1364 Grey seal

Halichoerus grypus (Fabricus, 1791)

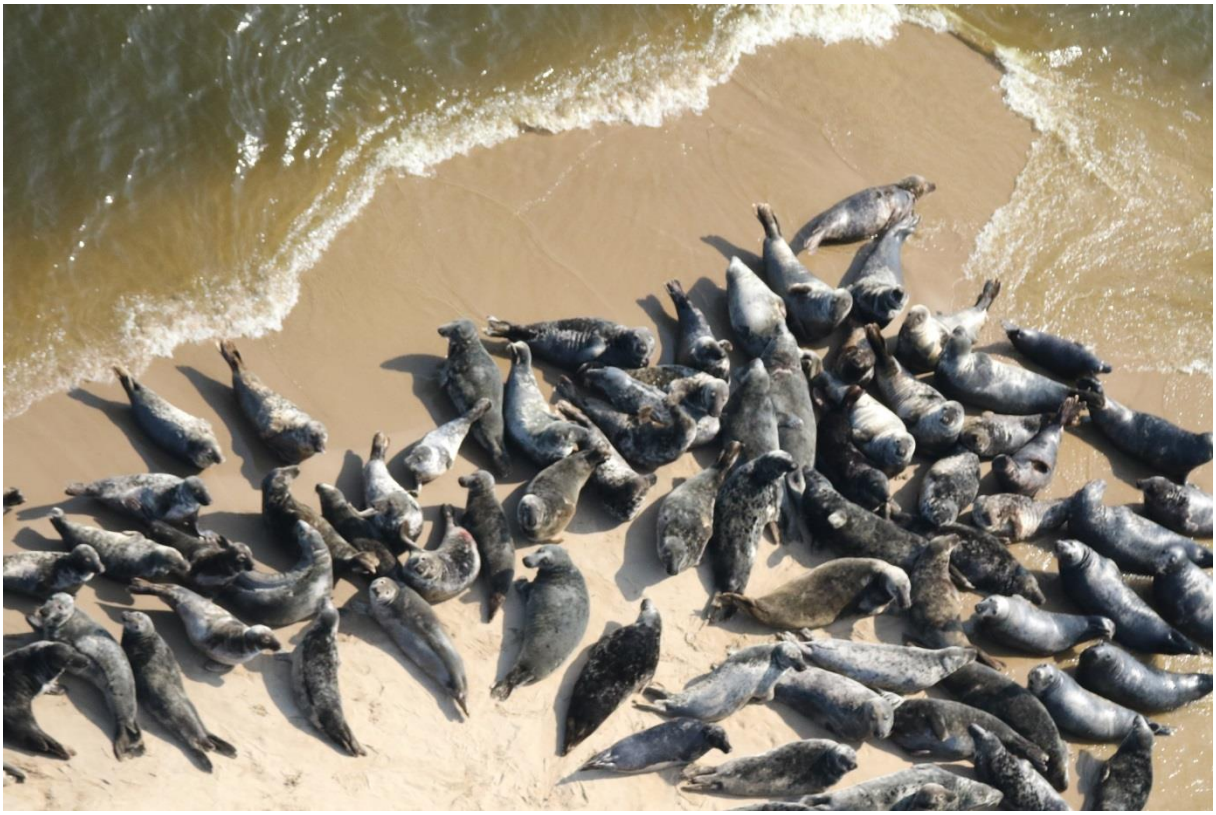

Photo 1. Herd of the grey seal at haul-out in the Vistula Przekop mouth (photo by M. Kozakiewicz)

I. INFORMATION ON SPECIES

1. Systematic affiliation

Order: Carnivora
Family: seals Phocidae

2. Legal status and threat to the species

International law
Habitat Directive – Annex II and V
Bern Convention – Annex III

National law
Protection of species - strict protection

IUCN threat category
IUCN Red List – LC
Polish Red List - Vertebrata – EN

3. Species description

The only representative of the genus *Halichoerus* in the Baltic Sea is also one of the two known subspecies *H.g. grypus* that inhabit the entire Baltic. In adults the sexual dimorphism is clearly visible - females reach a length of up to about 2 m with a body weight of up to 190 kg, while adult males reach a body length of up to 2.5 m and weight over 300 kg (Gójska and Pawliczka 2012). It should be emphasized that individuals from the subspecies *H.g.grypus* are significantly smaller than individuals from the subspecies *H.g.atlanticus* (from the west Atlantic) reaching a weight of up to 400 kg (Macdonald 2006).

