



LIFE Nature project “Marine Protected Areas in the Eastern Baltic Sea”
Reference number: LIFE 05 NAT/LV/000100

Action A4 – Marine mammals inventory
Action leader P18, Environmental Board

FINAL REPORT

Author:

Ivar Jüssi

2009

Reporting period: August, 2005 – September, 2009

Description of activities: The main aim of the action was to collect data about abundance and distribution of three marine mammal species in Eastern Baltic coastal sea and study their habitat preferences in spatial and temporal scale. Target species for current study were Grey seal (*Halichoerus grypus*), Baltic ringed seal (*Phoca hispida botnica*) and Harbour porpoise (*Phocoena phocoena*)

Activity 1 – Inventory of Harbour porpoise (*Phocoena phocoena*)

The standard method of detecting small cetaceans, including harbor porpoises and measuring its activity is to use passive submerged porpoise detectors (T-POD) – computerized acoustic devices that monitor the environment for porpoise sounds and record them at detection. Arrays of T-PODS enable surveying of areas and record porpoise presence or bypasses, thus allowing to measure the impact of a site, object, activity etc. on these otherwise “invisible” animals.

In the project the inventory performed at selected project areas in all main parts of eastern Baltic Sea: Gulf of Finland, Gulf of Riga and eastern Baltic Proper.

Activity 2 – Grey seal (*Halichoerus grypus*) survey

Satellite telemetry is a standard method to study the activities of marine mammals in time and space, because no other technology allows to track these diving animals. Telemetry of seals is a natural part of environmental impact assessments and development of management schemes .

In the course of this activity the animals caught by net in the Gulf of Riga and Baltic Proper and the equipment deployed. As the devices were glued to fur, their lifespan was up to next moult in April. The numbers of marked grey seals was 6. The retrieved data was stored into the GIS databases. Instead of originally planned Satellite Linked Time and Depth Recorders (Argos SLTDR) much more powerful and precise Fastloc/GSM tags were used.

Comprehensive survey of coastal sea was made for controlling all possible haulout sites.

Activity 3 – Ringed seal (*Phoca hispida*) survey

A standard transect survey method was used: Gulf of Riga was covered by aerial transect survey flights, mapping abundance and distribution of *Phoca hispida*. These flights were carried out in mid-April 2006.

In addition, the 3EST Väinameri project site was surveyed by observation flights in 2009 and northern part of Gulf of Riga 2007. No flights made 2008, as the winter was extremely warm and there was almost no ice to survey. Instead of aerial survey, land and boat counts were carried out in main concentration areas of Ringed seal main distribution range.

For species habitat investigation, 4 Fastloc/GSM telemetry devices deployed on Ringed seals. This activity was not originally planned, but data obtained during the project showed urgent necessity to study the species habitat use all year round.

Methodology of Method 1: Passive acoustic monitoring of Harbour porpoises inventories

Passive acoustic monitoring devices for detecting and recording cetaceans hydrolocation clicks (T-PODs) were used for monitoring presence of Harbour porpoises.

T-PODs log the times and duration, to 10 microseconds resolution, of clicks resembling the echo-location clicks produced by the target species. The dedicated software on the PC then identifies and classifies trains of clicks within the logged data. This process of click train recognition filters out non-cetacean clicks and gives reliable data on the presence of the animals and some indication of their behaviour.

Devices were anchored to sea bottom to depths from 5 to 15 m. Autonomous working time for devices were up to 3 month. For downloading data and replacing the batteries, T-PODs were retrieved and deployed again later. Recordings were analyzed with special software.

The software (TPOD.exe) analyses the data on a PC to find click trains and identify those trains that are characteristic of dolphins and porpoises.

Method 2: Telemetry of Grey and Ringed seals

Originally planned seal tags (Argos SLTDR) were replaced with more modern and precise system (Fastloc/GSM). Different positioning, measuring and data transfer system provide considerably better data for less cost.

Six Grey seals (2 females and 4 males) were caught by seine nets (active catching) from two haulouts in Estonia 6 EST and 4EST. Seals were sedated with Zoletile for tag deployment period (20 min.). Catching of seals and deployment of transmitters occurred from July 14 to August 20, 2007.

Data about seal's movement, activity, diving profiles, habitat use etc. are stored to database.

