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The find of a whale barnacle, *Cetopirus complanatus* (Mörch, 1853), in 10th century deposits in the Netherlands

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Key words: *Cetopirus complanatus*; Cirripedia; whale barnacles; The Netherlands; archaeological find; history; distribution; host species; *Eubalaena*; right whales; *Eubalaena glacialis*; northern right whale; North Atlantic; North Sea; whaling.
A specimen of *Cetopirus complanatus* dating from the 10th century A.D. is described from archaeological excavations at Tiel, the Netherlands. Two vertebral parts of northern right whales *Eubalaena glacialis*: a vertebral arch and an epiphysis, were also found, possibly dating from the same period. The disc-like epiphysis had been used as a cutting board. The specimens probably had reached Tiel through early trade in whale products. *Cetopirus complanatus* is only known from right whales of the genus *Eubalaena*. It has not been found in the Northern Hemisphere since the late 19th century. Its host species in the North Atlantic and North Pacific, *E. glacialis*, is now very rare as a result of whaling.

Introduction

During archaeological excavations in the town centre of Tiel, province of Gelderland, the Netherlands, some animal remains were found dating from the 10th century A.D. They consist of two parts of the vertebral column of a whale: an epiphysis and a vertebral arch, and of a whale barnacle *Cetopirus complanatus*, a rather poorly known species, which is dealt with below. The discussion of that species is followed by a description of the archaeological context of the finds and some notes on the occurrence of the host species, the northern right whale *Eubalaena glacialis*, in the North Atlantic and North Sea.

Notes on *Cetopirus complanatus* (Mörch, 1853)

(L.B. Holthuis)

Material.— The specimen from Tiel (accession number 5-2-12, site code number 39D-256N; fig. 1a-b) is the property of the National Service for Archaeological Investigations (Rijksdienst voor Oudheidkundig Bodemonderzoek), Amersfoort, the Netherlands. It was found in two pieces, but is surprisingly well preserved and consists of a complete set of the six compartments of the barnacle, total length 39 mm, width 33 mm, height 14 mm, dorsal opening 15 × 17 mm, lower opening 14 × 15 mm.

Taxonomy.— *Cetopirus complanatus* is an easily recognizable species, which has been known for a long time; an excellent figure of it was published as early as 1705.

