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Helminths of the harbour porpoise, *Phocoena phocoena* (L.), in the southern Baltic

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Abstract. Seventeen young harbour porpoises, *Phocoena phocoena* (L.), stranded or caught in fish nets in the southern Baltic the period 1989–1995, were searched for parasites. Four nematode species, *Halocercus invaginatus* (Quekett, 1841), *Pseudalius inflexus* (Rudolphi, 1808), *Torynurus convolutus* (Kühn, 1829) and *Stenurus minor* (Kühn, 1829), were found in their respiratory and vascular organs, and one trematode *Campula oblonga* (Cobbold, 1858) was recorded in the bile ducts of a single porpoise. Infection data are given. No nematodes were found in the digestive tract. Although *Anisakis* larvae occur sparsely in fish in the southern Baltic, the absence of *Anisakis simplex* in the porpoises studied is noteworthy.

Introduction

The harbour, or common, porpoise *Phocoena phocoena* (L., 1758) is the only common whale species in the Baltic Sea (Skóra 1991), although stray specimens of other species may occasionally be seen or caught in the southern Baltic. Being one of the smaller toothed whales, maximum lengths for female and male are 189 and 178 cm, respectively, it is widely distributed in the north Atlantic. In the Danish Belts and the Sound, porpoises are known to move from the Skagerrak/Kattegat to the Baltic, in spring/early summer, and to move in the opposite direction, out of the Baltic before the onset of winter (Reijnders 1992). Being so to speak a summer visitor in the Baltic, porpoises may be found dead on beaches or are caught accidentally, as by-catches, by commercial fishing vessels. The few known papers on the porpoise in the Polish part of the Baltic, dealing with its biology and occurrence, are mainly based upon such records (Jakuczun 1973; Ropelewski 1950, 1957). The porpoise in the Black Sea is by some authors regarded as a subspecies, *Ph. phocoena relicta*, while the Pacific harbour porpoise is a separate species, *Ph. vomerina* (Klinowska 1991).

Being common and occurring in near-shore waters, it is no wonder that the parasite fauna of this small whale is better known than that of other whale species (Raga 1994). However, quantitative investigations on its parasites are insufficient (Balbuena et al. 1994). Schmidt-Ries (1939) recorded six parasite species in the porpoise from the Baltic Sea.

Materials and methods

In the period 1989–1995 a total of 20 porpoises which had either been found dead on Polish beaches or had been caught by fishing vessels off the Polish coast were available for study; but three of them were decomposing and could not be searched for parasites, data on collection/capture dates, area, sex and body length of the 17 specimens studied are given in Table I. The data – sex, length, age, date and area – for the remaining three porpoises are, respectively: male, 118/1, 03.04. 1991, Wolin; female, 128/2, 20.03.1992, Międzyzdroje; male, 111/1, 23.12.1993, Puck Bay. Upon arrival at Hel Marine Biological Station near Gdynia, the porpoises were individually deep frozen and kept frozen until being thawed for dissecting and searching for

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rasites. From each porpoise a tooth was extracted d cut for age determination. In this type of study, e carcasses are usually in various stages of decay ıen received, and the "carcass quality" obviously ects the quality of the parasites recovered. The gans searched were digestive tract including liver and ncreas, heart, kidney and the respiratory system luding the ear-cavities in the head. The parasites ınd were fixed and stored in 70% ethanol. Trema- les were later stained in carmalum, cleared in echwood creosote and mounted in Canada balsam. e nematodes were via 96% and 100% ethanol ared in beechwood creosote for microscopy.

sults

otal of 4631 parasites, belonging to five species – r nematode and one trematode – were recovered, y and infection data for each porpoise are presented Table I.

enea

npula oblonga (Cobbold, 1858)

st: *Phocoena phocoena.*
: hepatic ducts.
ographical distribution: the Baltic, and N. Atlantic.
valence: 5.9%.
only infected porpoise harboured 9 specimens.

