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Phocine Distemper Epidemic amongst Seals in 2002

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Introduction

In May 2002, a mortality of common seals caused by phocine distemper (pd) virus infection was identified in the Danish Kattegat area. Since then, the virus has spread to the Swedish and Norwegian coast in the Kattegat/Skagerrak area, to the east coast of the United Kingdom and also to the Dutch, German and Danish Wadden Sea, where the virus was first found in a common seal stranded on the Dutch Wadden Sea coast in mid June 2002. The occurrence of the pdv infection was associated with an unusually high mortality in the above areas. Between the beginning in May 2002 and the end of October 2002, in total about 21,000 dead common seals (*Poca vitulina*) were registered in the Danish-Swedish-Norwegian Kattegat/Skagerrak area, the Limfjord, the Baltic Sea, the Wadden Sea and the North Sea.

In 1988, the same pd virus caused the death of a substantial part of the common seal population in Western Europe. In the following, more details are given regarding the status and development of the mortality in 2002 in comparison to the 1988 outbreak.

Status and Development of the Seal Mortality in 2002

The pd virus is very contagious for common seals, but not dangerous for man. Most of the 80% of the virus-infected seals died due to secondary infections from other pathogens such as bacteria, because the virus weakens the immune system. Most often the cause of death is pneumonia.

Outbreak and confirmation of the pd-disease

During the 1988 pdv epidemic, already in February – March, the number of dead seals along the Danish Kattegat-Skagerrak area and the Wadden Sea coast in Schleswig-Holstein was approximately three times higher than the average for the same months in the previous four years. The first indication of an epizootic within the common seal population was noted by the increasing number of aborted pups on the island Anholt in the central Danish Kattegat in April 1988.

In the beginning of May 2002, the first common seals suspected to have died of pdv were also found on the island Anholt in the Danish Kattegat, the same island, which was the starting location of the pd epidemic in 1988. About 150 dead seals were documented on Anholt and Laesø within a short time until 27.05.2002.

Three samples of some of the first dead seals were examined at the Erasmus University in Rotterdam in the Netherlands with the Polymerase-Chain-Reaction-method (PCR) with positive results of the pd virus in mid May (Jensen et al 2002). According to the investigations at the Danish State Veterinarian Institute in Aarhus, it had definitely been confirmed since 04.06.02 that the pd virus was the cause of the mortality of common seals in the Danish Kattegat. This virus caused similar mortality in common seal populations in the past (e.g. the outbreak in 1988).

Distribution pattern

In 1988, the disease quickly spread from the Danish island Anholt to all other seal sites in the western and eastern Kattegat/Skagerrak, the Danish, German and Dutch Wadden Sea and to nearly all other seal stocks in Europe in April/May/June. Some seal stocks, for example seal colonies in the Baltic Sea and in Norway were not affected. (CWSS 1991)

In May/June 2002, there were indications that the initial phase of the pd outbreak in the Kattegat-Skagerrak this year seemed to be less severe than the outbreak in 1988. However, it was not possible to predict the pattern of this year's outbreak and the further development of the virus infection for the seal population at that time. The disease spread south and northwards in the Kattegat/Skagerrak area and affected all relevant seal colonies in the area off the Danish east coast. The outbreak of the seal disease was registered on the Swedish west coast on 30.05., and ran from south to the north and reached northwards the outer Oslo-fjord in Norway on 22.06.2002.

On 19.06.02, the first common seal with pd was confirmed in the Netherlands. The seal was found on the Dutch Wadden Sea island Vlieland on 16.06.02 by a staff member of the Pieterburen Seal Nursery Center and transferred to Pieterburen. Since then, it had been expected that the virus would also emerge in the other parts of the Wadden Sea. However, the mortality first only started in the Dutch part of the Wadden Sea, and only later an unusual mortality and also the confirmation of pd had been registered in Lower Saxony since 25.07., on the island of Helgoland since 11.08., in the Hamburg (Neuwerk and Scharhörn) since 21.08., in the Schleswig-Holstein part since 26.08., and - as the last region - in the Danish part of the Wadden Sea since 30.08.02.