Spindle-shaped body is tapering towards the back with rear fins strongly directed backwards. The pectoral fins support the body of the seal on land and help to move. The shape of the grey seal's mouth clearly distinguishes this species from other seals - the strongly elongated head makes it similar to that of a dog. The body is covered with thick fur. Colouring varies from light grey on the dorsal side and cream-white abdominal parts with distinct dark spots in females, uniformly dark with irregular spots on different parts of the body in males. New-born individuals have a light-cream fur called *lanugo*, which they get rid of in 2-3 weeks.

4. Biology of the species

Grey seals live in a large groups during the breeding and calves feeding period at the turn of late February till early March and during the moult at the end May and early June. During the breeding period, both males and females do not feed, using layer of the fat. After the breeding period males leave the herd and lead a solitary life. Females stay with the young for a few weeks, then leave them and return to intensive feeding. Therefore, the calves are forced to begin feeding at the sea and start an independent life soon after. Grey seals reach the maximum age of 46, with an average for this species of 26-30 years. Females reach sexual maturity at the age of 4-7 years and males at the age of about 6 years (Gójska and Pawliczka 2012).

The grey seal as a food opportunist hunts both pelagic and bottom fish. In the Baltic Sea their diet consist mainly of fish: herring, sprat, cod and salmon as well as European whitefish or vendace (ibidem). Molluscs (including cephalopods), crustaceans or occasionally birds (ibidem) were also found in its food composition. In recent years, attacks of the grey seal on the harbour porpoises have been reported in the region of the North Sea (Podt and IJsseldijk 2017).

5. Habitat conditions

Grey seals use both the sea and land habitats as the typical representative of *Pinnipedia*. In the life cycle of the species, there are periods closely related to feeding and availability of food (the period before and after reproduction and moulting) as well as requiring access to rest, breeding and moulting areas related to land habitats. The distribution of the grey seals over the year depends on both availability of food and access to a land. As a migratory species, it shows great mobility and the ability to travel even 100 km per day. It is also known to explore the Baltic Sea within the entire range of population (Chudzińska et al. 2011, Gójska and Pawliczka 2012).

6. Species distribution

Historical data indicate that about 100 years ago the grey seal population in the Baltic Sea had reached over 90000 individuals (Harding et al. 2007). However, intensive exploitation of the species - primarily hunting and by-catch in the fishing nets - resulted in a decrease in the population size to around 20000 in the 1940s. A further drastic decline took place up to the 1970s, when the population

was less than 3000 individuals, the main cause of which was marine pollution with PCB and DDT substances limiting female fecundity (Harding and Härkönen 1999). At the turn of the 19th and the 20th centuries, the population of the grey seal in the Gulf of Gdańsk region numbered about 1000 animals, and during hunting and fishing (including fishing traps) up to 200 individuals were recovered annually in the area of the Hel Peninsula. In the Polish waters this species has been systematically recorded and fished at least until the 1940s. From the second half of the last century the species had been sporadically recorded in the Polish Marine Areas until the grey seal had completely disappeared that the species was placed under protection (Gójska and Pawliczka 2012). At the end of the 1980s the Marine Station of the Institute of Oceanography at the University of Gdańsk in Hel began to obtain data on the observation of the grey seals from both accidental observations at the sea and from by-catch or found dead individuals on the shore (Gójska and Pawliczka 2012). However, it was only at the beginning of this century that regular observations of the species were recorded, mainly in the area of the Gulf of Gdańsk and since 2007 there is a permanent place of the occurrence of the species on the sandbank which is a haul-out for this herd in the area of the Vistula Przekop River. Since 2014 abundance of herd in this region exceeds 100 individuals (Hylla-Wawryniuk 2017).

