale set-net capture operations near the Erimo Fishing Port, led by local fishery organizations.
- ○ Discussions with fishers and experts will be held to examine capture and deterrent methods that are both effective and feasible.
- ○ In response to increasing damage to fishing gear, such as set nets, caused by Kuril harbor seals in recent years, measures to reduce such losses, especially during the period when capture nets are installed, will be considered.

(2) Capture numbers

Capture numbers will be established based on the considerations outlined below.

Current population status:

In recent years, the maximum haul-out count of Kuril harbor seals in the Erimo area has been decreasing, with 250 seals recorded via drone surveys in Fiscal Year 2023 and 257 seals in surveys conducted by the Kuril Harbor Seal Research Group, Obihiro University of Agriculture and Veterinary Medicine. The current estimated population, adjusted for haul-out proportion and sighting probability, is about 600 individuals, much lower than the roughly 1,000 individuals estimated at the start of the project in 2015 (FY 2015), and below the 20% reduction target set to lessen fishery impacts, which may indicate the population has roughly halved. (Fig. 17). Although the average population growth rate over the past 30 years has been around 5% annually (Matsuda *et al.*, 2015), capture pressure in recent years has surpassed

the natural increase rate. At the same time, enhancing the accuracy of monitoring remains an ongoing effort challenge.

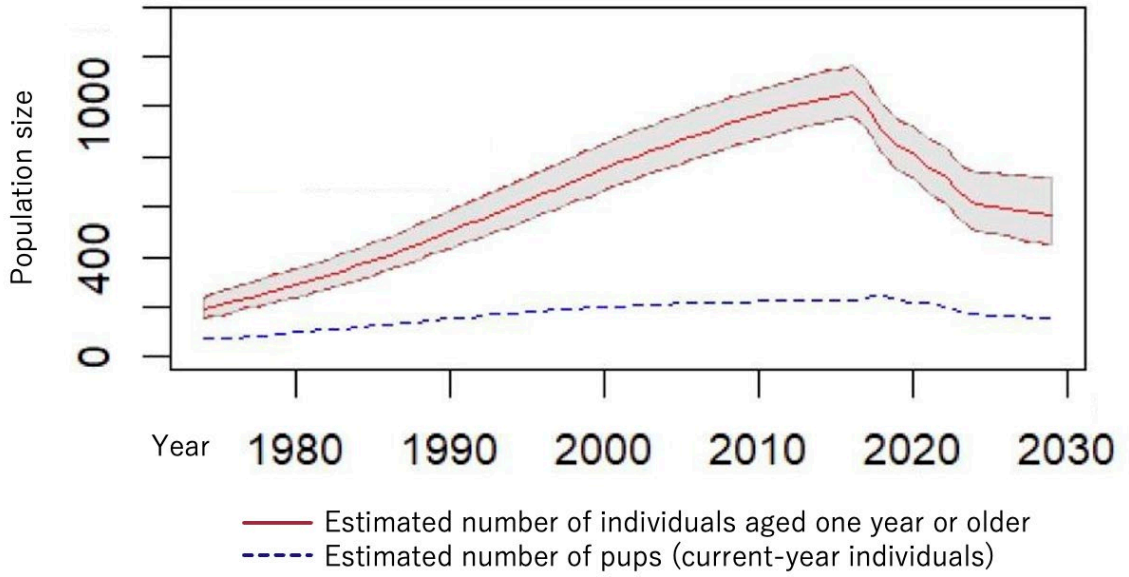


Fig 17. Projected abundance of Kuril harbor seals (*Phoca vitulina stejnegeri*) excluding pups, based on the population dynamics model, assuming annual removals of 20 individuals beginning in 2025.

*Results are provisional and may be updated following further model development.

<Basic considerations underlying the setting of capture quotas>

○ The capture quota will be determined based on an assessment covering the nine-year period from FY2016 (Heisei 28) to FY2024 (Reiwa 6).

○ When setting the quota and assuming that management will continue beyond FY2025 (Reiwa 7), attention will be focused on ensuring population sustainability to minimize fishery impact while preventing the Kuril harbor seal from being reclassified as a threatened species. Specifically, efforts will be made to keep the risk of extinction within 100 years below 10%.

○ Because the Erimo population of Kuril harbor seals is highly isolated both demographically and geographically, and because there are still uncertainties about population size estimates, population structure, and ecology, a precautionary safety margin for population persistence is necessary.

○ Capture quotas must be flexibly adjusted based on bycatch numbers and biases related to sex and age groups among captured individuals (for example, when a disproportionate number of adult females, which significantly influence population dynamics, are captured, or when bycatch mortality of pups decreases).

○ Mass mortality events linked to avian influenza virus among pinnipeds have been reported abroad, and in 2023, over 300 northern fur seals and Steller sea lions stranded on Tyuleny Island off Sakhalin (The Moscow Times, August 11, 2023), with the cause

still unknown. In the United States, along the coast of Maine, seal strandings have increased significantly since June 2022, and high pathogenicity avian influenza virus (HPAIV) was found in 17 of 35 sampled harbor seals between June and July (Puryear *et al.*, 2023). Therefore, the potential for a rapid population decline in the future must also be considered.

<Setting of capture quotas and related parameters>

○ The resource management simulation conducted thoroughly at the time of management plan formulation (2016) indicated that, unless a large-scale mass mortality event caused by infectious disease were to occur, the probability of extinction within 100 years was effectively 0% (Kitakado, 2019).

○ However, recent warming trends and associated changes in habitat conditions, including prey availability, may influence biological parameters for Kuril harbor seals. Therefore, capture quota settings must be more conservative than in previous years, and further improvements in monitoring accuracy will be required.

