An analyze of camera observation data and trapping data from Vågøya, Landegode and Fugløya island in Nordland in the period 2018-2020

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Mink checking out a Goodnature trap at Landegode

Table of contents:

1. Abstract

After testing and collecting data from 25 Goodnature traps with wildlife cameras in the period 2018-2020 on Landegode and Vågøya on the coast of Nordland, we investigated if we could find any patterns on diurnal and seasonal rhythm for the invasive species American mink (Neovison vison) in this area. We also compared the trap efficiency of the Goodnature trap and the Trapper90 on the Fugløya Island.

The mink in the study-area seemed to be more active during the hours of dusk and dawn in fall and early winter months, while in the summer the diurnal activity seemed more random.

Studying the seasonal pattern for the mink, there was more observations of mink in the fall and early winter months, than in the summer months (June and July).

After calculating a catch per observation-ratio on the Trapper90 on Fugløya and Goodnature on Landegode and Vågøya, Trapper90 got a result of being 16 times more efficient than the Goodnature. Considering many (1200) observations and few catches (12) for the Goodnature trap, it seems clear to us that the Goodnature trap is inefficient.

2. Introduction

2.1 Background:

In the period May 2018 - October 2020 Statens Naturoppsyn in Norway have been trapping for mink with 25 Goodnature traps distributed on the archipelagos Vågøya and Landegode. The main goal was to test this particular trap type on the behalf of the minkFAMNA-project. Each of the 25 traps has been monitored by a wildlife camera, and over the years this has resulted in a massive amount of camera data.

The local trapper Karstein Olsen has been managing traps and wildlife cameras since the beginning of this project. He has gone through all the pictures and noted down every mink observation with date and time of observation in a handwritten table. Karstein also kept track of date for when traps were checked, when and what traps were rebaited with, and at what times cameras were deployed and taken in.

2.2 Goals for this study:

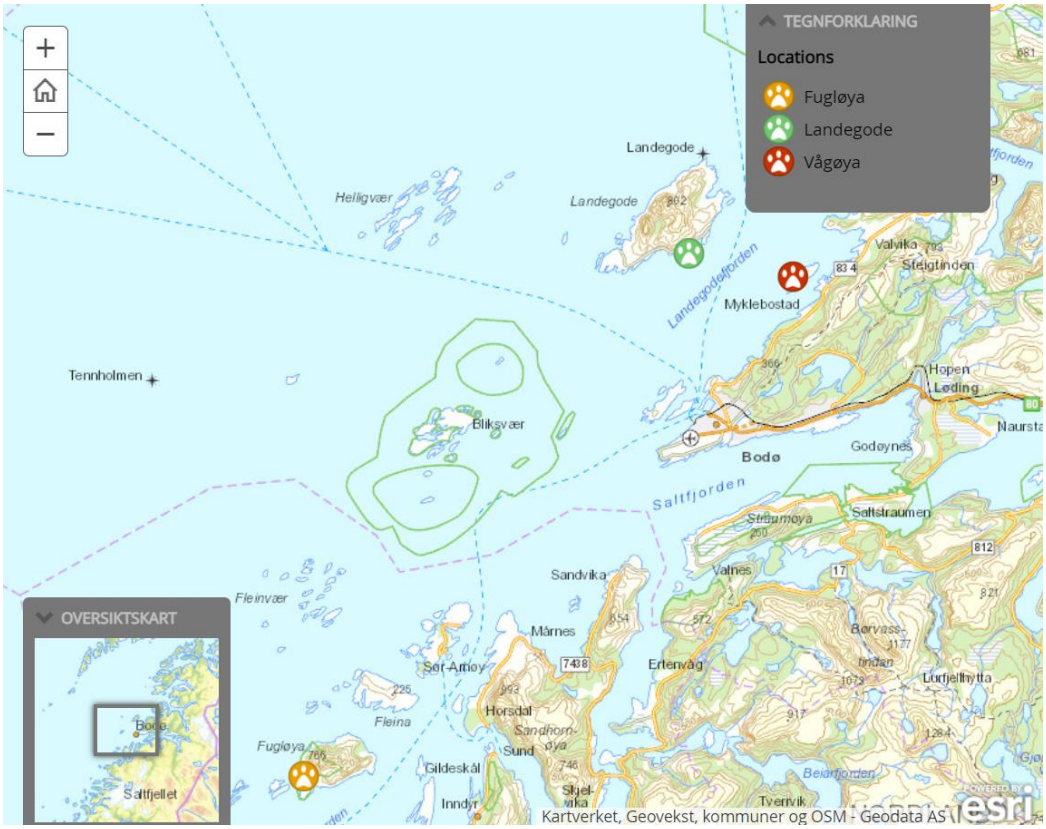
We were hired by the Swedish Hunters Association (SHA) to organize and analyze the trapping and camera data that has been collected from traps and wildlife cameras on Vågøya and Landegode in the period 2018-2020.