Besides the Wadden Sea, also the Dutch North Sea coast of the provinces of Noord-Holland, Zuid-Holland and Zeeland, the Belgium/French North Sea coast and the United Kingdom, mainly the Wash and the Northumberland and Suffolk North

Figure 1: Map of Northern Europe – Areas marked with occurrence of phocine distemper mortality of common seals in 2002

Sea coast, as well as the Danish Baltic Sea and the Limfjord, DK, as the last, have been pd affected areas with higher mortality amongst common seals.

In all parts with occurrence of unusual mortality, at least some samples of dead seals were tested pdv positive, and thus confirmed the pd outbreak in seals. In 2002, more or less the same areas are affected by the pd as during the pd epidemic in 1988.

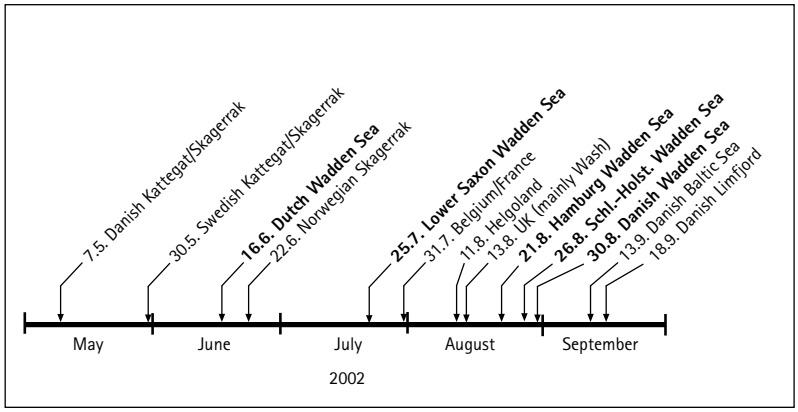

Figure 2: Chronological timetable with the date of the phocine distemper outbreak amongst common seals in the different areas in Northern Europe in 2002.

Grey seals (*Halichoreus grypus*) were not as severely affected as common seals in 1988 and 2002. In the United Kingdom, e.g. single, and in the Wadden Sea in Lower Saxony about 19 grey seals were registered until the end of October 2002. Grey seals seemed to be less susceptible to the disease.

The distribution pattern of the seal epidemic in Northern Europe in 2002 and the first date of occurrence of the unusual mortality of common seals, which is the starting point of the outbreak of the disease in that region and at the same time the beginning of the counting of the pd mortality, are given in Figure 1 and 2.

Final stages of the epidemic

According to the Tjärnö Marine Biological Laboratory, Sweden, the epizootic among common seals in the Skagerrak-Kattegat area seemed to be over by about mid September 2002.

The number of found dead seals in the entire Wadden Sea had stagnated on a low level since the beginning of October and came more and more to an end. Among the found dead seals, there were only a few fresh ones at that time. However, the first autumn storms, again, washed ashore a higher number of old, rotten carcasses in mid/end October 2002.

In the Limfjord, the junction between the Baltic and the North Sea, many seals were still dying in the second half of October. The mortality in the United Kingdom had also still not come to an end at that time.

Numbers of dead seals in 2002

In 1988, more than 18,000 seals, mainly common seals died in northwest Europe from the highly contagious disease. Substantial numbers of seals died in the United Kingdom and the population in the Wash declined to about 50% of its size before the epidemic. In the entire Wadden Sea, it was estimated that close to 60% of the population died as a result of the virus epidemic, which amounted to about 8,500 dead seals. (CWSS 1991)

The development of the seal deaths in the different areas between May and September 2002 is given in Figure 3 and 4.