Nematoda

Halocercus invaginatus (Quekett, 1841)

Host: *Phocoena phocoena.*
Site: lungs and cysts on pleural epithelium.
Geographical distribution: Baltic Sea, Atlantic, Pacific off California coast.
Prevalence: 11.8%.
Intensity: <100. In the two infected porpoises, 1 cm^3 of lung tissue harboured 4 and 3–6 parasites, respectively.

Pseudalius inflexus (Rudolphi, 1808)

Host: *Phocoena phocoena.*
Site: lungs and heart.
Geographical distribution: N. Atlantic, coasts of Europe, Asian coasts of the Pacific.
Prevalence: 88.2%.
Intensity: 5–114. A total of 626 specimens were recorded, 176 males and 220 females as well as juveniles; 28 specimens occurred in heart, 598 in lungs.

Torynurus convolutus (Kühn, 1829)

Hosts: *Phocoena phocoena* and *Globicephalus melas.*
Site: respiratory and circulatory systems. In present material specimens were recovered from larynx, trachea and lungs.
Geographical distribution: N. Atlantic (Europe), the Pacific (Sakhalin).
Prevalence: 82.3%.

le I. Information on collection/capture dates, area, sex and body length for the seventeen porpoises studied. The specimen numbers are given the porpoises when received at the Marine Biological Station Gdańsk University at Hel

imen ber	Date	Area	Sex	Body length (cm/age)	*Halocercus invaginatus*	*Pseudalius inflexus*	*Torynurus convolutus*	*Stenurus minor*	*Campula oblonga*
	15.03.1989	Puck Bay	female	112/1		8		64	
	06.05.1989	Puck Bay	female	127/2+		5	37		
	21.01.1990	Puck Bay	female	128		21	202		
	05.05.1991	Gdańsk Bay	female	125/0+		60	381		
	26.03.1991	Gdańsk Bay	female	122/1+		10			
	13.12.1991	Puck Bay	male	126/1+		84	85		
	22.12.1991	Władysławowo	female	131/2+			194	25	
	07.01.1992	Międzyzdroje	male	129		13	111		
	29.01.1992	Łeba	male	131		114	357		
	17.02.1993	Puck Bay	male	129/2+		16	216		
	01.07.1993	Ustka	female	120/1		47	4	200	
	02.08.1993	Puck Bay	male	131/2		31	51	461	9
	29.12.1993	Puck Bay	male	141/2		78	436	789	
	20.01.1994	Puck Bay	female	127/0+				47	
	26.01.1994	Puck Bay	female	147/2+	>100	65	21	43	
	18.02.1995	Puck Bay	female	124/0+		61	91	50	
	08.03.1995	Gdańsk Bay	female	160/1	>100	13	97		
lence (%)					11.8	88.2	82.3	47.0	5.9
sity					>100	5–114	4–436	25–789	9.0
intensity					>100	41.7	163.0	186.5	9.0

Intensity: 4–436 specimens. The 14 infected porpoises yielded a total of 2283 specimens, 503 males and 1780 females.

Stenurus minor (Kühn, 1829)

Hosts: *Phocoena phocoena* and *Delphinapterus leucas* (Pall).

Site: auditory cavities in head, the respiratory and vascular systems. In present material specimens were found in Eustachian tube, tympanic bulla, nasal and head cavities, larynx and lungs.

Geographical distribution: N. Atlantic, North Sea, Black Sea, Sea of Azov, Asian coast of the Pacific.

Prevalence: 47.0%.

Intensity: 25–789 specimens. The 8 infected porpoises yielded a total of 1679 specimens – 657 males and 1022 females.

Discussion

The harbour porpoise and its Pacific sister species are widely distributed in the northern hemisphere, and the list of their known parasites is quite extensive. Raga (1994) lists two ectoparasites and 28 endoparasites from the porpoise in European waters. One, the cirriped *Xenobalanus globicipitis* (Steenstrup, 1851), is probably not a parasite, but uses the "host" as substrate, in which case the relationship becomes one of phoresy.