Our goal was to investigate the following:

- Patterns in diurnal rhythm for mink
- Seasonal pattern for mink
- Trap efficiency of the Goodnature trap
- Comparing the efficiency of the Goodnature with the Trapper90

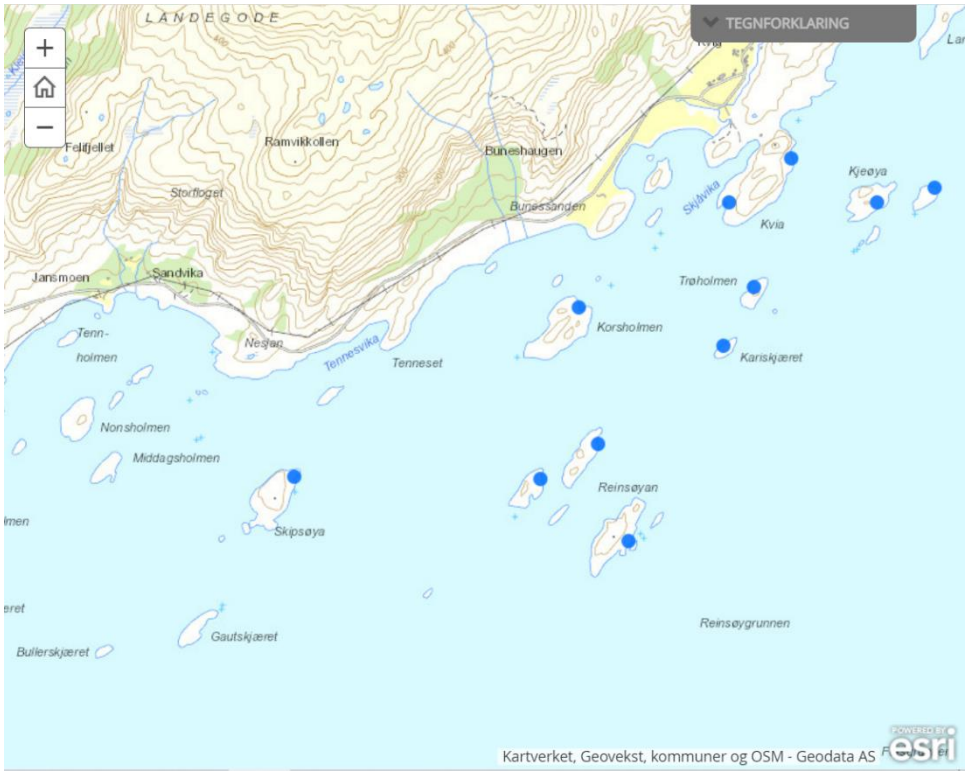
In order to be able to compare the Goodnature with the Trapper90, we also included the Fugløya island in the project. Fugløya consists of one main island, with several small islands around. SNO has been trapping for mink with both Goodnature and Trapper90 from 2018-2020.

2.3 Areas:



Picture 1: Overview map over the trapping areas Landegode, Vågøya and Fugløya

Both Vågøya and Landegode are quite close to the mainland and is only a short boat ride away from the north side of Bodø. The easy access to these group of islands was one of the main reasons why these areas were chosen as test sites for the Goodnature trap. Fugløya on the other hand is a lot more remote, and no one is permanent resident there. In order to get there from Bodø, a larger stretch of open ocean which is very exposed. Because of this, Vågøya and Landegode was visited more regularly than Fugløya.



Picture 2: Landegode and the distribution of Goodnature traps.

In Landegode: From the westernmost trap at Skipsøya to the easternmost trap at Kjeøya the distance is approximately 3 km. The average distance between traps is less than 500 meters.

Picture 3: Vågøya and the distribution of Goodnature traps.

Vågøya is the trapping site which is closest to the mainland. Karstein Olsen, the local trapper who has been monitoring and checking the traps, lives close to Vågøya. The wildlife cameras on Vågøya are the only cameras that has been out for a whole winter without being taken in (2018/2019).