Project team, including representative of P16 was trained during the fieldwork by seal catching expert from UK. Special attention was paid on animal welfare and personal security issues.

Because of needs to get more spatial and temporal data about Ringed seals' habitat use, the rest of transmitters (4) were deployed on adult ringed seals in august 2008 and may 2009. Passive netting method was used in 3 EST area. Seals were not tranquilized.

Database is stored in server of service provider (Sea Mammal Research Unit, Scottish Ocean Institute) and can be downloaded from their web page at any time. Special software developed by SMRU was used for analyzing seals' movements and diving character.

Method 3: Aerial surveys of Ringed seals

The survey was third in history of use of this method in the Gulf of Riga and was successful. The weather conditions were not ideal and so caused some technical minor problems like drift of ice and navigation in side wind but the results are sufficiently reliable to enable direct comparison between surveys and draw distribution maps.

Development of sea ice was followed using satellite imagery and public ice forecasts provided by Finnish and Swedish national ice surveys. Location and extent of ice fields carrying seals were detected. Field work was carried out from 17th to 19th of April 2006 using two high wing aircraft (Cessna 172, Cessna 182) each carrying an observer on each side of plane and, in some observation flights, a trainee. Altogether, four flights were made to the northern part of the Gulf of Riga to cover more than 10 per cent of available ice with seal observations.

In 2007 Survey flight for localizing breeding habitat, breeding area and breeding success carried out in March 15. Ringed seals sighted in mouth of Pärnu bay and northern part of Gulf of Riga, close to areas 3EST and 5EST. All seals were photographed with GPS-linked digital camera. Data were plotted over satellite ice image via GIS.

Method 4: Visual boat or land counts of Ringed seals during the breeding season and annual moult.

On the annual moulting season of 2007 and 2008 the ice situation did not allow to carry out transect census surveys. As alternative relative census method, visual land or boat based counts were carried out. All main concentration areas covered in 3EST and adjacent waters.

During the breeding season of 2008 only ice area in Pärnu bay was observed visually using 20 – 60 x magnification spotting scopes. Number of seal pups recorded and predation by white-tailed eagles (*Haliaeetus albicilla*) observed.

Conclusions about the methods:

No main changes in agreed methods took place, but effort was shifted from grey seal surveys more on ringed seals.

Compared to original plan, more effort was put on ringed seal alternative surveys because climate conditions were favorable for standard absolute census method (line transect survey over the sea ice on annual moulting time - mid April) only one year of project duration (2006). In other years sea-ice melted before start of ringed seals' molting period and standard abundance censuses were impossible. As alternative census, all known resting places covered by boat and land surveys 2007 and 2008. Only suitable ice during the 2009 breeding season was in 3EST project area, one observation flight and two land counts made for localizing breeding animals.

Results from Grey seal telemetry obtained 2007 and 2008 showed very large individual variety of sea area use. Increasing the number of tagged animals did not decrease variability.

Extremely warm winter and exceptionally high ringed seal pup mortality in 2008 indicated urgent need for more detailed habitat use data about Gulf of Riga Ringed seal population. This was the reason why decision of deploying the rest of 4 telemetry devices to ringed seals instead of grey seals was taken.

Telemetry proved to be only method of seals habitat investigation and is highly recommended as standard for any survey of EIA studies, protection and management planning of protected areas or protected marine mammal species.

Land- or boat based surveys during molt (when standard survey is not possible) give a good alternative for determining important sites for ringed seals. Knowing these places is essential for planning protection measures.

Inventory results

Activity 1 – Inventory of Harbour porpoise (*Phocoena phocoena*)

Acoustic monitoring units for detecting Harbour porpoise echolocation clicks (T-POD) deployed at sites 6EST in November 2007 recovered in January 2008. In March 2008 the same units were controlled again and deployed to different location at 6EST project area close to border of project area 9LAT. Devices were controlled in June, redeployed until August 2008. Altogether 682 POD/days monitored at first location of 6 EST area and 817 POD/days at second location of 6EST area.

Array of T-PODs (7 units) deployed to project area 12 LIT in June 2008, controlled in September 2008 and retrieved October 2008. At area 12LIT 791 POD/days monitored in the period from June to October 2008.