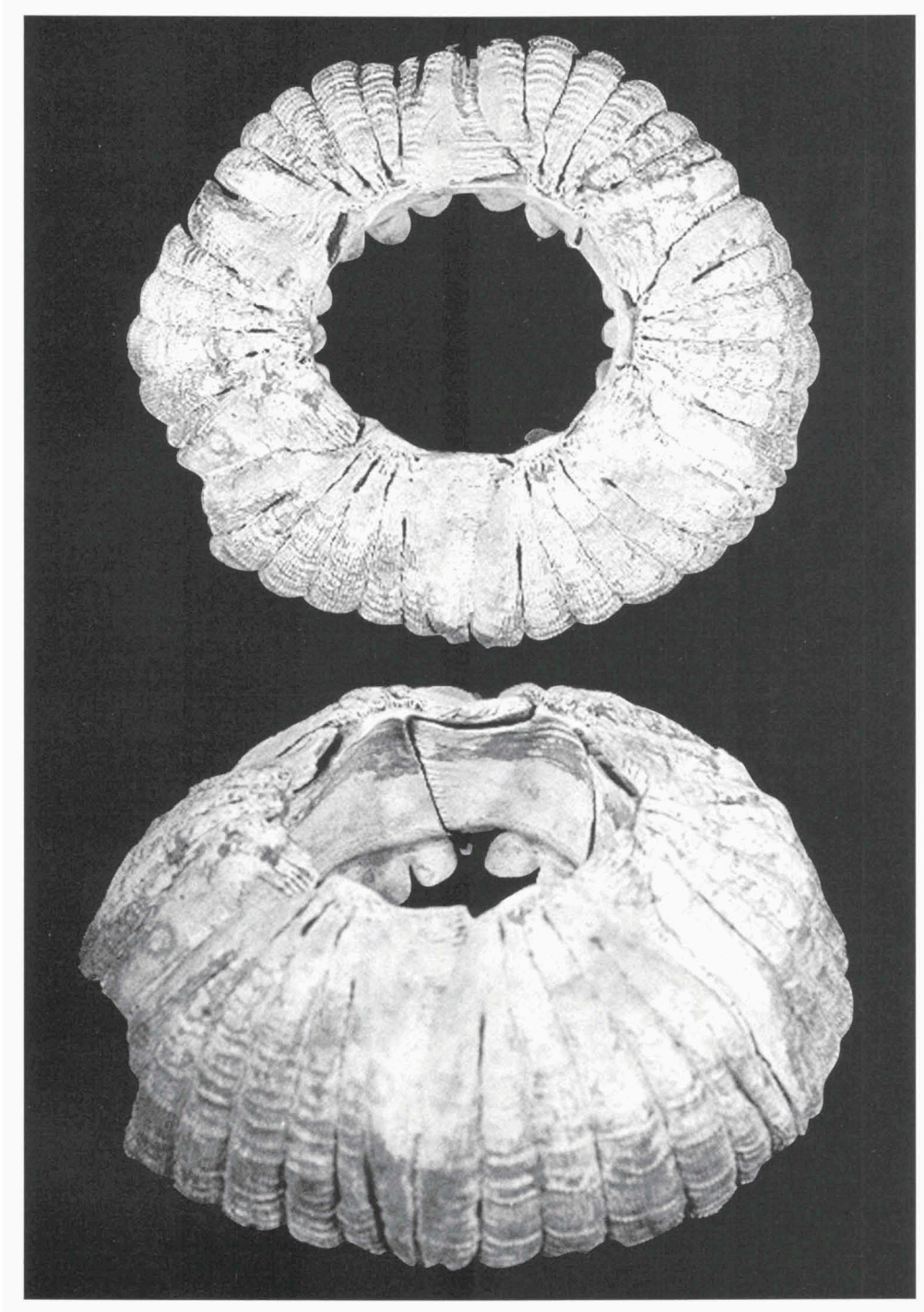

Fig. 1a. *Cetopirus complanatus* from Tiel, the Netherlands, dating from the 10th century A.D. Upper figure: dorsal view; lower figure, oblique view.

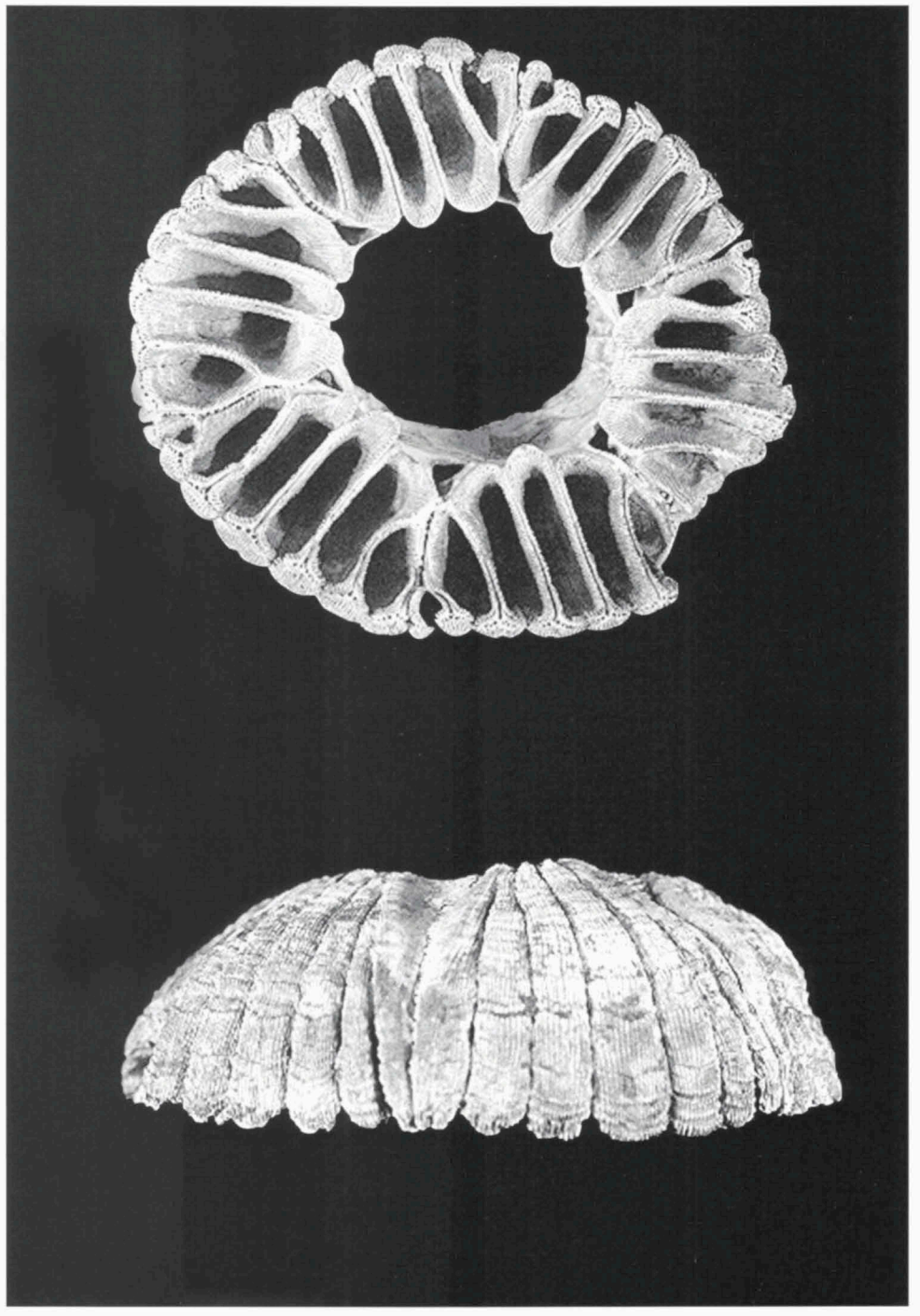

Fig. 1b. *Cetopirus complanatus* from Tiel, the Netherlands, dating from the 10th century A.D. Upper figure: ventral view; lower figure, lateral view.

There are no great taxonomic problems. Older authors, such as Darwin and Pilsbry, assigned the species to the genus *Coronula* Lamarck, 1802, but modern cirripedologists agree that it should be placed in a separate genus *Cetopirus* Ranzani, 1817, of which it is the only species.