Studies on occurrence and abundance of the grey seal in PMA were carried out in 2016-2018 (as part of the project "Pilot implementation of monitoring of marine species and habitats in 2015-2018", Opioła et. al 2016, 2017, 2018). The analysis of the collected data showed the haul-out in the area of the Vistula Przekop River with the herd size at the level of about 200 individuals during the moulting (ibidem).

II. METHODS

1. Concept of monitoring of the species

The proposed monitoring methodology is based on the HELCOM Monitoring guidelines (HELCOM 2018). It assumes an aerial survey monitoring and photo documentation of haul-out sites in late May and early June to determine abundance and at late February and earl March to determine the number of new-born calves in lanugo or pregnant females.

The occurrence of the seals, the number of adults and calves as well as resting, breeding and moulting areas and the availability of these sites are defined based on the analysis of photographic materials.

2. Indicators and assessment of the species conservation status

Indicators of population status

The table (Table 1) presents indicators for the assessment status of the 'Population' parameter, while the table (Table 2) presents the method of valorisation of these indicators.

Table 1. Indicators for assessing the status of the grey seal 'Population' parameter

Indicator	Unit	Indicator description
Occurrence	yes/lack	occurrence of the grey seal at haul-out (based on photographic documentation)
Abundance and relation to the total population size	N / N%	number of individuals at haul-out (based on photographic documentation) and number of individuals in relation to the total population (based on HELCOM data)

Indicator	Unit	Indicator description
Breeding	N	number of the calves or pregnant females (based on photographic documentation)
Mortality	N	number of dead individuals found in fishing nets and on the beach (reported by MGMiŻŚ, NMFRI, SMOIUG, WWF Polska) or observed during monitoring with traces of by-catch or intentional killing

Table 2. Valorization of indicators for assessing the status of the grey seal 'Population' parameter

Indicator	Assessment		
	FV favourable status	**U1** unfavourable inadequate status	**U2** unfavourable bad status
Occurrence	seals observed on each haul-out during each flight	seals observed at least during half of the flights on each haul out	seals observed during less than half of the flights on each haul out
Number of individuals	increase of the herd size of 7% in relation to the last year or herd size is above 0.5% of the total Baltic Sea population	increase of the herd size less than 7% in relation to the last year and herd size is less than 0.5% of the total Baltic sea population	lack of animals
Breeding	number of the calves recorder is above 5% in relations to herd size	number of the calves recorder is lower 5% in relations to herd size	lack of recorded calves or pregnant females
Mortality	number of by-caught animals and stranded with traces of by-catch or intentional killing is lower than 50% of herd size increase but not higher than number of calves recorded	number of by-caught animals and stranded with traces of by-catch or intentional killing is higher than 50% of herd size increase and higher than number of calves recorded	number of by-caught animals and stranded with traces of by-catch or intentional killing is higher than increase of the number of the individuals in the studied year

Habitat status indicators

The table (Table 3) presents indicators for the status assessment of the 'Habitat' parameter for the grey seal, while the table (Table 4) presents the method of valorisation of these indicators.

Table 3. Indicators for assessing the status of the grey seal 'Habitat' parameter

Indicator	Unit	Indicator description
Existence and access to optimal rest sites	descriptive indicator based on the expert assessment	determined on the basis of expert knowledge, including following information: • existence and access to the optimal rest sites established on the basis of observation of the seal's occurrence along the entire coastline, • possible disturbance of the access to these sites due to

Indicator	Unit	Indicator description
		construction works (breakwaters, bands) or pressures related to tourism or maritime transport.
Existence and access to optimal moult sites	descriptive indicator based on the expert assessment	determined on the basis of expert knowledge, including following information: • existence and access to the optimal moult sites – haul-outs, • possible disturbance of the access to these sites due to construction works (breakwaters, bands) or pressures related to tourism or maritime transport.
Existence and access to optimal breeding sites	descriptive indicator based on the expert assessment	determined on the basis of expert knowledge, including following information: • existence and access to the optimal breeding sites established on the basis of observation of the seal's occurrence along the entire coastline, • possible disturbance of the access to these sites due to construction works (breakwaters, bands) or pressures related to tourism or maritime transport.