Picture 4: Fugløya, 6 Trapper90 with wildlife cameras were deployed in the years 2018,2019 and 2020.

There were originally 26 traps on the Collector map from Fugløya, where 14 was Goodnature and 12 was trapper90. In *picture 4* only 6 of the Trapper90 that were deployed with wildlife cameras are marked in the map, as the focus in this report is to compare the camera and trapping data from these 6 traps with the Goodnature traps in Vågøya og Landegode.

2.4 Trap Setup:

Both Goodnature and Trapper90 at the different locations have had a similar setup. The trap is placed close to the sea, but in a safe distance from the tide and potential swell. When placing a trap, we look for signs of mink activity, like tunnels, paths, tracks or other things that indicates that this may be a spot where mink is likely to pass by. Natural formations can be used to "funnel" the mink into the trap if possible. The trap is then weighed down and covered by rocks, this is also to generate a more natural look. For bait, odour from mink glands or artificial odour has been used. This could be odour from either male or female mink. The wildlife cameras are placed in a way so that they are facing toward the trap, in order to monitor the activity at the trap entrance.

The trapping areas are very exposed to winter storms, and SNO learned from the first year that both cameras and traps may be filled with snow, ice or sea water, or worst case blown or washed away at sea. Because of this, the wildlife cameras were mostly taken in for the wintertime, except on Vågøya in the winter of 2018/2019.

Picture 5: Classic trap setups. To the left is Trapper90, to the right is Goodnature.

3. Methods

The data on camera observations of mink (time and date) and trapping data were first organized in tables in Microsoft Excel. Further on, we ran the camera observation data in the software R and R-studio, in order to get plots and graphs that could give us a picture of patterns in the diurnal and seasonal rhythm.

At last, we made a comparison table in Excel with both trapping data and camera observation data from Landegode, Vågøya and Fugløya to see if there was any difference in efficiency of the Goodnature trap and the Trapper90. We calculated a trap efficiency-ratio by dividing the number of catches on the number of camera observations for each island.

4. Results

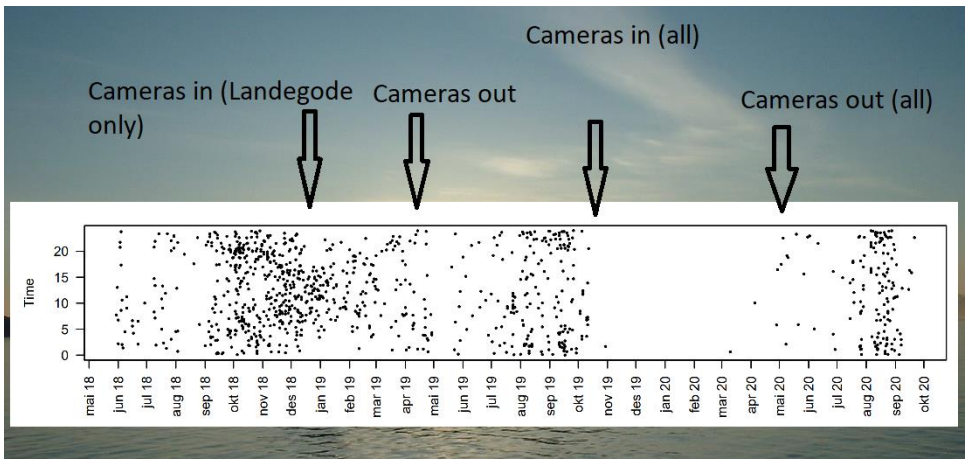


Figure 1: Overview scatter plot of camera observations from Landegode and Vågøya

Figure 1 shows a scatter plot for all camera observations from Landegode and Vågøya distributed in a timeline from May 2018 to October 2020. The cameras have been taken in each winter (except Vågøya for the winter 2018/2019), and this is roughly pointed out in the figure. On the Y-axis, time of day is represented (0 = 00:00, 5 = 05:00, 10 = 10:00 and so on).