The number of registered dead common seals in the different areas in 2002 is given in Table 1

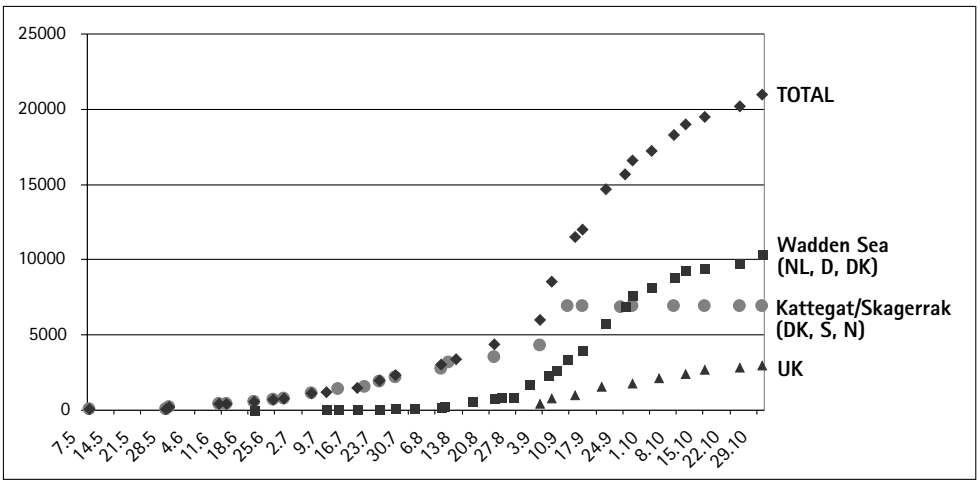

Figure 3: Development of the seal dying in the different areas in Northern Europe in terms of numbers since May 2002

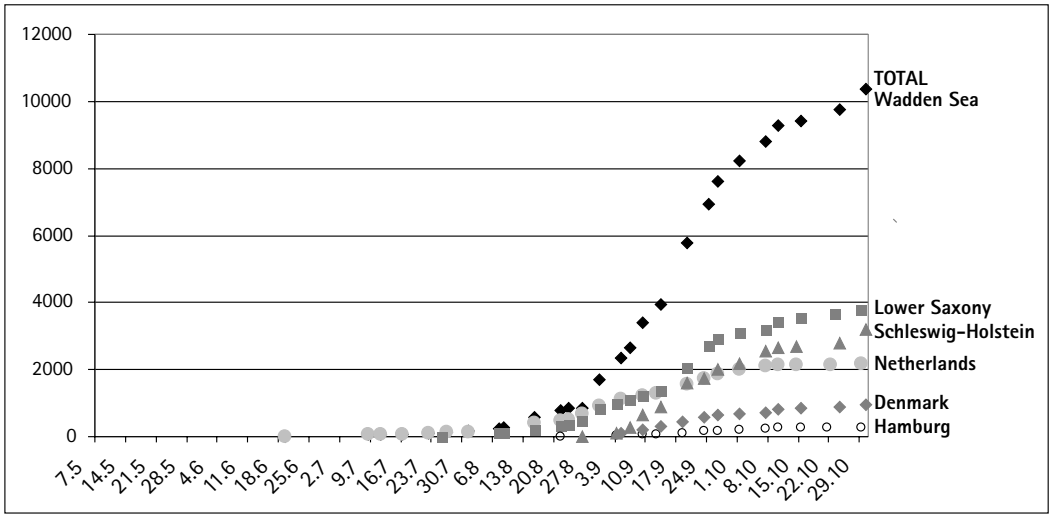

Figure 4: Development of the seal dying in the different parts of the Wadden Sea in terms of numbers since May 2002

(third column). The table also includes the first date of the unusual mortality in the different areas (second column) as well as the minimum population size of common seals in the different areas according to the results of the seal counts in the Wadden Sea in 2001, respectively according to other sources (last column).

Size of common seal populations and loss due to the pdv infection in Northern Europe

The counted numbers of common seals in the different areas, which is the minimum population size in the area, are given in Table 1 (last column).