Nomenclature.— There are some nomenclatural problems. For a long time, the specific name *balaenaris* was used for this species (as, e.g., by Darwin, 1854), but Stebbing (1910: 572) made clear that *Lepas balaenaris* O.F. Müller, 1776, is a junior synonym of *Lepas diadema* Linnaeus, 1758 (= *Coronula diadema*). Stebbing proposed a new name, *Coronula darwini*, for the present species. Pilsbry (1916: 277) found that the name *Cetopirus complanatus* Mörch, 1853 (Pilsbry gave the year as 1852, but Mörch's description was published in 1853, in the second part of his 1852-1853 "Catalogus") was the first valid name used for the species. Mörch (1853: 67) under "*Ceteopirus* [sic!] *complanatus*" referred to several previous authors, but clearly based the name *complanatus* on *Lepas complanata polythalamia* described and figured by Chemnitz (1785: 325, pl. 99 figs 845, 846). Pilsbry is followed by most zoologists and the name *Cetopirus complanatus* is now generally accepted.

In the original account of *Cetopirus complanatus*, Mörch did not indicate a holotype. Therefore, all the specimens on which his original publication of *C. complanatus* is based are syntypes. Tarasov & Zevina (1957: 246) remarked that the type specimen of the species was figured by Chemnitz (1785). Under Art. 74 (a) of the International Code of Zoological Nomenclature this can be considered the designation of a lectotype, and thus the specimen figured by Chemnitz (1785, pl. 99 figs 845, 846) is now definitely accepted as the lectotype of *Cetopirus complanatus*.

Not so straightforward, however, is the nomenclature of the generic name *Cetopirus*. According to Pilsbry (1916: 271, footnote 2), Ranzani (1818) indicated *Cetopirus balaenaris* (recte *Lepas balaenaris*) as the type of *Cetopirus*. According to Art. 70 of the International Code, the species selected by an author as the type species of a genus is assumed to be correctly identified. As *Lepas balaenaris* is a junior subjective synonym of *Lepas diadema* Linnaeus, and the latter is the type species of *Coronula*, the generic name *Cetopirus* becomes a junior subjective synonym of *Coronula*. In order to save *Cetopirus* for *C. complanatus*, an application has been submitted to the International Commission on Zoological Nomenclature requesting the use of their plenary powers to designate the species *Lepas complanata* Mörch, 1853, as the type species of the genus *Cetopirus* Ranzani, 1817. The suggestion to replace the name *Cetopirus* by *Ceteopirus* cannot be accepted, as *Ceteopirus* is a misspelling by Mörch of *Cetopirus* and thus has no nomenclatural status.

Geographic distribution.— Until recently, the material of *Cetopirus complanatus* present in many zoological collections consisted of very few fresh or well-documented specimens. Pilsbry (1916: 277), in his monographic treatment of the group, said on this account: "I have seen a considerable series of this species, but only three lots bear locality data. One in the collection of the Academy of Natural Sciences, Philadelphia, is labeled California, but as it was purchased in London many years ago, the label is probably apocryphal. One of the lots in the United States National Museum is labeled West Africa, and another is in a box with the label Valparaiso, but these specimens have been in the collection many years, and the collector is not stated. I can not find that any definite records have been published since Darwin's Monograph [1854],

except those given by Gruvel [(1903: 152)] for specimens in the Paris Museum, from collectors of the first half of the last century."

The collection of the Leiden Museum confirms Pilsbry's observations: of the four dry lots of *C. complanatus*, two (nos. 517 and 518) are without any indication of locality or date; no. 518 bears the name E.A. Forsten, but it is not clear whether this is the collector or the donor (Forsten collected in the East Indies, and his material is always properly labeled). A third specimen (no. 1321), also dry, was collected around 1900 on the beach of the North Sea near The Hague, the Netherlands. The specimen is incomplete, rather worn and discoloured; it may have been washed ashore after having been in the water for a very long time. Another dry lot (no. 519) has the label St. Vaast la-Hougue, Normandy, France, without further details. The only alcohol lot (no. 51) contains two specimens from Cape of Good Hope, South Africa, collected there between 1825 and 1838 by H.B. van Horstok, a Dutch physician in Capetown, who regularly sent material from there to the Leiden Museum. The specimens must have been taken from a southern right whale *Eubalaena australis* (Desmoulins, 1822), as that was the only species of large whale which Van Horstok obtained and of which he sent one complete skeleton and one skull to the Leiden Museum. The whale barnacles evidently were cut by Van Horstok from one or both of these whales, as part of the whale's skin is still attached to either specimen.

Occurrence in the Southern Hemisphere.— Although there are records from the North Atlantic for *Cetopirus complanatus*, most of these are incomplete or unreliable and for a long time it has been assumed that the species was restricted to the Southern Hemisphere. Darwin (1854: 415) gave the distribution as "Attached to whales in the Southern Ocean", and 132 years later Scarff (1986a: 130) defined the range as "Southern Hemisphere". Both Pilsbry (1916: 277) and Newman & Ross (1976: 45) listed seven localities, of which only one (coast of Norway, based on Gruvel, 1903: 152), was from the Northern Hemisphere (see below). The southern records so far known are Chile (Coquimbo, Valparaiso), Brazil, West Africa, South Africa, Kerguelen Island, Australia (New South Wales, Tasmania), and Indonesia (Kei Islands, Amboina). Most of the known specimens of *C. complanatus* with reliable locality data were found in the area inhabited by the southern right whale *Eubalaena australis*.