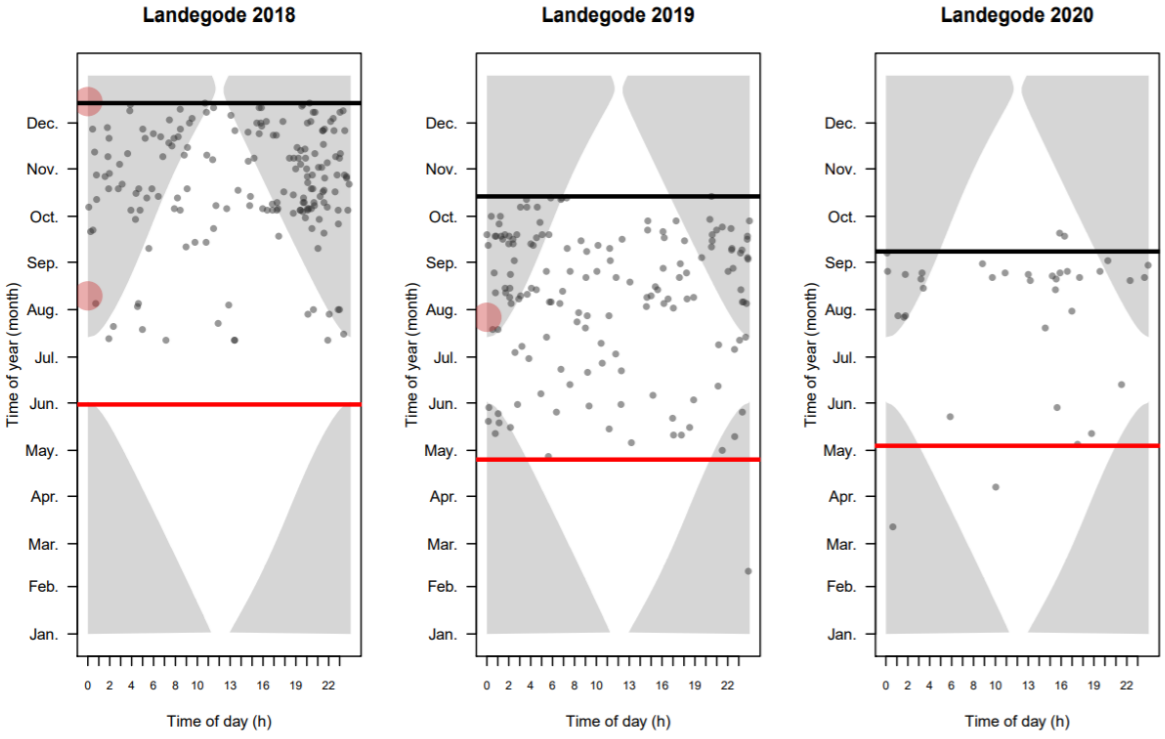


Figure 2: Actogram for Landegode distributed over 3 years; 2018, 2019 and 2020

This figure represents 3 scatter plots for the camera observations of mink at 11 GoodNature traps on Landegode over a period of 3 years. The red line marks when the majority of wildlife cameras were placed out, and the black line marks the time when the cameras were taken in for the winter. The wildlife cameras were taken in each winter for all 3 years. The grey dots are the observations, while the red dots mark the trapped mink. We did have the date, but not a time of day for the caught mink, which is why all the red dots are placed at 00:00 in the graph. The diamond-shaped white area in the middle marks the time of day when the sun is up, while the grey areas in the corners mark the time when sun is down. Note that in June and July there is midnight sun, and the sun does not set, while in December and January we have dark season and the sun does not rise. While working with the data, we recieved information about a large trapping and hunting effort done by a local hunter who lives on Landegode island. Since 2018 he has trapped and hunted over 60 mink in areas from 400-2000 meters from our traps. This might have affected our results significantly.