Wadden Sea

In 1987, before the outbreak of the epidemic in 1988, the maximum number of counted common seals in the Wadden Sea was about 8,600 animals, that means that about 10,000 would have had been counted without an epidemic in 1988. The total real number of the population in 1988 was at least 30% higher. In the entire Wadden Sea, about 8,500 dead seals were registered in 1988, and it was estimated that about 60% of the estimated seal stock in the Wadden Sea died. (CWSS 1991)

Last year, almost 20,000 common seals were counted in the Wadden Sea but not all seals in the population are observed during surveys because they do not all rest on the sandbanks at the same time (TSEG 2001). Research showed that the total number is at least 30% higher. This implies that it can be assumed that the size of the population was approximately over 25,000 animals. The seals were in a relatively good condition, and there were no indications for an overpopulation. For the survival of the pups after weaning, it is imperative that they built up enough reserves during the four weeks of lactation. Still normally, 30% of the pups do not survive the first year (TSEG-plus 2002).

In the entire Wadden Sea more than 10,000 dead seals were registered in 2002, It can be estimated that close to about 40% of the estimated seal stock in the Wadden Sea (about 25,000) died as a result of the virus epidemic. The percentage may differ from region to region and can be higher or lower in specific areas. However, the loss of seals will become more evident during the next aerial counts in 2003.

Danish and Swedish Kattegat / Skagerrak area

On the Danish island Anholt, about 800, on Laesø about 900 and on Hesselø about 700 common seals were counted during the last regular count in August 2000 (Laursen 2001). It can be estimated that the total stocks of the islands are twice as big. The total population of common seals in the Danish Kattegat and Oresund area was – according to the results of the counting in 2000 - about 3,250 animals.

According to information from the Tjärnö Marine Biological Laboratory, Sweden, in total, approximately 7,000 common seals have been re-

ported dead in the Danish-Swedish-Norwegian Kattegat-Skagerrak area, but probably in total 10,000 seals died. Thus, of those about 19,000 common seals that lived in the area in spring, slightly more than 50% died. Aerial surveys during August 2003 will provide more exact numbers.

Other areas

According to the Sea Mammal Research Unit the estimated or minimum population size of common seals in the United Kingdom including Scottland was about 34,100 animals. In the United Kingdom the mortality is still going on, therefore an estimation on the loss of seals cannot be made yet.

Possible causes of the pd epidemic

It is still unclear, why the mortality commenced in the Anholt area in 1988 and again in 2002. It is possible that the Anholt area is a virus reservoir, or a new introduction of the virus took place, e.g. by another aquatic animal, or from indirect anthropogenic sources (e.g. mink farms).

The seal sites of common seals on the Danish Island Anholt are reserves with no public access and they are far away from the inhabited parts of the island with about 150 inhabitants and some 1,000 summer guests. There are only some sheep and cows on the island, however, nothing special such as fur farms. There are also grey seals (*Halichoerus grypus*) on Anholt, which migrate far

	First date of occurrence of unusual mortality	**Seal Report No. 42 (31.10.2002) Number of dead common seals (until date)**	**Minimum population size of common seal (number/year of counting)**
WADDEN SEA			
Netherlands (incl. Noord- and Zuid-Holland, Zeeland)	16 June 2002	2,174 (29.10.02)	3,600 (2001)* NL-Wadden Sea
Lower Saxony	17 July 2002	3,783 (29.10.02)	6,220 (2001)*
Hamburg	21 August 2002	261 (29.10.02)	(488 (2001)*, included in numbers of Lower Saxony)
Schleswig-Holstein	26 August 2002	3,206 (30.10.02)	7,190 (2001)*
Denmark	30 August 2002	937 (29.10.02)	2,380 (2001)*
Wadden Sea Total		**about 10,360**	**20,000** (2001)* **(25,000 estimation)**
Helgoland	11 August 2002	**270** (30.10.02)	**about 400***
KATTEGAT/SKAGERRAK			
Danish Kattegat / Oresund	07 May 2002	2,037 (24.10.02) no new figures available epizootic mainly over	3,250 (2000)***
Swedish Kattegat / Skagerrak	30 May 2002	about 4,000 (06.09.02) epizootic mainly over	about 15,000 (estimation)**
Norwegian Skagerrak	22 June 2002	878 (23.09.02) epizootic mainly over	1,200 (1996-98)****
Kattegat/Skagerrak Total		**about 6.915**	**about 19,000****
DK- Limfjord			
	about 18.09.2002	**315** (24.10.02) no new figures available	**1,631/886**** (1999/2000)
BALTIC SEA			
Danish Baltic Sea: Falster, Møn, South-Lolland	about 13.09.2002	**91** (24.10.02) no new figures available	**270** (2000)*
German Baltic Sea coast Mecklenburg-Western Pomerania	30 August 2002	**11** (07.10.02)	no colonies
BELGIUM/(FRANCE)			
	31 July 02 (France) / 18 August 02 (Belgium)	21 (10.10.02)	no colonies
UNITED KINGDOM			
(common and grey seals)	13 August 2002	2,980 (30.10.2002)	34,100****
ALL AREAS TOTAL		**ABOUT 20,965**	