However, there are some records from the Southern Hemisphere that do not fit this picture. One of those is "Amboina", mentioned by Pilsbry (1916) and cited by later authors. Pilsbry's record is based on the figure published in G.E. Rumphius's 1705 "D'Amboinsche Rariteitkamer". In this book, Rumphius described and figured numerous marine invertebrates (Mollusca, Crustacea, Echinodermata, etc.) found in the region of Amboina, Moluccas, Netherlands East Indies, now Indonesia. On pl. 14 fig. H, an unmistakable figure of *C. complanatus* is shown (fig. 2). Pilsbry's record therefore is perfectly understandable. What he did not know is that, when Rumphius's manuscript arrived in Holland to be published, the publisher wanted it to be more copiously illustrated, in order to find a better market for it. In the meantime, Rumphius had died in 1702, and the editing of his book was entrusted to Simon Schijnvoet, an Amsterdam amateur naturalist, who had figures made of many of the unillustrated species mentioned in the "Rariteitkamer". For this purpose he used specimens from the numerous private natural history collections which at that time abounded in the Netherlands. Schijnvoet did his best, but several times the figures

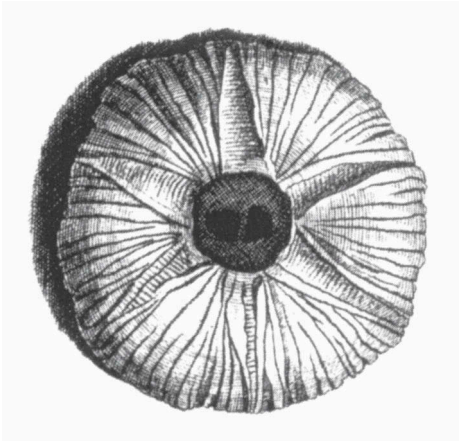

Fig. 2. *Cetopirus complanatus*, pl. 14 fig. H in Rumphius: "D'Amboinsche Rariteitkamer", 1705.

which he had made did not represent the species that they were said to illustrate. Therefore, there are many discrepancies between text and figures. Fortunately, Schijnvoet indicated which figures were not provided by Rumphius and mentioned the owner of the specimen after which the figure was made. Pl. 4 fig. H is said in the text to illustrate "Steentjes" (small stones), which were identified by von Martens (1902: 135) and Engel (1959: 217) as corals growing around a sipunculid or a mollusc. Schijnvoet's explanation of pl. 14 fig. H showing *C. complanatus* reads (in translation): "From the collection of Dr. D'Acquet [burgomaster of Delft, and the owner of a well-known and very extensive cabinet of natural curiosities] we have added two more figures, one of which is shown with the letter H, being stony and strong". As already remarked by Stebbing (1910: 572), there is no indication of the provenance of D'Acquet's specimen of *C. complanatus*, and the locality Amboina can therefore safely be deleted for this species.

The record "Kei Islands" by Newman & Ross (1976: 45) is puzzling. I have not been able to find the source of it. In his report on the Cirripedia collected during Th. Mortensen's 1922 expedition to the Kei Islands, Broch (1931) did not mention the species, neither in the running text, nor in his table of the Cirripedia known from Indomalayan waters. I have not been able to find any later reference to these islands as a locality for *C. complanatus*. As to Pilsbry's (1916: 277) record of the species from West Africa, this also falls largely outside the range of the right whales (see below). In his account of the cirriped fauna of tropical West Africa, Stubbings (1967: 300) gave strong arguments against the correctness of Pilsbry's record (Pilsbry himself already sounded doubtful about it) and concluded that "it is unlikely that confirmatory material will ever be forthcoming." Gruvel's (1903: 152) record of the species from "Astrolabe: mers du Brésil" also is rather doubtful. The Astrolabe, at least on her 1837-1840 expedition, did not encounter whales in Brazilian waters, and on the outbound trip in 1826 did not touch Brazil. I know of no later Brazilian records of *C. complanatus*. In his revision of the Coronuloidea of the Brazilian coast, Young (1991: 190-212) did not include it as a Brazilian species.

Thus, the definitely known range of *C. complanatus* in the Southern Hemisphere at present comprises Chile, South Africa, Kerguelen Island, and Australia, coinciding well with the range of *Eubalaena australis*. Recently, Pastorino & Griffin (1996: 770) reported Holocene fossil material of *C. complanatus* from Argentina.

Occurrence in the Northern Hemisphere.— Pacific: Pilsbry's (1916) doubtful record of the species from California has not been confirmed. Scarff (1986) sighted barnacles on a northern right whale *Eubalaena glacialis* at 1.5 km SW of Pillar Point, near Half Moon Bay, California (37°30′ N 122°03′ W); these barnacles, which were

photographed, showed to be "similar to *Coronula diadema*, *C. reginae*, and *Cetopirus complanatus*" (Scarff, 1986a: 131). On p. 133, however, Scarff concluded "that the barnacles on the right whale were all *Coronula* spp.", the photographs not being sufficiently detailed to allow a definite identification. No other records of *C. complanatus* from the North Pacific are known.