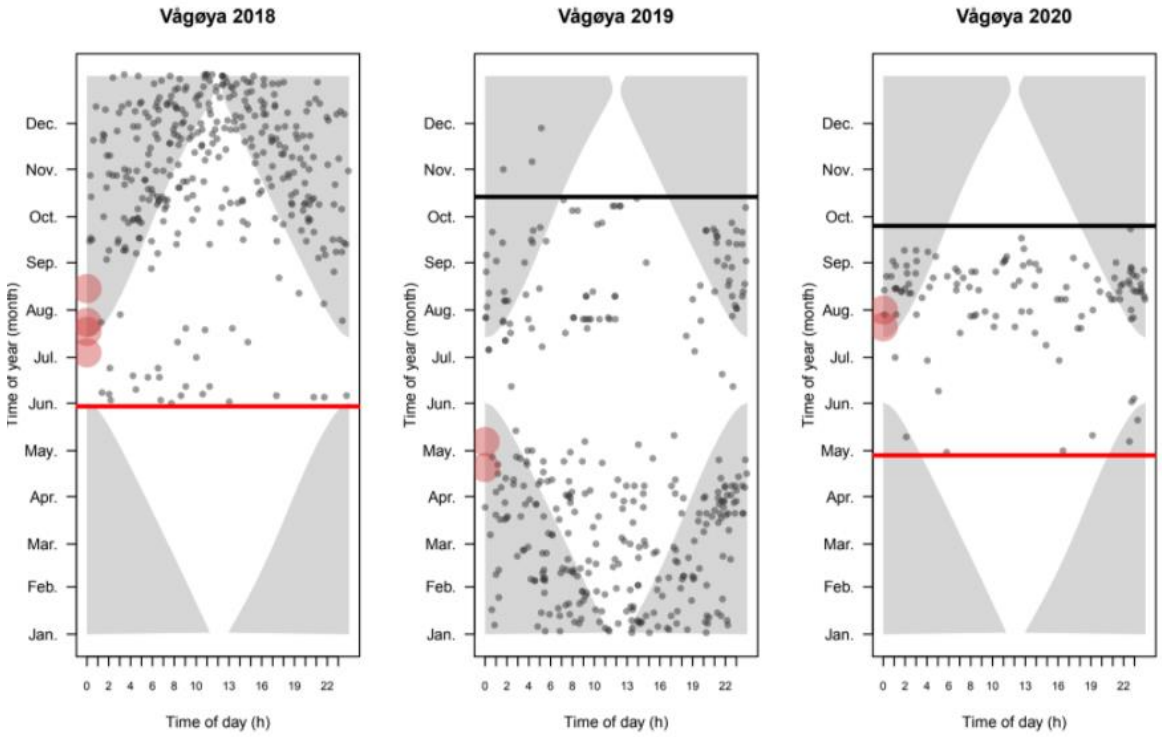


Figure 3: Actogram for Vågøya distributed over 3 years; 2018, 2019 and 2020

Figure 3 is similar to figure 2, except it represents the 14 traps placed at Vågøya. Note that the cameras were not taken in the first winter of 2018/2019, so there are data from observations in the winter months of 2019. The Scatter Plots shows very few observations in the summer months (June and July), while there are more observations in the late fall and winter months. 6 of 8 catches are distributed around July/August,

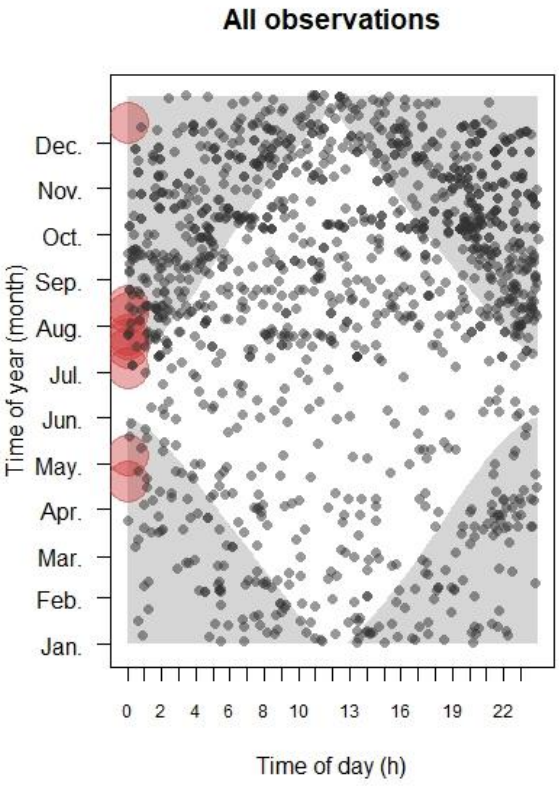


Figure 4: The distribution of all camera observations and trapped mink from Landegode and Vågøya

Figure 4 is similar to figure 2 and 3, but here all the data from both areas and all 3 years are shown in the same actogram. The idea was to see if a pattern in diurnal and seasonal rhythm would be more visible.

Island	Type of trap	Number of traps	number of mink observations	number of catches	catch per observation
Vågøya	Goodnature	14	662	8	**1,20 %**
Landego	Goodnature	11	496	4	**0,80 %**
Fugløya	Trapper90	6	67	11	**16 %**

Figure 5: Table of catch per observation ratio for Vågøya, Landegode and Fugløya

A catch per camera observation table gives us a ratio of the number of catches per visit to the trap. This ratio can indicate the trap efficiency for the different locations and trap types. We have compared Goodnature traps at Landegode and Vågøya with 6 Trapper90 at Fugløya. All traps have been monitored with a wildlife camera over the years 2018-2020.