The data analyse did not give any porpoise positive days for any of the T-PODs. During the study period no harbour porpoises detected in ranges of porpoise detectors. Harbour porpoises are extremely rare in the whole Baltic sea. The Eastern Baltic coast can be visited very seldom by single vagrant species and therefore it can not be special target for planning the study areas protection measures. As it is known that one of the biggest risk for the animals is fisheries by-catch in bottom set gillnets, extensive use of this fishing gears will increase the threat of extinction of harbour porpoises in Baltic.

It is not feasible to apply special local restrictions when only vagrant individuals can pass the area. Special additional protection measures (fishing restrictions) can not be applied for protection of the species in project areas at current abundance of species in Baltic Sea.

Map of monitoring stations is attached to Annex I

Activity 2 – Grey seal (*Halichoerus grypus*) survey.

Grey seals are inhabiting the whole Baltic sea. The major part of the population is in northern and central part of the Baltic Proper. Biggest houlouts are in Archipelago Sea (Finland), Åland islands, Stockholm archipelago and West Estonian archipelago. Total minimum Baltic population is estimated 22 330 animals and it have positive yearly increasing trend about 7 %. Annual censuses are carried out during the annual moult (late May) on houlout sites. Censuses from study period (2005 – 2008) show that ca 11 – 17 % of total population is concentrated around West Estonian archipelago.

Data from six Grey seals equipped with telemetry devices show wide ranges of movements, as well as fidelity to certain feeding and resting areas. They can change resting places often (sub- adults and males), but can have strong site fidelity for breeding, resting and also for foraging areas (adult females)

Results are showing individually and seasonally variable habitat use. In warmer season feeding sites are usually in deeper offshore waters outside of project areas (depth range 50 – 90 m), in cold season on coastal slopes and reefs. Some animals used certain shallower places, also inside of project study areas. All main houlouts in current project range are in territorial waters of Estonia (unfortunately there is no suitable islands or reefs what reach to sea surface in Latvia and Lithuania), mostly in 3EST, 4EST and 6EST.

Regular migrations between most important houlout sites in Central Baltic Proper were discovered. Because of very large seasonal and individual variation much more study animals is needed for comprehensive overview of critically important habitat. This study has to be made in whole core area of Baltic grey seal distribution, in cooperation with Finland and Sweden.

Main breeding sites are also in areas 3EST, 4EST and 6EST. Telemetry study showed that **these areas have important role for whole Baltic grey seal population.**

Foraging places and migration routes areas inside of project areas:

Very important for grey seals Irbe strait (trans-boundary area 6EST/9LAT) as a migratory route from Gulf of Riga to Baltic Proper. Grey seals are using Irbe strait frequently for migrating in and out from Gulf of Riga and also as feeding place

Additional for telemetry, Estonian coast was surveyed for finding new places for grey seal moulting. New houlout sites was found in West coast of Saaremaa, close to border of project area 6EST and inside of project area 3EST

1 new important moulting place found in 6EST (max 660 seals). This site was earlier known as irregular breeding place.

Statistics about collected data, maps of tracks of study animals in relation to project areas are given in Annex II.

Telemetry is only tool for detailed description of 3D environment. This must be essential part of any EIA dealing with marine areas' development where seals are present.

Project areas in relation to different aspects of grey seal protection:

Estonia:

1EST

Area is located in central part of Gulf of Finland. One houlout site is in the borders of area and it is protected. Site is inhabited by very low number of grey seals, no land-breeding reported. In moderate winters grey seals are breeding on drift ice and can be some years, when suitable ice fraction is forming or drifting into area, relatively numerous.

No additional protection measures needed for the particular houlout. Biggest problem for species protection is fisheries by-catch in trap-nets.

2EST

One less important houlout site is in the borders of area. Site is protected. Seals are not abundant in 2EST area, threats are minimal. Ice breeding on area is only during cold winters. Almost no fishing activities what can be dangerous for seals is present.

3EST

Three important and one less important houlouts are in the area Important sites are protected, named less important place was found during this survey. Breeding is recorded in mild winters on one of the houlouts. Grey seals are more abundant in northern part of 3EST area, but can be found specially in spring and autumn in all parts of 3EST. No more site protection measures needed in area.

On the level of protecting individuals, highest risk is still fisheries by catch, although fishing activities with dangerous gears are low.