Atlantic: The type locality of *C. complanatus* is in the North Atlantic. Chemnitz (1785: 325-326) remarked of the type material: "Derjenige Schiffer, welcher mir ein paar Stücke von diesen [p. 326] raren flachen Meereicheln überreichte, hatte den Nordcaper [= *Eubalaena glacialis*] auf der Höhe zwischen Neufundland und Island angetroffen." This type locality actually is rather precise, and it is difficult to see why it was so completely ignored by all subsequent cirripedologists. The cetologists Eschricht & Reinhardt (1866: 35) provided some details about the capture of the type material. They stated that the vessel, "called the 'Christianshavn', did really succeed, on one of the voyages (we suppose on that of 1779), in catching a 'Nordkaper' between Newfoundland and Iceland, the head of which was infested with such a multitude of Cirripeds that it would have been easy, according to the statement of the captain, to gather a whole sackful of these 'white patches,' as he called them. On the return of the vessel to Copenhagen, Chemnitz, the distinguished conchologist, obtained a few specimens which the captain had brought with him, and recognised in them the *Balanus polythalamius complanatus*, described by Walch, ..." They also remarked that "this animal exists only on right-whales".

The other North Atlantic records of *C. complanatus* are, as said, few and incomplete. Apart from the two Dutch specimens from Tiel and The Hague mentioned above, there is a third reported from the Netherlands by Nilsson-Cantell (1931: 116), who listed a dry specimen in the Natural History Museum in Basel, Switzerland, collected in 1844 in the dunes near Katwijk, a town on the Dutch North Sea coast near Leiden. The three Dutch localities are all secondary: the specimens were brought there after their death, and they most likely originated from whaling or from stranded whales. Since at the time when the specimens were found, there was no Dutch whaling in the Southern Hemisphere, it can be assumed that all three came from the North Atlantic, maybe even from the North Sea. The undated specimen from St. Vaast la-Hougue in the Leiden collection possibly also resulted from whaling. De Smet (1976: 2) remarked that "in the village of Saint-Vaast-la-Hougue (in Normandy), whale bones were so numerous that they were used for several purposes" (though he evidently was referring to the situation in the Middle Ages). Another dry specimen in the Basel Museum (Nilsson-Cantell, 1931) was simply labeled "North Atlantic, 1871". Gruvel (1903: 152) listed a specimen from the Norwegian coast collected in 1883 by the Pouchet expedition. Scarff (1986a: 139-145) discussed several old records of barnacles on right whales including North Atlantic specimens, but he found the available data insufficient for a certain identification; the more, as the possibility exists that the white callosities found on right whales may have been mistaken for barnacles.

The present find of *C. complanatus* at Tiel shows that the species must have occurred in the North Atlantic in the 10th century A.D. De Smet (1976: 1) presented evidence that whaling "was practised in the North Sea and English Channel during the Middle Ages, surely from the 9th century onwards." The whales taken in those days were almost exclusively right whales. Much later, whaling expanded all over the

North Atlantic and was carried out by different nations, with right whales as the prime target within that species' range; for further details, see below. Quite likely, *C. complanatus* was found on the northern right whale, and whalers took specimens home. In this way, the species ended up in curiosity cabinets in the Netherlands and elsewhere. At the time, the owners of those cabinets were primarily interested in the beautiful shape of their specimens and in their scientific and vernacular names. Information about geographic origin and habitat were hardly ever noted. Only in the 19th century, the interest in the distribution and biology of the animals began to increase, but by that time the northern right whale, the source of the whale barnacles, had become rare (see below). This explains why the greater part of North Atlantic specimens of *C. complanatus* in collections are dry, old and without data.

The identity of the host species.— Only few published records of *C. complanatus* are accompanied by an indication of its host. The most detailed in this respect is the original description of the type material. Chemnitz (1785: 325) gave the cirriped the vernacular name "Die Laus des Nordcaper Wallfisches", and on the same page remarked: "man findet sie gemeinlich nur auf solchen Wallfischen, welche den Namen der Nordcaper führen"; furthermore, on p. 326 he repeated that he received the material from a whaler who had collected it from a "Nordcaper" between Iceland and Newfoundland. Although the German name "Nordcaper" or "Nordkaper" and the Dutch "noordkaper" have in popular accounts been used for several cetacean species, in more scientific literature it has always been the name for the northern right whale *Eubalaena glacialis*. The correctness of Chemnitz's record seems confirmed by our material from Tiel, even though the finds do not allow a definite association of the whale barnacle with the skeletal remains of *E. glacialis* found nearby.

The second host record for *C. complanatus* is that by Darwin (1854: 417), who cited the southern right whale *Eubalaena australis* as its host species in the Southern Hemisphere. Scarff (1986: 130) listed *C. complanatus* as the only coronulid until then reported from right whales. He himself observed what he thought to be *Coronula* on *Eubalaena glacialis;* but his in situ photographs of those barnacles do not allow a definite identification and no material was collected (see above). Scarff (1986a) reported the right whale as the only host known with certainty for *C. complanatus* (he regarded the northern and southern right whales as conspecific). The specimens of *C. complanatus* from South Africa in the collection of the Leiden Museum, collected by Van Horstok, confirm that *E. australis* is a host for this species. Guiler (1956: 3) reported *C. complanatus* (as *Coronula balaenaris*) from the "fins and lips" of the humpback whale *Megaptera novaeangliae* (Borowski, 1781) from Marion Bay, Tasmania. However, as this is the only record of *Megaptera* as a host for *Cetopirus*, this observation should be regarded with suspicion, as confusion with *Coronula reginae* Darwin, 1854, seems likely.