Table 4. Valorisation of indicators for the assessment of the status of the grey seal 'Habitat' parameter

Indicator	Assessment		
	FV favourable status	**U1** unfavourable inadequate status	**U2** unfavourable bad status
Existence and access to optimal rest sites	optimal rest sites exist and animals have unlimited access to them (no pressures triggering the spreading effect)	optimal rest sites exist but access is limited (including pressures triggering the spreading effect)	optimal rest sites do not exist or animals have no access to them (for example, destruction of a previously recorded rest site)
Existence and access to optimal moult sites	optimal moult sites exist and animals have unlimited access to them (no pressures triggering the spreading effect)	optimal moult sites exist but access is limited (including pressures triggering the spreading effect)	optimal moult sites do not exist or animals have no access to them (for example, destruction of a previously recorded moult site)
Existence and access to optimal breeding sites	optimal breeding sites exist and animals have unlimited access to them (no pressures triggering the spreading effect)	optimal breeding sites exist but access is limited (including pressures triggering the spreading effect)	optimal breeding sites do not exist or animals have no access to them (for example, destruction of a previously recorded breeding site)

Conservation prospects

The assessment of the conservation prospects is an expert assessment and at the same time a prediction of the population and the habitat status in the perspective of the next 10-15 years. It takes into account both current data on population status and species habitat as well as applied protective

measures (e.g. approved national species protection plans) and observed threats (potential risks related to the anthropogenic growth) and their trend in the long-term perspective. It is important that in addition to the results of the monitoring itself, the assessment should take into account all the analyses of the long-term trends in population change in the Polish Marine Areas as well as available information on the above-mentioned issues resulting from systematic scientific or monitoring research.

Conservation prospects are in favourable status (FV) when both 'Population' and 'Habitat' parameters are at least in unfavourable inadequate status (U1). Besides, in the assessed period (10–15 years) there is not prediction for the increase of negative factors which may worsen the stability of the moult and breeding sites and impact on the number of the by-catch animals. The unfavourable inadequate status U1 can be assigned when both 'Population' and 'Habitat' parameters are at least in unfavourable inadequate status (U1), but there are factors that negatively affect both parameters and in the perspective of 10–15 years will worsen their current condition. If we assess that the current population and/or habitat status will deteriorate, the conservation prospects should be assessed as unfavourable bad (U2).

Overall assessment

The overall assessment of the conservation status of the species is synonymous with the lowest assessment of the three assessed parameters: 'Population', 'Habitat', 'Conservation prospects'. Scheme of assessment aggregation of components of indicators and parameters of the conservation status for the grey seal is presented in the figure (**Błąd! Nie można odnaleźć źródła odwołania.**).

