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Short communication

Lesions observed on stranded seabirds along the Belgian coast from 1992 to 1995

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From 1992 to 1995, dead seabirds found on Belgian beaches were collected and various tissues of 241 birds were sampled for histopathological, bacteriological, parasitological, and toxicological investigations. The most common species examined was the guillemot (*Uria aalge*). Necropsies revealed cachexia (severe emaciation), acute haemorrhagic gastro-enteropathy and oil contamination in many of these birds. Statistical analyses were performed in order to explore correlations of these with biological parameters such as age, sex, and origin (pelagic or non-pelagic). The pelagic origin of seabirds were associated with the three main findings. Oil contamination was associated with acute gastro-enteropathy and cachexia, and cachexia was more prevalent among juveniles. Finally, cachexia and acute gastro-enteropathy were strongly associated. It is possible that oiled pelagic seabirds become cachectic and die of acute gastro-enteropathy.

Key words: emaciation, oil, pathology, seabirds.

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Introduction

The southern North Sea is heavily exposed to oil and chemical pollution, e.g. heavy metals and organochlorines that accumulate in food webs (North Sea Task Force, 1993a, b). Pathological investigations of dead seabirds provide information on the causes of death and may identify specific diseases. Common findings recorded at necropsy on stranded seabirds include severe emaciation, acute haemorrhagic gastro-enteritis, oil contamination, food shortage, net entanglement and plastic ingestion (Camphuysen and van Franeker, 1992; Camphuysen and Leopold, 1994; Jauniaux *et al.*, 1996). Relationships between these various findings are not easy to identify, but oil contamination seems to be associated with emaciation and intestinal lesions (Jauniaux *et al.*, 1996). Pathological investigations must be linked with ecological and toxicological studies in order to build valid hypotheses on the causes of seabird mortality in the southern North Sea. Since 1989, such multidisciplinary evaluations have been carried out on seabirds wintering along the Belgian coast.

This paper describes *post-mortem* findings on 241 seabirds stranded along the Belgian coast during three successive winters from 1992 to 1995.

Materials and methods

Each year, between November and March, Belgian beaches were surveyed weekly and carcasses with little evidence of decay were collected for necropsy (Offringa *et al.*, 1995). Collection of all dead birds at the same locations on a weekly basis, discarding only carcasses that were too putrified to be necropsied, results in minimal bias in the sample submitted for necropsy. Corpses were individually labelled and kept frozen until necropsy.

Pathological investigations were performed on 241 birds, using a consistent necropsy protocol (Dorrestein and van der Hage, 1993; Jauniaux *et al.*, 1996). They were weighed, oil contamination on plumage and/or in intestinal tract was recorded, lesions were noted, and emaciation was evaluated. Sex and age determination

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Table 1. Main species of birds collected dead along the Belgian coast and necropsied during 1992 to 1995 winters.

Species	n	%
Guillemot (*Uria aalge*)	146	60.60
Razorbill (*Alca torda*)	19	7.90
Herring gull (*Larus argentatus*)	14	5.80
Kittiwake (*Rissa tridactyla*)	13	5.40
Oystercatcher (*Haematopus ostralegus*)	12	5.00
Black-headed gull (*Larus ridibundus*)	6	2.50
Fulmar (*Fulmarus glacialis*)	5	2.00
Other (n<5)	26	10.70
Total	241	

Table 2. Results of birds necropsied during the winters 1992 to 1995.

Results	n	%
Sex		
Male	110	45.64
Female	91	37.76
nd	40	16.60
Age		
Juvenile	112	46.47
Adult	96	39.83
nd	33	13.69
Emaciation	178	73.80
A.H.G.	147	61.00
Oil contamination	105	43.60
Respiratory mycosis	7	2.90
Absence of alimentary content (data available during 2 winters)	87	80.00
Gastrointestinal parasites	74	30.70
Air sacs parasites	4	1.70
Foreign bodies	8	3.30

A.H.G.=acute haemorrhagic gastroenteropathy.
nd=not determined.

was based on examination of gonads and the presence (juvenile) or absence (adult) of the bursa of Fabricius. Gastrointestinal tracts were examined for the presence of food. Tissues were collected and processed as previously described for histopathological, bacteriological, and parasitological examinations (Jauniaux and Coignoul, 1994; Jauniaux *et al.*, 1996; Brosens *et al.*, 1996). In guillemots, pectoral muscles, liver, and kidneys were sampled for toxicological investigations.

Chi-square statistical tests were used to test for associations between biological data (age, sex, and pelagic origin) and pathological observations (Jauniaux *et al.*, 1996).

Results

The main species necropsied (61% of the total) was the guillemot (*Uria aalge*) and ca. 78% of samples were of pelagic species (Table 1).

Necropsy findings are listed in Table 2. Emaciation, characterized by absence of fat and reduction of pectoral muscles, was observed in 74% of birds. Acute haemorrhagic gastro-enteropathy, characterized by a serosal congestion, intestinal wall thickening and hyperaemia, and by the presence of haemorrhagic exudate in the lumen, was observed in 61% of birds. Oil was present on the plumage and/or in the intestinal tract of 44% of birds. Among oiled birds, 82% were emaciated, while only 48% of emaciated birds were oiled. The gastrointestinal tract was empty in 80% of birds. Foreign bodies (mainly plastics) were collected from the gizzard of eight birds (3.3%).

Six birds had fungal pneumonitis and aerosacculitis characterized by white greenish nodules and plaques in the air sacs and in the lungs. *Aspergillus fumigatus* was identified in all lesions. One bird had a fungal aerosacculitis around the pericardium, and *Candida albicans* was isolated.