4EST

Two very important grey seal houlouts are in area, both are land-breeding sites. Both are protected. As area is in Baltic proper, most of it is ice free in mild to moderate winters. Land breeding occurs almost every year and up to 20% of the whole Baltic population can be found in the area in breeding time. The rest of the year houlouts hosts 2-3 % of total Baltic stock. Sites are essential part of central Baltic grey seal resting places network. Deep water foraging places are outside of area. Major risks is fisheries by catch, but as fishing is low, risk is also not significant.

5EST

Area is most important during the breeding season. Grey seals gather to the edge coastal sea ice when suitable ice is available (mild winters). During moderate to cold winters breeding occurs outside from 5EST. In spring and autumn grey seals are using coastal areas for foraging. No haulouts located in the area.

6EST

Area is very big and including grey seals' important haulouts, land breeding sites, ice breeding areas as well as migration routes. 6EST area holds more than 75 % of seal stock moulting in Eastern Baltic and 13 – 14 % of total Baltic Grey seal population. 6EST have very big importance during the breeding season, ca 25% of the whole Baltic grey seal population gather to the area. In moderate winters of ice they breed on ice, warm winters on two main breeding islands. Third site has not been used for breeding during the study period, but is known as suitable place from earlier years. All breeding places are legally protected. It is need to prolong seasonal restrictions for one site until the end of annual moult, as results of this survey show importance of the site also as grey seals resting place. Main risk in the area for individuals is by-catch, it is necessary to implement seal-safe gears for fishing.

6EST/9LAT

Current study proved trans-boundary 6EST/9LAT area complex as very important foraging ground, specially in shallower banks, as well as migration route from Baltic Proper to Gulf of Riga and back. Irbe strait was used by one adult female very systematically for foraging. As there are implications of group behaviour, seals from the same haulout are using the same area for feeding, but not exclusively. During cold winters Irbe strait is just on the border of distribution of drift ice. When most of the Gulf of Riga is frozen, the majority of grey seals are breeding in Irbe strait.

Offshore reef 52 km northwest from Ventspils (9LAT) was also visited regularly by seals. This shows importance of offshore shallow areas for marine mammals as important feeding areas.

Latvia and Lithuania:

As Latvian and Lithuanian coastline is straight compared to Estonian and there is no islands, Grey seals have no opportunity to use this areas for land-breeding or resting. They are hauling out to mainland coast very seldom and usually young or sick animals were found on mainland beaches.

All Latvian and Lithuanian areas except trans-boundary 9LAT/6EST complex (as mentioned above) can be described together.

Grey seals are visiting Latvian and Lithuanian coast regularly, more observations and locations from current telemetry survey are from spring and autumn. Adult seals spend winter usually closer to breeding areas, but can make long and fast migrations just before the breeding starts. During the summer usually deep water foraging grounds were used. Data from the other similar studies show that southern part of Baltic sea is used mostly by juvenile and sub-adult animals or adult males.

This study did not show any special behavioural features inside of LAT/LIT project areas. Coastal zone north from 10LAT was used for foraging by one seal twice, the same occurred briefly at southern border of the same area.

As for all other sites described, main risk for the individuals is fisheries by-catch. It is strongly recommended to introduce seal-safe gears for mitigating seal-fisheries conflict.

Summary table of importance of project areas for Grey seal.

Area	Houlout sites	% of Baltic moulting population	Land-breeding sites	Ice breeding	Number of sites for grey seal protection and % of total (13)
1EST	1	0,001	0	rare	1 (7,7%)
2EST	1	0,002	0	Very rare	1 (7,7%)
3EST	4	2,7	1	rare	3 (23,1%)
4EST	2	2,7	1	common	2 (15,4 %)
5EST	0	0	0	Very common	0 (0%)
6EST	2	13,4	2 - 3	Very common	2 (15,4%)
7LAT	0	0	0	rare	0
8LAT	0	0	0	rare	0
9LAT	0	0	0	common	0
10LAT	0	0	0	No	0
11LAT	0	0	0	No	0
12LIT	0	0	0	No	0
13LIT	0	0	0	No	0

Activity 3 – Ringed seal (*Phoca hispida*) surveys:

Aerial survey for population abundance

Altogether 20 hours of flight (transfer flight time included) were used to cover approximately 2376 kilometres of observation transects, total coverage of the ice area was 11.25% to 12.45%, depending on including or excluding transfer flight across the surveyed area. Compared to calculated variation what is caused by aggregation of animals on survey area. This 1,20 % have no significant influence for final result. As all observations were registered with hand-held GPS units, seal distributions was mapped with very high precision. Three more persons got first experience and professional supervision for further work as observers in similar surveys. Population size of ringed seals in the Gulf of Riga in 2006 was estimated to be about 1475 individuals (+- 30%). Map of observed ringed seals plotted over the satellite ice image is in Annex III. Compared to results from earlier survey from 1996, the abundance estimate remained the same as 10 years ago (1407 +- 42%). In one hand it is good that population has not declined, but if to take into account the fact that normal growth rate for ringed seals is 5 – 7 % per year, population size must be around 2300 -2700 individuals in 2006. The reason of that absent increase is not exactly known. It is probably caused by rather big pup mortality in relatively mild winters (1997, 1998, 2000 – 2002) and by-catch of seals in fishing gear. There are acute problems in population.

Ringed seal breeding habitat surveys

Aerial survey.

Survey over the ridged sea ice areas was carried out at the last stage of ringed seals' breeding season in 2007. Snow was melting quickly and it was possible to see ringed seal lairs and breathing holes. Suitable ice structures localised from satellite images and during the observation flight all lairs, seals and breathing holes inside of observation strip (400 m from the plane) photographed with GPS-linked cameras. Structures determined later from images and data plotted on satellite ice image.

Results of 2007 survey show biggest concentrations of breeding ringed seals in the mouth of Pärnu Bay and northern part of Gulf of Riga. Breeding success was not known for 2007, because heavy storm between March 15 and March 17 compressed most of the ice to the coastal areas. Definitely it was a cause of extra mortality of ringed seal pups. See figures in Annex III

Coastal survey.

The winter of 2007/2008 was warmest in last 100 years and only small fraction of Pärnu bay was covered by ice. Ice area was estimated only ca 10 km². Duration of ice cover was less than 3 weeks from beginning of ringed seals breeding season (see Annex III), but lactation lasts usually 5 – 6 weeks. Concentration of breeding seals in the area was very high, over 50 mother-pup pairs observed on area of ca 3 km². On the same time more than 50 White tailed eagles observed at the same ice fields. Avian predation as a cause of pup mortality is severe risk to the population, when breeding conditions are unfavourable (lack of ice and snow for making lairs). Ringed seals breeding success was close to zero in 2008.

Winter 2008/2009 was milder than average and ice formed only in Väinameri area 3EST, South coast of Saaremaa 5EST areas and Pärnu bay. Coastal surveys and one observation flight on breeding time over 3EST and 5EST show high concentration of wintering and breeding seals in 3EST area. Usually seals leave from Väinameri when land-fast ice is forming, but this year they stayed in named region.

Ringed seals' breeding can not be linked directly to any of the project areas, as it depends only on ice conditions. But recent data show very high importance of 3EST area as ice forms in Väinameri also during the mild winters.

In warming climate conditions population is in very high extinction risk. Habitat quality is the key factor for population survival.

Survey of concentration areas during the annual moult.

In mid April 2008, during the annual moult, all known ringed seal concentration areas were covered by horizontal census (counting from boat or land). All resting sites are in areas 3EST and northern border of 5EST. Almost whole ringed seals sub-population inhabiting Gulf of Riga was concentrated in Väinameri straits. In total 1047 ringed seals counted in 3EST and 7 in 5EST. In comparison this result with aerial census result (1475±437) it verifies the minimum population estimate of Gulf of Riga ringed seals. Method is applicable when standard survey is not possible to carry out.

Ringed seal telemetry.

First transmitter, what was deployed adult female ringed seal in August 30, 2008, worked until March 12, 2009. Results give a good overview of animal behavior and habitat use during late summer and autumn foraging period as well as wintering and breeding time. Three other transmitters deployed in May 2009 give comprehensive picture of foraging and resting habitat use during the season.

Resting habitats (houlouts) are situating all in 3EST area. Seals are very conservative and site-fidelity is high. During the summer utilization of houlouts is relatively low, as animals are recovering their energy resources. Ringed seals spend in 3EST area 5 – 7 % of time. Short resting periods in houlouts (2 – 4 days) alternate with long (up to 40 days) foraging trips to central and southern part of Gulf of Riga. Migrations through the Suur strait are usually fast, also conservatism in usage of migration route is noticeable. Spatial and temporal data from resting habitat match very well with visual census data. These areas are most important for the whole Gulf of Riga ringed seal population.