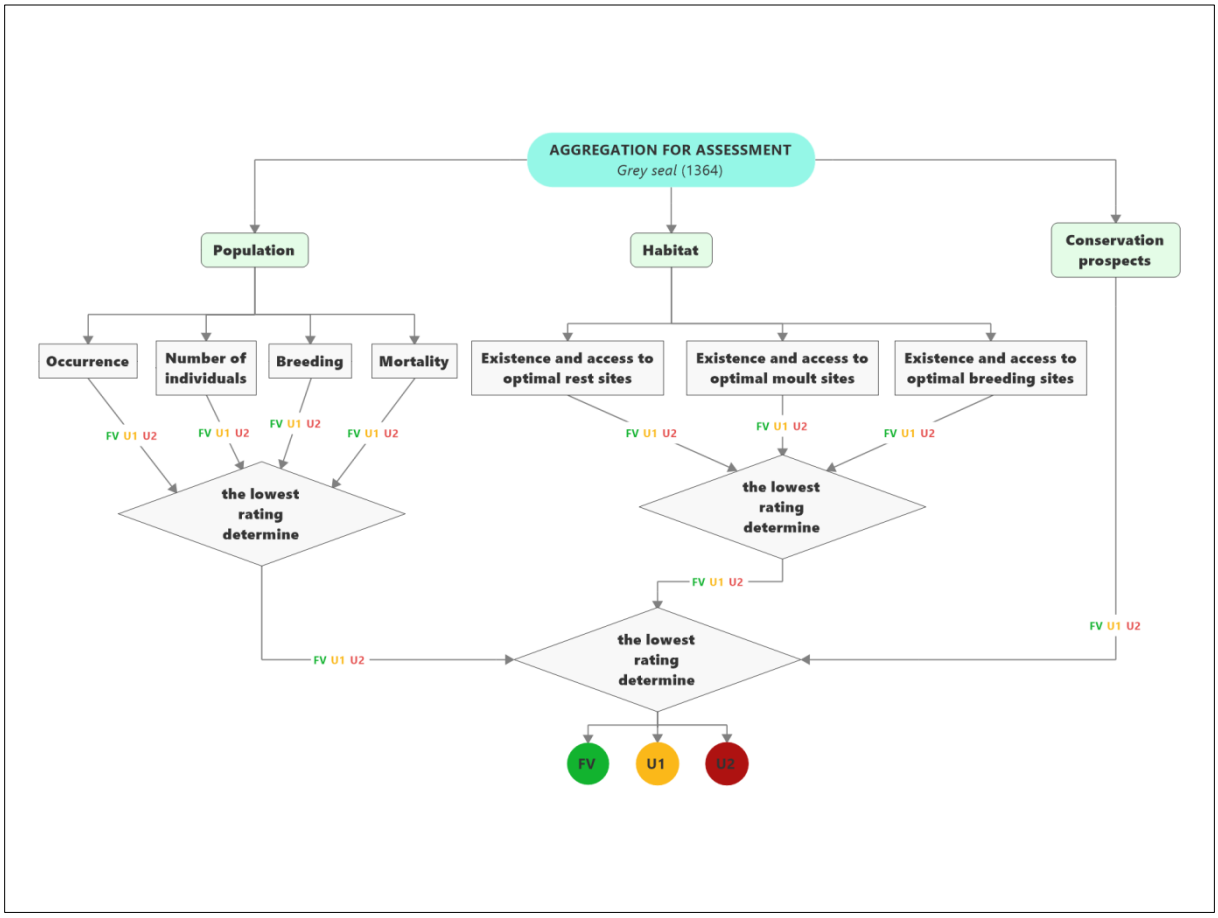

Fig. 1. Diagram of aggregation of indicators and parameters to assess the state of protection of the grey seal

3. Description of monitoring

Selection of monitored site
The 'monitoring site' is to be understood as each of the established haul-out area for the grey seal.

Grey seal surveys are carried out in the form of aerial observations and photographic documentation. Aerial monitoring of sandbanks (nowadays only identified haul-out in the Polish water) in the Vistula Przekop mouth (Fig. 2). In case of finding a new haul-outs of the species these sites should be also monitored.