Nematodes (*Contracaecum spiculigerum*, *Cosmocephalus obvelatus*, and *Paracuaria tridentata*) and acantocephals, respectively, were found in the gizzard (80 birds) and in the intestine (six birds). Free parasites (Pentastomids) were observed in the air sacs of four birds.

Emaciation was significantly associated with age, pelagic origin, and oil contamination (Table 3). Juvenile, pelagic or oil-contaminated birds were more frequently emaciated (p=0.0005, p=0.0151, and

Table 3. Contingency tables between emaciation and origin (pelagic/non-palagic), age, and oil contamination of birds dead along the Belgian coast during 1992 to 1995 winters.

	Pelagic	Non-pelagic	Juvenile	Adult	nd	Oiled	Unoiled
Emaciation +	150	28	94	67	17	86	92
−	38	25	18	29	16	19	44
	χ^2=15.56 p=0.0001		χ^2=5.91 p=0.0151			χ^2=6.24 p=0.0125	

nd=not determined. +=presence of lesion. −=absence of lesion.

Table 4. Contingency tables between acute haemorrhagic gastroenteropathy (AHG), origin (pelagic/non-pelagic), and oil contamination of birds dead along the Belgian coast during 1992 to 1995 winters.

	Pelagic	Non-pelagic	Oiled	Unoiled
AHG +	132	15	73	74
−	56	38	32	62
	$\chi^2=30.53$		$\chi^2=5.69$	
	p=0.0001		p=0.0243	
Oiled	100	5		
Unoiled	88	48		
	$\chi^2=32.2$			
	p=0.0001			

+=presence of lesion. − =absence of lesion.

Table 5. Contingency tables between acute haemorrhagic gastroenteropathy (AHG) and emaciation of birds dead along the Belgian coast during 1992 to 1995 winters.

	Emaciation	
	+	−
AHG +	121	26
−	57	37
	$\chi^2=13.95$	
	p=0.0002	

+=presence of lesion. +=absence of lesion.

p=0.0125, respectively). In addition, acute haemorrhagic gastro-enteropathy, or oil contamination (Table 4) were significantly more frequent in pelagic birds (p=0.0001 and p=0.0001, respectively). There was a significant association (Table 4) between oil contamination and acute haemorrhagic gastro-enteropathy (p=0.017). Finally, there was a significant association (Table 5) between acute haemorrhagic gastro-enteropathy and emaciation (p=0.0002).

Discussion

The most frequent and most significant lesions observed were emaciation and acute haemorrhagic gastro-enteropathy, both being strongly associated together. These lesions are frequently reported in oiled seabirds (Pionneau, 1987; Fry and Lowenstine, 1985), and slightly oiled guillemots are frequently emaciated (Camphuysen, 1989; Camphuysen and van Franeker, 1992; Camphuysen and Leopold, 1994). Emaciation is a chronic, long-lasting process, whereas acute haemorrhagic gastro-enteropathy is a short disease. As previously suggested (Jauniaux *et al.*, 1996), it is likely, therefore, that birds first become emaciated, then die of a rapid, terminal intestinal disease.

The precise cause of emaciation is not easy to determine. A first hypothesis would be oil contamination of plumage leading to a loss of body heat and, through increased metabolic rate, exhaustion of energy reserves (Ekker and Jenssen, 1989; Jenssen *et al.*, 1985). However, about 50% of emaciated birds did not have evidence of recent oil contamination. Other possible causes of emaciation could be food deprivation, severe weather conditions or long-term exposure to pollutants (Camphuysen, 1989; Camphuysen and van Franeker, 1992; Jauniaux *et al.*, 1996). Low temperatures increase birds' energy losses and affect the distribution and availability of prey (Camphuysen, 1989). In guillemots stranded along the Belgian coast, elevated levels of Cu, Zn, and PCBs were linked to emaciation and may represent an additional stress in the debilitation process (Debacker *et al.*, in press). Nutritional state is linked to seasonal and climatic variation. Nevertheless, emaciation, characterized by absence of body fat and severe amyotrophy, as observed on most birds, is unlikely to be due to winter weather conditions, but appears to be a real debilitating process.

The origin of acute haemorrhagic gastro-enteropathy could be linked to oil but is not reproducible in experimental studies (Leighton, 1985, 1986). Other authors consider these intestinal lesions to be the result of stress (Leighton, 1993), oil then being considered one of many non-specific stressors (Holmes *et al.*, 1978, 1979).

Pelagic seabirds, which spend much of their time on the water, were more frequently oiled than coastal birds. This observation accords with the findings of other studies (Clarck, 1984; Sheridan and Pamart, 1988; Albers, 1991).

As previously described for guillemots (Brosens *et al.*, 1996), seabirds from the Belgian coast were mildly infested with parasites. Parasites were not considered to be a likely cause of death of any bird in this series.

Marine birds are particularly susceptible to aspergillosis (Jauniaux and Coignoul, 1994), a disease that occurs when the bird's resistance is impaired by environmental stress or immunosuppression (Chute and Richard, 1991). It is possible that aspergillosis occurred in birds that had previously been held in rehabilitation centres, those fungi being absent in the natural marine environment of the birds (Dorrestein and van der Hage, 1997).

In conclusion, our main observation was that seabirds stranded along the Belgian coast were severely emaciated. In about 50% of the birds, emaciation was associated with oil contamination but other causes could have been involved, including stable pollutants. It seems probable that a significant number of pelagic seabirds became progressively emaciated and most of them died from acute intestinal lesions.

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