Table 1: Phocine Distemper epidemic amongst common seals in 2002 (sources: first, second and third column – information supplied by countries for the Seal Reports (Reineking 2002); last column – * = TSEG 2001, ** = information by the Tjärnö Marine Biological Laboratory, Sweden, * = Laursen 2001, **** = homepage of SMRU-UK****)**

away/around and rest on Anholt (no rearing area). During the 1988 disease only some grey seals were infected on Anholt. On Laesø, there are three seal sites and on the small island Hesselø, which is a seal reserve too, beside the seals, only a few summerhouses can be found.

According to a press release from the Tjärnö Marine Biological Laboratory, Sweden, the following was stated on 08.08.2002:

"During the years 1991-2001, i.e. between the epizootics 1988 and 2002, samples of 12 common seals and grey seals in the Baltic and along the Swedish west coast were taken. At the time of sampling these were suspected to have died of the pdv. On 07.08.2002, the analysis of these samples was completed, showing that all test results were negative. The result of this limited study weakens the hypotheses that the pdv had existed in the populations of grey seal and common seal around the Swedish coasts. The virus is thus unlikely to have circulated among common seals and grey seals, forming a source of infection to the common seals on Anholt this year.

In all probability, the seal epizootic in 1988 started because pdv-carrying harp seals (*Phoca groenlandica*) had swum southwards, infecting common seals in the Kattegat. This year there were no reports of harp seals as far south as the North Sea area. The hypothesis that harp seals spread the virus to common seals this time is therefore very weak.

The main hypothesis is now that minks or other animals spread the virus to common seals. If sick or dead minks are drifting in the water, the playful common seals can swim up to them and get infected. Minks have been collected from the areas of Måkläppen, Varberg, Göteborg and Koster, Sweden. Samples of these were to be examined later over the summer."

According to a press release from the Tjärnö Marine Biological Laboratory, Sweden on 26.09.2002, it was stated that in Sweden, several dozens of wild mink were shot during the late summer. Virological analyses will show if the pdv is circulating among them as well. It is also intended to get samples collected in 1989-2001 from minks, in order to find out if this species could have carried the pdv since 1988 and possibly infected the common seal in 2002.

Conclusions

Since there are obscurities regarding the cause of the disease, and there are several hypothesis being discussed currently, it seems imperative to conduct further investigations into the disease. To gain more detailed knowledge regarding the causes of the epidemic, and to get answers on specific questions related to management and political and scientific points of view, joint international activities to design essential investigation and research programs are necessary.

Answers to some questions are already expected from the international symposium on the management of the North Sea common and grey seal populations, which will be organized at Ecomare on Texel, the Netherlands on 29 and 30 November 2002. The aim of the symposium is to present state of the art knowledge on the status and management of the North Sea seal populations in relation to, e.g., developments in fisheries, recreation, and large infra-structural works. Furthermore, the consequences of the pdv epidemic and of other developments in the entire Wadden Sea and North Sea on seals will be discussed.

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