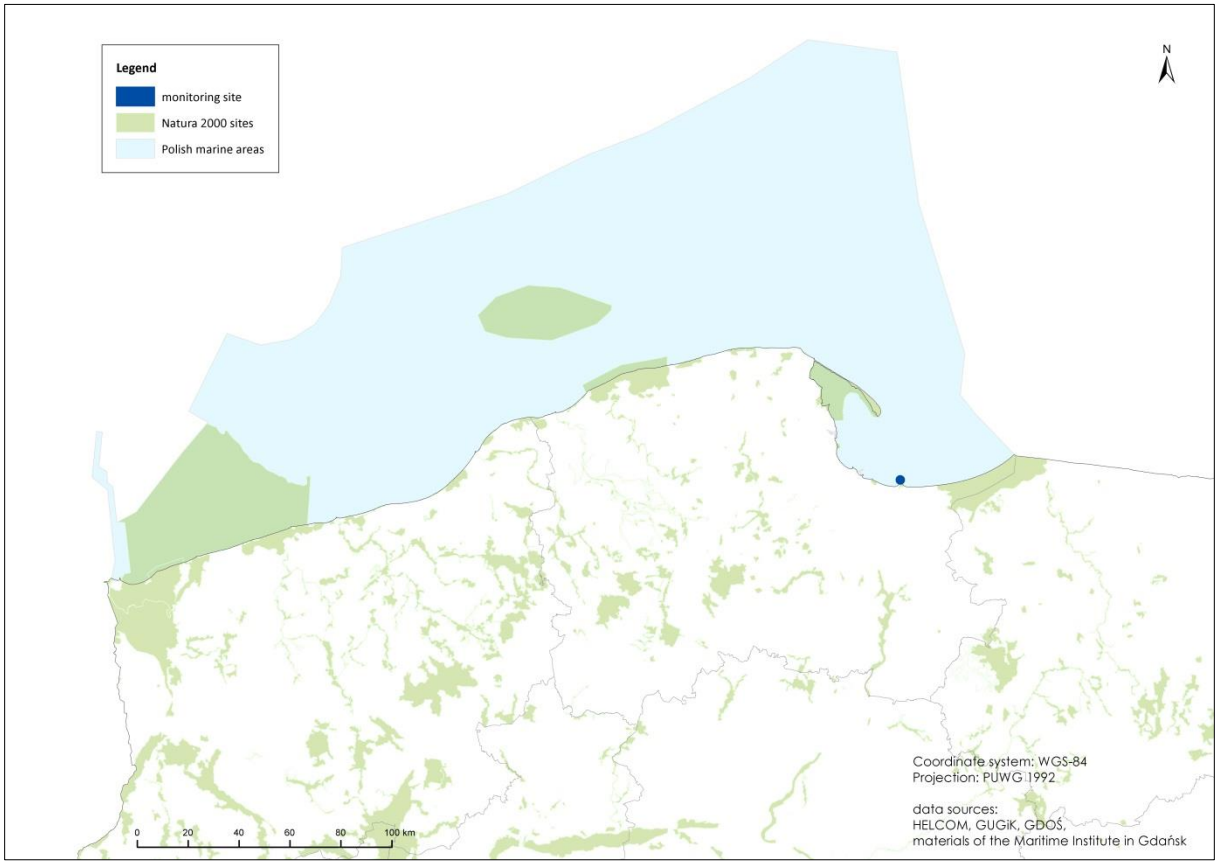

Fig. 2. Site for the grey seal monitoring

Study method
Two methods of monitoring are allowed to assess the status of the grey seal, i.e. using a drone or aircraft if more than one haul-out location is to be monitored.

Due to the fact that currently there is only one haul-out site for this species in the Polish Marine Areas it is recommended to carry out air raids using an unmanned aircraft equipped with a camera and/or a high-resolution photo camera that allows determining the species composition of the herd and abundance of individuals staying on sandbanks and in the water in their vicinity. The raid should take place at a distance (about 150 m) at a ceiling of about 100–150 m from the seal site. It is recommended to avoid direct flights over resting haul-out seals in order to prevent the spreading effect. Pictures should be taken in the so-called "hangs" and the time of one trip (from take-off to landing) should not exceed 30 minutes. The number of raids is determined by the current conditions, however, it is recommended to perform no more than two raids during one day of monitoring.

If new haul-outs of the grey seal will be established it is recommended to perform monitoring with plane: aerial observations are conducted by two observers sitting on the same side of the aircraft.

When haul-outs are located at a distance that allows taking pictures using the drone - monitoring is carried out with its use. However, when they are at a distance that prevents the use of drone, monitoring should be done using the aircraft. The aircraft should maintain a ceiling of an altitude of 200 m and speed of approximately 110 km/h. The flight path leads over the water a short distance from the mainland which allows both observers to cover the entire area of the coastline and the beach. With the exception of haul-out (permanent habitat) seal observations are recorded only on land. In the place of permanent occurrence of seal individuals who swim a short distance from the coast of haul-out are also noted. Observers document observations by taking photos and completing field forms. The number of observed individuals is estimated by observers during the flight and recorded in the field observation form.

It should be underlined that the decision on the application of a particular method of surveys (aircraft, drones) belongs to the person conducting the monitoring and have to take into account both the research effort aspect and the number and distances between the haul-out sites of the species covered by the monitoring.

The final analysis of data from aviation monitoring consists of analysing the photographic documentation provided. On this basis, the seals are identified to the species and their numbers are determined independently by two experts.

The assessment of the grey seal conservation status is determined irrespective of the number of the monitored sites (haul-outs) and is correspond with a single assessment in the Polish Marine Areas.