Resting site-fidelity is very high. Seals return back almost always to the same place. Resting places are the same as for moulting during ice-free springs. New important resting site was found in southern part of Väinameri area.

Maps about resting habitat use are given in Annex III.

Foraging habitat of summer period is in deep parts of Gulf of Riga, in central and southern part. Diving profiles show feeding in deep waters, almost all dives reach to the bottom. Foraging area is deeper than 30 m depth contour, shallow areas were avoided and underwater reefs have no importance as foraging places. Water column 0 – 4 m from the bottom was used. Map of foraging areas is in Annex III

Autumn and winter distribution is related with seals' energetic resources. Usually seals have gained their maximum weight by October – November and long foraging trips are seldom. They spend most of time on or close to haulouts and making shorter movements inside of Väinameri (3EST) area. With ice formation seals have sort migrations to northern part of Gulf of Riga (Annex III). Shortly before breeding time they stay stationary at breeding place until the end of the season. As it was stated above, selection of wintering and breeding areas is depending on ice situation of particular winter.

Very intensive migration between resting and foraging areas was found. Suur Strait Between Muhu island and mainland have crucial importance for population as migration route.

Summary table of importance of project areas for Ringed seal.

Area	Houlout sites	Moulting and resting	Breeding	Foraging	Presence of species
1EST	0	no	no	Very rare	Vagrant, rare
2EST	0	no	no	Very rare	Vagrant, very rare
3EST	4	Common	Yes	Common	common
4EST	0	Very rare	No	Very rare	Vagrant, very rare
5EST	0	Rare (only on ice)	yes (on ice)	rare	Seasonal (ice season)
6EST	0	Rare (only on ice)	Yes (on ice)	rare	Seasonal (ice season)
7LAT	0	Rare (only on ice)	Rare (on ice)	rare	rare
8LAT	0	Rare (only on ice)	Rare (on ice)	rare	rare
9LAT	0	Very rare (only on ice)	Very rare (only on ice)	Very rare	rare
10LAT	0	0	0	No	Vagrant, very rare
11LAT	0	0	0	No	Vagrant, very rare
12LIT	0	0	0	No	Vagrant, very rare
13LIT	0	0	0	No	Vagrant, very rare

Conservation status and threats for Grey and Ringed seals

Grey seals:

All major haul-outs (resting places) in Eastern Baltic are protected. New small moulting places found but there is no need to apply new special protection measures, minor changes in protection regime for some places are necessary.

Baltic population is out of risk and have been increasing during the study period ca 7 % per year (from annual trend monitoring data, supplementary for current project). Main threat is by-catch in coastal fisheries. Technological modifications of fyke-nets have developed and application of this will reduce by-catch considerably. Offshore fisheries can have implication through over-exploitation of fish stocks in long term perspective.

Ringed seals:

Ringed seal population in Gulf of Riga is endangered. No signs of recovery during last 10 years in Gulf of Riga and Gulf of Finland. Warming climate have very strong negative impact on breeding success. Animals are vulnerable on disturbance at breeding and resting sites.

Fisheries by-catch is main cause of human induced mortality.

Large scale infrastructure development (e.g. bridge and wind parks) can have unforeseeable negative impact. There is no experience of influence of this kind of structures for Ringed seals habitat and species distribution range in the World.

Protection status of species and it's habitats: proposals to Estonian and Latvian authorities:

- Changes in protection category (from II to I in Estonia),
- Changes of borders and times for public access of existing protected areas,
- Establish one more new special protection area,
- Make seal-safe fishing gears mandatory at least in Pärnu Bay and Väinameri.

Monitoring and sustainable use of commercial and non-commercial fish resources in main foraging area, central and southern part of Gulf of Riga in Latvian and Estonian waters.

Deliverables and products of the action

The data collected during the implementation of the action (literature overview and new data collected through field works) is one input for the elaboration of the management plans.

Fact sheets for HELCOM completed for Grey seals and Ringed seals. Data collected during this project are available for HELCOM seal working group. The group is responsible for implementing seals recommendation (HELCOM Recommendation 27-28/2).