The present data make it clear that *C. complanatus* still occurs in the Southern Hemisphere, and at least formerly was also present in the Northern Hemisphere, at least until the end of the 19th century. Both species of right whales belonging to the genus *Eubalaena* are its host. It would be interesting to compare the material from the Northern and Southern Hemisphere, to study whether or not there are any (sub)specific differences. *Cetopirus complanatus* has not been recorded from the other species of the family Balaenidae: the Greenland right whale or bowhead whale *Balaena mysticetus* Linnaeus, 1758, and the pygmy right whale *Caperea marginata* (Gray, 1846).

The archaeological context of the finds at Tiel

(F.J. Laarman)

The small city of Tiel is situated on the river Waal, which is now the main arm of the river Rhine in the Netherlands. In former times, at Tiel the Waal forked into the Waal proper and the river Linge (fig. 3). Tiel is first mentioned in A.D. 896 and in its heyday, during the second half of the 10th and the 11th century, it developed into a major trade settlement and as such is thought to have succeeded Dorestad, situated NW of Tiel on the Nederrijn, another channel of the Rhine delta. The town's economic success in this period was due to its position on the trade route linking the Rhineland, the towns on the river Meuse, and England. Its mintage rights also contributed to its economic rise. During the 12th-14th centuries, however, Tiel's economic importance waned, one of the reasons being that the riverbeds of the Waal and Linge shifted their position. By the end of the 14th century, the importance of this once flourishing port had diminished to that of a small market town (Sarfatij, 1997).

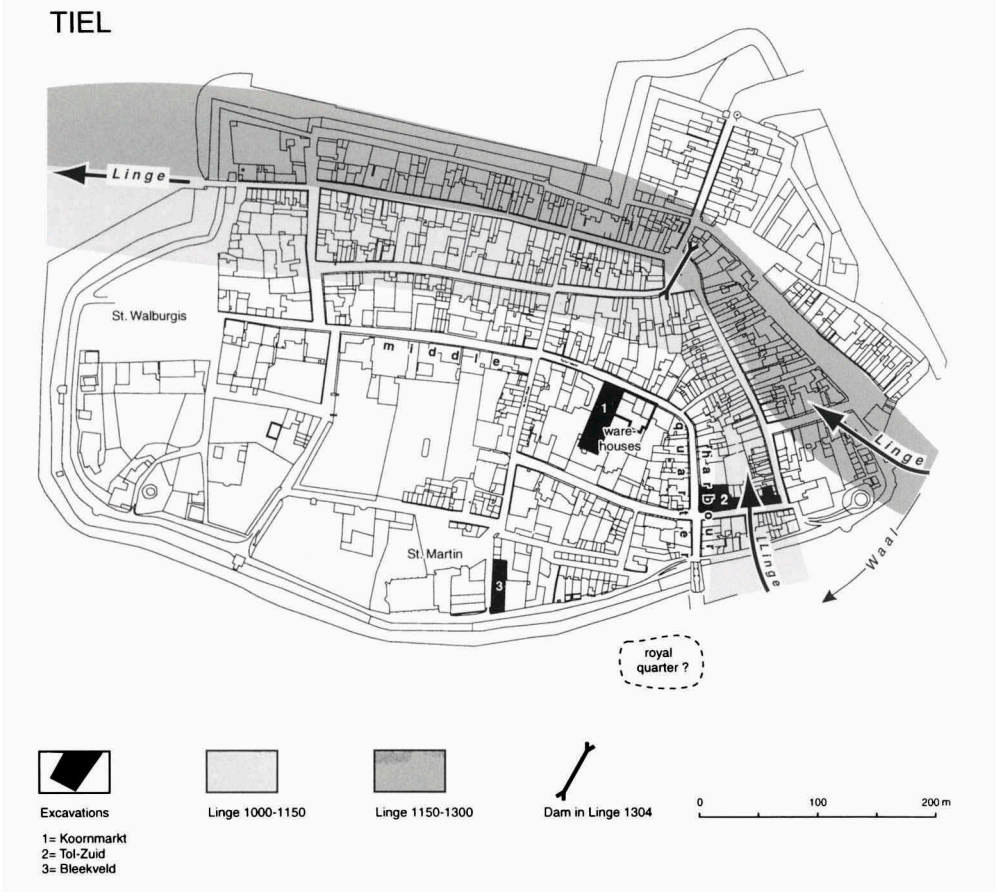

Fig. 3. Cadastral map of Tiel, showing the sites mentioned in the text.

The National Service for Archaeological Investigation (Rijksdienst voor Oudheidkundig Bodemonderzoek: ROB) has since 1968 been running the project "Urbanisation in the Central River Area during the Middle Ages". This project encompasses inner-city archaeology in the cities of Deventer, Dordrecht, Nijmegen and Tiel. Within the framework of this project, in 1996 and 1997 excavations were performed at various locations in Tiel. The whale barnacle *Cetopirus complanatus* was found at the site Tol-Zuid (fig. 3). During the excavations at the Koornmarkt site, the epiphysis of a whale vertebra emerged, and the Bleekveld site produced a vertebral arch of a large whale. Both specimens were identified by C. Smeenk and E.J.O. Kompanje as belonging to the northern right whale *Eubalaena glacialis*.