Determination of the population status indicators

Occurrence. Based on the analysis of photographic data in the period from May to June, it is determined whether at each haul-out of the species, the grey seal is recorded every time.

Value of 'Occurrence' indicator is calculated as:

$W = N/(A*B)*100\%$

where:
W – value of 'Occurrence" indicator
N – number of positive detections of seals at each haul-out
A – number of aerial surveys (every season)
B – number of monitored haul-outs

The number of individuals. Based on the analysis of photographic data from May to June, the maximum number of herds is determined, i.e. the number of individuals is present in the haul-out area for each raid and the maximum value is indicated as the number. For the valorisation of this indicator only the highest value of abundance from all flights carried out during one day is taken into consideration. This value is compared with the result for the previous year and defines the percentage change (year on year) of the herd abundance.

In the case when the change in the number of herds is lower than assumed in the valorisation method, the percentage share of the herd population in the total number of the grey seals populations in the Baltic Sea is checked.

Reproduction. Based on the analysis of observer forms and photographic data from February to March, it is determined whether pregnant females or young grey seal females in lanugo (calves) were observed at the station. The sum of these observations is calculated for each of the raids and

determines the maximum number for this indicator in a given year of monitoring. The value obtained is compared with the herd size (data from May-June raids) and its percentage share is determined.

Value of 'Reproduction' indicator is calculated as:

R = C/D*100%

where:
R – value of 'Reproduction' indicator
C – number of seal calves in lanugo and pregnant females
D – value of 'Number of individuals' indicator

Mortality. Information on the number of animals and dead animals caught in fishing nets containing traces indicating the human factor is obtained from reports of the Ministry of Economy and Sea Fisheries, WWF Poland, SMOIUG and observations obtained as part of the monitoring. It is recommended that in subsequent evaluations, the methodology of indicator valorisation should be taken into account on the basis of HELCOM MAMA recommendations.

Determination of the habitat status indicators

Existence and access to optimal rest sites. It should be determined if there are optimal resting sites and whether grey seals have unrestricted access to them. All kinds of factors limiting access to such places should be taken into account - the development of the coast infrastructure (strengthening), ports and estuaries and the intensity of tourism in the coastal areas. The assessment takes into account the specificity of the location of rest sites and the type and strength of potential pressures.

Existence and access to the optimal sites of moulting. It should be determined if there are optimal sites for moulting and whether grey seals have unrestricted access to them. In the case of this parameter, photographic documentation made in May-June allows you to determine the haul-out condition and its availability for the grey seal. All available permanent sites of the species should be taken into account. The assessment takes into account the specificity of the location of moulting sites and the type and strength of potential pressures.

Existence and access to optimal breeding sites. Specify if there are optimal breeding sites and whether grey seals have unrestricted access to them. In the case of this parameter, photographic documentation made in the period February-March allows you to determine the haul-out condition and its availability for reproduction of the grey seal during this period i.e. sea ice conditions/ coverage or sea level. It should be taken into account whether or not calves or pregnant females were observed in a given year - i.e. whether there were actually optimal places for breeding the species. The assessment takes into account the specificity of the location of breeding places and the type and strength of potential pressures.

4. The date and frequency of investigations

It is recommended to conduct air monitoring every year on the following dates, in accordance with the HELCOM (2017) methodology:

- during the breeding time of the grey seal to conduct flights monitoring nearby the haul-out sites. As an optimal two flights are considered – one at the breeding period (end of February-early March) and one in the second half of March,

- - during the moulting of the grey seal (May–June) – carrying out flights covering every time the haul-out of the species within two weeks at the end of May and earl June. As an optimal number, three flights are considered within (in total) two weeks.

It is recommended that the interval between consecutive flights is not shorter than five days.

Monitoring flights should be carried out in good weather conditions that allow to make photographic documentation, i.e. with good visibility and not less than six hours from atmospheric precipitation.

Monitoring flights over all identified haul-outs must be completed within one day.

5. Equipment and materials for investigations

An unmanned aerial vehicle (drone) should be equipped with a camera capable of capturing high resolution images. A HD quality camera is also allowed frame-based material analysis, GPS or geotagging of images and image transmission allowing the observer to correct the flight route.