○ In the Erimo area overall, the percentage of damaged salmon in autumn set-net fisheries was 0.02% in FY2023 (Reiwa 5). However, since fishery catches have recently decreased significantly, this figure should be interpreted carefully. There is still a strong need to deter or remove individuals that consistently enter specific set nets.

○ Assuming that biological parameters haven't changed from previous conditions and monitoring conditions remain stable, population dynamics estimates based on observed maximum haul-out counts suggest that maintaining the current population level would be feasible if the upper limit of annual captures in FY2025 (Reiwa 7) is set at approximately 20 individuals (excluding those released after movement tracking and those caught by bycatch), assuming this continues for several years. Therefore, in cases where seals are confirmed to repeatedly enter specific set nets and non-lethal mitigation methods such as rope barrier lattice nets are insufficient to prevent fishery damage, up to this upper limit may be taken through capture in set nets to reduce fishery damage.

○ Considering that multiple set-net sites have recently been visited by Kuril harbor seals during the autumn season, the planned ratio of captures between spring and autumn set nets will be approximately 2:3. In the FY2026 (Reiwa 8) implementation plan, the maximum capture limit through spring FY2027 (Reiwa 9) will be decided after reviewing capture results from autumn FY2025 (Reiwa 7) onward.

○ Given that many individuals are unintentionally caught (i.e., bycatch), efforts will be made to prevent bycatch to ensure that captures follow the management plan properly. When bycatch occurs, fishers will be asked to report to the official in charge at the Ministry of the Environment.

○ Even if the total number of captures reaches the upper limit, if individuals are confirmed to be causing significant fishery damage and alternative measures are ineffective, and if population safety can be guaranteed, emergency capture of the minimum necessary

number of individuals may be carried out after consulting with the Ministry of the Environment.

<Adjustment, modification, and future setting of capture quotas>

○ Based on viability assessments using observational data from UAV and visual surveys, and through collecting information necessary for adaptive management, the upper capture limit for FY2026 (Reiwa 8) will be determined within the FY2026 implementation plan, incorporating input from the Scientific Committee.

(3) Other considerations in implementing population management

○ If a rapid change in population status is observed, or is considered likely, due to unforeseen events such as mass mortality of pinnipeds in neighboring countries or within Japan, capture quotas may be flexibly revised within the same fiscal year during which capture occurs conducted.

○ If situations occur where infectious diseases like avian influenza become a concern, necessary actions will be taken in collaboration with relevant agencies, including providing safety guidance to personnel involved in capture operations.

○ Captured and bycaught individuals shall be used as much as possible for activities that help manage populations properly. This includes research for data collection, and transferring animals to zoos or aquariums that support conservation, education, environmental awareness, scientific research, and public outreach. When removal is necessary, methods that reduce pain and distress shall be employed.

3. Monitoring

To assess the effectiveness of project implementation and ensure proper management of Kuril harbor seals by incorporating population status into the management plan, the following monitoring activities will be carried out. If necessary within the framework of adaptive management, additional survey items may be added. The survey and evaluation methods will be reviewed and approved by the Scientific Committee and related bodies.

(1) Population size and population structure

○ Counts of hauled-out individuals will be conducted using imagery captured by drones (UAV) and visual observation from land to determine accurate haul-out numbers. Detection rates will be calculated from both UAV-based and visual counts, and efforts will be made to improve accuracy.

○ UAV surveys will be conducted whenever survey conditions allow, regardless of season.

○ Collected UAV imagery will be analyzed (including body length measurements) to assess population structure to the fullest extent possible.

○ Individual identification will be performed using photographic data to gather basic information on lifespan, haul-out rates, and haul-out site use. Efficient methods for identifying individuals will also be evaluated.

(2) Age determination

○ Although age determination of Kuril harbor seals is currently conducted using dental thin sections, alternative methods such as age estimation based on blood DNA methylation levels will be explored.

(3) Damage assessment and effectiveness of mitigation measures

○ Fishers will be asked to record daily damage data (such as the number of damaged fish and bycaught individuals), and additional details will be gathered through onboard surveys to evaluate the extent and severity of damage. Multiple indicators, including damage rates, catch biomass/weight, and catch value, will be used in damage evaluation.

○ Stomach content analysis of bycaught and captured individuals will be conducted to assess salmon predation.

○ At set nets where population management and mitigation trials are implemented, underwater cameras will be installed to monitor seal behavior and salmon entry into nets.

(4) Population trends

○ Ecological data necessary for understanding population trends (body length, body mass, age, sex, blubber thickness, reproductive status, etc.) will be collected from captured and bycaught individuals.

○ Samples necessary for analysis of infectious diseases and genetic diversity of the population will be collected.

(5) Habitat environment

○ With cooperation from fishers, systems for collecting and analyzing information necessary for assessing coastal ecosystem conditions, including fish assemblages serving as prey resources, will be examined.

○ The average sea surface temperature off the coast of Kushiro, including the Erimo area, has increased by 1.66° C over the past 100 years (Japan Meteorological Agency, March 5, 2024). Information will be gathered on how rising seawater temperatures affect Kuril harbor seals, including data from managed-care animals.

(6) Population viability assessment

○ Population dynamics modeling and viability assessments will be conducted based on monitoring results using quantitative analytical approaches.

4. Public Awareness

(1) Collaboration with aquariums and zoos

Efforts will be made to transfer captured individuals and to conduct public outreach in collaboration with aquariums and zoos, for example, by co-hosting panel exhibitions, to promote a deeper understanding of the ecology of the Kuril harbor seal and the objectives of this project.

(2) School education

To promote long-term coexistence between the Kuril harbor seal population in the Erimo area and the local community, including coastal fisheries, educational outreach programs will provide proactive, dialog-based, and authentic learning opportunities regarding the ecological role of Kuril harbor seals in the marine ecosystem and the effects of climate change on the ocean.

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