The whale barnacle (find no. 5-2-12) comes from a filling-in deposit in the harbour zone of Tiel. As the harbour silted up with sand from the river Waal, the quays had to be replaced on several occasions. During those constructions, the area between the old and new quays was always filled in with soil. By means of dendrochronology the filling-in deposit in question was dated as being from around A.D. 986. The ROB site name is Tiel Tol-Zuid; site code: 39D-256N. The ROB municipal code is TL96-5; coordinates: 158.520/433.020.

The vertebral epiphysis of *E. glacialis* (find no. 3-5-115) was found in a wide ditch in the merchants' quarter of Tiel. The ditch dates from the late 12th century, but it cuts across the remains of a warehouse that was built around A.D. 965. Hence, the bone may well have been among dug-over debris from the latter half of the 10th century. The beautifully round, disc-like bone shows many cuts caused by knives and had clearly been used as a cutting board (fig. 4). The ROB site name is Tiel Koornmarkt; site code: 39D-223N. The ROB municipal code is TL96-4; coordinates: 158.360/433.100.

The vertebral arch of the same species (find no. 1-7-97) was lying in a ditch in the periphery of the settlement of Tiel, near the church, which itself also dates from the late 10th century. As yet, this excavation has not been fully worked out. The ROB site name is Tiel Bleekveld; site code: 39D-270N. The ROB municipal code is TL97-3; coordinates: 158.350/432.950.

At present, Tiel is situated at about 100 km from the North Sea coast (about 80 km as the crow flies). It seems impossible that the whales and attached cirriped arrived here in a natural way. Neither does it seem likely that whales were towed to Tiel and dismembered there. It can only be assumed that the large whales had been caught in the North Sea close to, or had been washed ashore on, the Dutch coast. Trade in whale products must have brought the bones and whale barnacle to Tiel.

The status and distribution of *Eubalaena glacialis* in the North Atlantic and North Sea

(C. Smeenk)

The whale genus *Eubalaena* Gray, 1864, has an antitropical distribution. Most recent authors distinguish two species: the northern right whale *E. glacialis* (O.F. Müller, 1776) and the southern right whale *E. australis* (Desmoulins, 1822). The southern species has a circumpolar distribution, ranging from about 20° to 50° S. The original

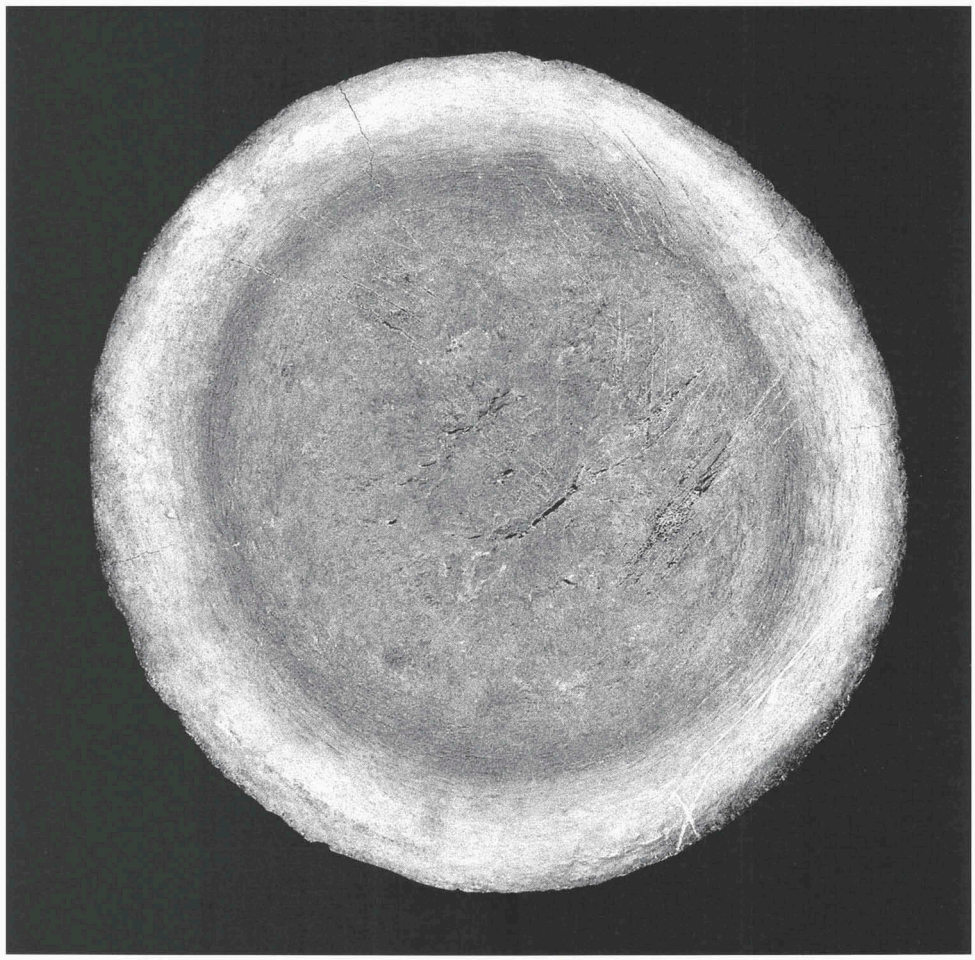

Fig. 4. Vertebral epiphysis of *Eubalaena glacialis* from Tiel, the Netherlands, possibly dating from the 10th century A.D. The disc-like bone has been used as a cutting board. The light-coloured scratches were caused during the excavation.

range (i.e. before the period of whaling) of the northern right whale probably extended from about 25° to 60° N in the North Pacific, from about 25° to 75° N in the North Atlantic (Cummings, 1985; Aguilar, 1995). The Atlantic and Pacific populations of *E. glacialis* are sometimes regarded as subspecifically or even specifically distinct, the Pacific form being distinguished as *E. (glacialis) japonica* (Lacepède, 1818). Right whales show regular north-south migrations, generally occurring at higher latitudes (feeding grounds) in summer, at lower latitudes in winter. Since they normally avoid warm tropical waters, the two species are now effectively isolated.