Observers performing air monitoring should be equipped with a GPS receiver that records the route of flight, regardless of the aircraft's equipment, binoculars with parameters not worse than 8x40 and a camera that allows taking pictures with high magnification in high resolution. The photographs should allow counting of individuals at the haul-out sites and species identification.

6. Examples of grey seal research forms

SEA MAMMALS OBSERVATION FIELD FORM		
Institution: *Maritime Institute in Gdańsk*		
Monitoring site: *haul-out in the Vistula mouth*		
Page no 1 of 1	**Method**: 1 = LAND survey; *2 = AERIAL survey;*	**FLIGHT information**:
Transect ID / Flight ID: *2017-06-03*	**Behaviour (seals)**: 1 = swimming 2 = milling 3 = feeding 4 = surfacing 5 = resting/sleeping	**Obs. and meteo conditions**: Scale from best to worst visibility (1–3)* clouds (0–8) rain (0–3) wind force (0–7) [°B] wind direction (1–360) [°] sea state (0–7) [°B] ** 1 very good* *2 limited* *3 below 500 m*
Observer:		Start time (UTC): *06:00* Stop time (UTC): *10:00* Plane: *CESNA 125* Pilot: Observer side (left / right): *right*
Date: *2017-06-03*		
No: status: 1 = start, 2 = stop, 3 = observation		

NO.	Position		TIME (UTC) [hh:mm]	Observations				Picture [yes / no]	Obs. and meteo conditions						Additional information
	LAT	LON		Species	Adults number	Calves number	Behaviour		Visibility	Clouds	Rain	Wind force	Wind direction	Sea state	
1			*06:30*						*1*	*0*	*0*	*1*	*25*	*2*	
3			*07:15*	*HAGRY*	*120*		*5*	*T*							*All seals at entrance no 55*
2			*9:30*						*1*	*1*	*0*	*3*	*30*	*2*	

Compiled by:	**Checked by:**	**Approved by:**
Date:	Date:	Date:
Signature – name:	Signature – name:	Signature – name:

PHOTO ANALYSIS FORM – MARINE MAMMALS									
Monitoring site: *haul-out Ujście Wisły*									
Transect ID: *2017-06-03*									
Data analysed by (name):				Maximal number of seals: *125*					
Photo time (UTC)	Position (LAT / LON)		Picture ID / number	Seal observations					Comments
				Species	Adults	Calves	Breeding [yes / no]	Mating [yes / no]	
07:15			*UW-170603-1*	*Grey seal*	*119*	*0*	*No*	*No*	
07:15			*UW-170603-2*	*Grey seal*	*125*	*0*	*No*	*No*	

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Date:	Date:	Date:
Signature – name:	Signature – name:	Signature – name:

7. Other species for which the developed methodology can be applied

In the case of the other two species of seals found in the Polish Marine Areas - the common seal and the ringed seal - the proposed method of air monitoring allows the assessment of population indicators. However, it should be taken into account that the indicators themselves as well as the proposed threshold values apply only to the grey seal - mainly due to its permanent presence in the Polish Marine Areas as well as the existing haul-out site. Both the common seal and the ringed seal occur sporadically, and in the case of a ringed seal, it is unlikely that the species could persist in the Polish Marine Areas due to its ecological requirements.

8. Protection of the species

The grey seal is a species included in the Red book of national species and classified as strictly protected species (Głowaciński 2002). The "Grey seal protection program - Project" document developed in 2012 (Gójska and Pawliczka 2012) has not been adopted so far, and thus the protective actions proposed and improving the habitat status of grey seal remain unfulfilled.

Within the framework of the Natura 2000 protection system there are eight areas in POM where the grey seal is the subject of protection, but the activities are primarily of an educational nature.

Due to the threat posed by by-catch in fishing nets and the increase in anthropogenic pressure from tourism and the development of coastal infrastructure, protective measures should primarily take into account the introduction of so-called "Seal safe gear" allows for a significant reduction of by-catch and the designation of special protection zones, in areas of rest, moulting and reproduction, which are crucial for the species.

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