The parasite fauna of the Baltic porpoise is rather poor, only 6 species are known (Schmidt-Ries 1939), of which five were found during the present study. No ectoparasites were found during the present study. Also, no cestodes were recorded, although Schmidt-Ries recorded *Diphyllobothrium latum* (L.) once. Acanthocephalans have never been reported from the porpoise in the Baltic, although *Corynosoma semerme* (Forssell, 1904) and *Corynosoma strumosum* (Rudolphi, 1802) have been found in Baltic seals (Grabda 1971).

The parasite fauna of porpoises in the Baltic differ significantly from those in Danish waters and the Norwegian Sea. In Danish waters outside the Baltic Sea, Herreras et al. (1995) found for *Anisakis simplex* the prevalence of infection to be 73%, mean intensity 107.5. One of us (JR, not published)) found in 7 of 9 porpoises from the west coast of Norway and the Norwegian Sea to harbour not only mature *A. simplex* but also III-stage larvae and immature stages. Forty one mature specimens with intensity 3–18 and 122 larvae with intensity 23–74 specimens.

Parasites can be indicators of social structure and stock identity of marine mammals (Balbuena et al. 1995), in short biological tags.

One would assume that porpoises migrating from the North Sea – Skagerrak/Kattegat into the Baltic Sea carry their parasites with them. The "tissue" parasites, i.e. the nematodes in the respiratory and vascular systems, can hardly leave their hosts, and remain in situ. It is noteworthy that the infection with these parasites is high in the porpoises studied, and which were young – 1–2+ years old. The same applies in principle also for the liver-dwelling trematode *Campula oblonga*, but only one porpoise was infected.

The absence of nematodes in the digestive tract in Baltic porpoises is quite striking. The literature is full of records of nematode-clusters in craters in the stomach walls of marine mammals, including the porpoise. Anisakids, typically *Anisakis simplex*, is the common species in cetaceans in cold seas. The life cycle of *Anisakis* involves krill (euphausids) as first intermediate hosts, and several fishes serving as transport/paratenic hosts. *A. simplex* larvae occur in cod and large herrings in the southern Baltic, but the infection is lower than in the western Baltic (Rokicki 1973, Myjak et al. 1994). As krill are absent in the Baltic, the infection in plankton-feeders such as the herring, must have been acquired in saltier water in the western Baltic and/or Skagerrak/Kattegat.

The nematodes infecting the digestive tract depend on the fish species, serving as intermediate-paratenic hosts, on which the porpoises feed. During the present study we found in some of the porpoise stomachs fish otoliths, mainly of gobiids, young herrings and sprats. Although *Anisakis* larvae are known from herring in the Baltic, the chances of porpoises becoming infected with anisakid larvae in the Baltic are slim. Any infection probably must have been acquired outside the Baltic. It is also interesting to note that the porpoises studied by us were young, 1–2 years old and four only being 2+ years old. If the anisakids were long-lived the infection should persist for a long time, but as none were found, this may indicate that their life-span in the definitive host is limited. These nematodes may be lost after some time, possibly in the course of a few months. Another, but more speculative possibility is that the parasites are able to "sense" that the sea is so brackish that it is waste of effort to reproduce when the life cycle cannot be completed.

In spite of the general belief that the porpoises undertake summer/winter migrations, our data show that porpoises were present in the Polish part of the Baltic at all times of the year. This may indicate that at least in years with mild winters, many of them are resident in the Baltic. But severe winters with much sea ice may force them to move out to the salty and open North Sea. In the period 1989–1995 the winters in the Baltic were mild.

Balbuena et al. (1994) claimed that some of the lung-worm species co-occur. The results of studies on co-occurrence of different species of lung parasites differ significantly from those presented by Balbuena et al. (1994). Our study has not confirmed that

Pseudalius inflexus and *Torynurus convolutus* always occur along with *Halocercus invaginatus*. In our material *P. inflexus* and *T. convolutus* occurred together in 70.5% of the porpoises (12 cases out of 17). *Halocercus invaginatus*, *T. convolutus* and *P. inflexus* occurred simultaneously only in 11.7% of the porpoises (2 of 17 animals). Our work does not confirm that *P. inflexus* and *T. convolutus* always occur together with *H. invaginatus*.

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