All right whales have been heavily exploited by man. The history of whaling for these species has been reviewed by Brownell et al. (1986) and Klinowska (1991). The present numbers of right whales are only a fraction of what they must have been before whaling started, and several stocks have been hunted to the verge of extinc-

tion. The southern right whale *E. australis* shows clear signs of recovery in some areas and, provided whaling is not resumed, appears no longer in danger of extinction.

The situation for the northern right whale *E. glacialis*, however, is critical. It is now the most endangered of the large whales and there are no signs of recovery. The Pacific population was exploited during the period 1840-1968 and is now thought to number only a few hundred animals (Scarff, 1986b; Klinowska, 1991). Whaling in the North Atlantic goes back to very early times. The Basques were the first to hunt whales systematically in the Bay of Biscay, the first documentation dating from the 11th century A.D. (Aguilar, 1986). De Smet (1976) presented evidence that whaling was practised as early as the 9th and 10th centuries in the English Channel and North Sea. In all cases the northern right whale was the principal target of those early whalers. The species often occurs very close to the coast, in shallow bays or lagoons, particularly during the period of calving. They are slow-swimming and could therefore be hunted with hand harpoons and lances thrown from rowing boats. Due to their thick layer of blubber, right whales stay afloat when dead. Struck and lost animals often died later and were then washed ashore. All this, as well as the large amount of meat, oil and baleen one animal provided, made that this species was with reason called the "right" whale, the only one within easy reach of the first whalers.

In later centuries, Basque whaling extended to other parts of the North Atlantic. In the early 15th century, the Basques reached Iceland and in the 16th century they established whaling settlements on the coasts of Newfoundland and Labrador, which were occupied until the early 18th century (Aguilar, 1986). In the meantime, other nations had joined in, partly trained by Basque whalers, and everywhere in the North Atlantic the right whale was being pursued relentlessly. During the 19th century, the populations had dwindled to the extent that the North Atlantic right whale was by some considered extinct or nearly so (Reeves & Mitchell, 1986b). In the Northwest Atlantic, however, hunting continued off Long Island, New York, till 1924 (Reeves & Mitchell, 1986a). In the Northeast Atlantic too, the species was still caught during the first decades of the 20th century, mainly from the Hebrides, where the last right whales were obtained in 1923; the last one off Norway was captured in 1926 (see Brown, 1986, who gives a total of 134-137 animals taken in the Northeast Atlantic between 1900 and 1926). The last North Atlantic right whales known to have been killed were a mother and calf near Madeira in 1967 (Maul & Sergeant, 1977; Brown, 1986).

At present, there are assumed to be two populations of *E. glacialis* in the North Atlantic: a western and an eastern stock (Reeves & Mitchell, 1986b), though it is not quite clear whether these have always been more or less separate, or whether this fragmentation is the result of whaling. The western stock is now estimated to number about 300 animals and shows no signs of recovery (Brown et al., 1994; Kraus, 1997). The numbers of the eastern stock are unknown, but it appears to be on the brink of extinction. Very few reliable sightings of right whales and no strandings have been reported for the Northeast Atlantic since 1900.

The occurrence of right whales in the North Sea has been reviewed by Kompanje & Smeenk (1996). They found records of only four sightings/captures off the Scottish and English North Sea coast in the 17th, 18th and 19th century (Southwell, 1881; Evans & Scanlan, 1989) and two strandings reported for the Flemish coast: one in

1178 which was tentatively identified as a right whale, and one well-documented case in 1751 (Mol, 1962; De Smet, 1974). Finally, Kompanje & Smeenk describe the finds of a few bones dredged by fishing vessels in the southern North Sea in 1994 and 1995 (probably belonging to the same specimen), which they assume to be from the second half of the 20th century. Obviously, the northern right whale has been very rare in the North Sea during the last few centuries.

De Smet (1974, 1981) summarized the prehistoric finds of right whale bones in the coastal districts of Belgium and NW France; Evans & Scanlan (1989) refer to similar material found near the English coast of the North Sea. Some identifications of this old and often incomplete material are tentative, but confusion with the Greenland right whale *Balaena mysticetus* can be ruled out, as that species has a truly arctic and subarctic distribution and has never occurred in the North Sea. The hunt for Greenland right whales started only in the late 16th century, so the earlier material cannot have originated from that source. The emerging picture is that there has been a population of northern right whales in the North Sea at least till the Middle Ages; our finds from Tiel fit in with this. We do not know whether this population was already overexploited by early whalers, or whether there have been other causes for its decline. At present, the northern right whale is at most an extremely rare vagrant in the North Sea.

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