5. Summary and discussion

In order to see more clearly if there was a diurnal rhythm or pattern, and a seasonal pattern in the dataset of camera observation data from Landegode and Vågøya, we collected all the data from all years and both areas into one plot: see *figure 4.*

Diurnal rhythm:

From these data we see that the observations in june and july are scattered throughout the whole day and night, with no significant pattern. However, if we look at the months from august until October, there are clusters of more observations in the dusk hours just before sunrise, and after sunset. As the days are getting shorter, the activity seems to follow the hours of dusk and dawn. This causes the clusters of more observations to shape a weak, but visible pyramid shape, going parallel with the sunset/sunrise border.

Seasonal rhythm:

We do think it is important to underline that the results found in this research cannot be interpreted unambiguously. There are some errors to consider. For the camera observation data that we used for studying the diurnal and seasonal pattern a lot of the cameras were taken in during the winter months. Because of that we only have observation data for winter months from Vågøya between 2018-2019. We might have gotten a different picture of both the diurnal and seasonal activity if all cameras were out the whole year all three years.

However, for the months where all cameras have been out there is clearly a lot less activity in the summer months (June, July) while the activity picks up in august and throughout the fall and early winter. We do find similar results to this in other studies from southern Europe *(Gerell, 1970), (Zschille, Stier, Roth, 2009).*

Of 12 mink caught in total, 9 was caught between middle of July and beginning of September. Research done in other parts of Europe show that youngsters are dispersing and roaming around at this time, as they have been chased away by the mother. Forced to find their own home-area, they are more likely to check out and enter a trap. *(Reynolds, Richardson, Rodgers & Rodgers, 2013) (Zschille, Stier, Roth, 2009).*

Even though we only have observations of mink in winter from Vågøya between 2018-2019, there are quite many observations from these winter months compared to the rest of the year. Could this be an indication that there might be a lot of mink activity and roaming even in the deepest winter months as well, from December until March?

Trap Efficiency:

Picture 6. One of over 1200 mink observations at a Goodnature trap in Landegode and Vågøya.

One of the main tasks in this project was to investigate the efficiency of the Goodnature trap. The fact that there are over 1200 mink observations at the Goodnature traps, but only 12 mink caught over a period of 3 years in Landegode and Vågøya indicates strongly that the Goodnature is not efficient. Most of the camera observations are similar to *Picture 6* above, where the mink is clearly checking out the trap, but it does not go all the way in.

From 2018 to 2020 a local hunter who lives in Landegode, has been trapping and hunting over 60 mink, which is very likely to have affected our results in camera observations significantly. This might be a major reason as to why there are less activity in Landegode, and decreasing over the years, compared to Vågøya.

In order to compare the efficiency with Trapper90, we included the Fugløya island in the project, where SNO has been trapping with Trapper90 in addition to the Goodnature. On Fugløya there have been 12 Trapper90 and 14 Goodnature traps deployed in the period between 2018-2020. Altogether 26 mink were caught, and 21 of them were caught in Trapper90 and 5 in Goodnature.

6 of the Trapper90 traps had wildlife camera in the same time period as on Vågøya and Landegode. This made it possible for us to do a comparison of trapping and camera data from Landegode, Vågøya and Fugløya. Based on the camera observations and trapping data, we calculated a catch per observation-ratio, see *figure 5*. The result showed that Trapper90s on Fugløya had a catch per observation ratio of 16%, while Landegode and Vågøya showed 0,8% and 1,2%. This means that according to *figure 5,* Trapper90 is 16 times more efficient than Goodnature.

The Catch per observation-table gives us a good indication of the trap efficiency, but there are some errors to be concerned. First, the trapping locations are different, and we do not know the exact size of the mink population in the different areas. There are also a difference in number of traps, were the number of Goodnature traps is higher than the number of Trapper90. Also note that the traps and cameras on Fugløya has not been checked and managed nearly as often as the traps on Landegode and Vågøya. Since caught mink on Fugløya may have occupied the traps for weeks, this may have prevented more mink from entering the traps. So, in theory, the number of catched mink could have been higher on Fugløya.

For the Goodnature traps, Karstein Olsen tried several different setups with different versions of boxes and entrance tubes, or different types of bait. This was with no significant result or change in the number of trapped mink.

Picture 6: 4 of 12 catches from Vågøya and Landegode. Note that the 2 pictures to the right are modified versions of trap setup.

To summarize, we can conclude that the Goodnature trap does not seem to be effective, and that Trapper90 seem to be far more effective.

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