THE CETACEANS *PHOCOENA PHOCOENA* AND *TURSIOPS TRUNCATUS* IN THE MARSDIEP AR0A (DUTCH WADDENSEA) IN THE YEARS 1931-1973. NIOZ REPORTS NR. 1975 - 17a/17b

by J. Verwey, Netherlands Institute for Sea Research, Texel, Netherlands.

A REVIEW *by A. D. G. Dral, Netherlands Institute for Sea Research, Texel, Netherlands.*

This paper reports a lot of original field observations on *Tursiops* and *Phocoena* made in the neighbourhood of Den Helder, Holland, where the Marsdiep connects the North Sea with the Dutch Waddensea.
In a series of chapters the species are looked at from an ever increasing angle : behavioural elements, daily movements, movements in the course of the year and the fate of the species during the last decades. Each of these chapters is placed in a frame which lifts it to a higher level than the local importance, suggested by the title.

During his long life, devoted to scientific research, the author has proved to be a trustworthy and (not less important) imaginative observer. As stated in the Introduction he wants to safeguard his observations "of limited value" (cetologists will heartedly disagree with this qualification) from possible loss. It can hardly be understood how this aim can be reached by hiding them in an internal report of the Netherlands' Institute for Sea Research. The explanation must be found in editorial problems: the paper takes some 160 folio pages ! This bulky size is partly due to the fact that much literature is incorporated (119 references), comprising many more species than the title ones and rendering the paper a very suitable introduction to anyone interested in cetacean behaviour.

In view of the probably restricted availability of the original paper, it is tried here to represent at least the most important observations and the author's conclusions from these as well as from the literature. Inevitably, the choice reflects the main interests of the reviewer and, equally inevitably, his personal evaluation of the presented matter pops up now and again. Is is strongly advised, therefore, to read the original paper if the possibility exists.
The Introduction already gives a good example of the structure of most of the paper. From the author's account that his observations are concerned with the species mentioned in the title follows a valuable summary on the occurrence of *Lagenorhynchus* and *Delphinus* in the studied area. The first chapter of the paper deals with aspects of the behaviour of both species. Several behaviour traits (courtship and mating, formation swimming, jumping, attitude towards ships, wave riding, lobtailing, spyhopping) are discussed mainly from literature data and personal communications. Value is added to this review by comparing the known facts with those of other cetacean (and incidentally non-cetacean) species. Not without reason schooling, grouping and jumping receive ample attention. In the area studied by the author the total number of bottle-nosed dolphins was never more than 30 or 40 at a time ; for the harbour porpoise this number amounted to some 20 - 30 on busy days. These schools as a rule

were subdivided into smaller units. We cite : "A troop of bottle-nosed dolphins, wildly hunting a herring school or other fish in all possible directions, may all at once transform into one (or more) colums, whereby some six animals swim closely together, side by side, in one transverse row. Although many more dolphins might be present in the area the number of about six individuals in one transverse row was seen several times and they formed what I should like to call a unit. " (p. 10). In contrast the following is stated about the harbour porpoise : "As a rule all these animals worked single or in pairs, the latter consisting of mother and young, or (presumably) male and female. Pairs consisting of mother and young could also be seen in *Tursiops,* but these pairs as a rule made part of the troops, whereas in the porpoise mother and young live alone, separated from other porpoises. Pairs, presumably consisting of male and female (sometimes three animals, presumably one female and two males), occurred especially in autumn, ... " (p. 21). Apparently the common porpoise is little social, except during migration (like is the case in many birds). The author carries on arguments which indeed render it questionable whether this species should be considered to be a schooling one or not.

Much attention is also given to the performance of high jumps. Such behaviour is characteristic for the bottle-nosed dolphen, which species received its Dutch, German and old-English namens because of this attitude. Jumping seemed to be restricted to certain periods and was seldomly displayed in winter ; days with fine, sunny wheather seemed to be favourable. Mainly more occasionally high jumping (or at least leaping free from the water) is performed by a variety of cetacean species, including large whales, but among the smaller odontocetes several species do not jump vertically. The common porpoise belongs to the latter category. Looking through all information collected in this subchapter, the reader could be persuaded to infer that high jumping primarily has a social function, at least in the bottle-nose dolphin. The author does not go that far, though the posisbility is left open " . . . that, beside its eventual value as a courtship movement, it may be important as part of plays and in strengthening social bonds. " (p. 16),

The subchapter on diving presents many original observations, including new records of diving times as measured in free living bottle-nosed dolphins : about 510 seconds for an adult animal and ca. 460 seconds for a young one. Much attention is given to the relation between diving and its counterpart breathing. Unfortunately, the presentation of the data initially leaves the reader in doubt whether the higher number of breathings *follows* a dive of longer duration (indicative for paying off an oxygen debt) or *precedes* it (in the opinion of the present reviewer possibly indicative for "planning" a deep dive). The reader's close examination of part of the data on p. 28 of the paper (another part can not be used because one of the figures is lacking) reveals that the correlation mentioned on p. 29 holds for the "planning" case. Nevertheless, at the end of an extensive and for the concentrated reader very much worth while annotated literature revieuw, in which many ceacean species are comprised, the author comes to an opposite conclusion (p. 40).
In the mean time the matter was discussed with the author. The protocoll notes were consulted again and it appeared that these gave not an absolute centainty that the verb "to follow", as used on p. 28, is fully justified ; perhaps it should be changed into the opposite. Realizing that this would make an important difference, the author intends to find out the true relations and, if necessery, to return to this subject in this journal.

Quite interestingly the author observed that the bottle-nosed dolphin during its series of shallow respiratory dives as a rule swims a straight course, laying down a fair distance from deep-dive to deep-dive and, after a deep-dive, surfaced not far from the place where it had gone down. These facts, combined with the duration of the deep-dive and the animal's swimming speed, are highly suggestive that (at least in the absence of pelagic fish schools) the sea bottom is thoroughly searched for food. One might guess what is the advantage of such behaviour to the hunter. Terms like basking (or sunning) and sleep contend an interpretation of certain behavioural traits. The discutability of its correctness is exposed in the next subchapter. Again own observations and literature data are compiled and discussed. Observations like those given in the above three subchapters on behaviour add subsatntially to the too limited amount of field observations being at the cetologist's disposition. With (or without) the author's comments the chapter is a usefel base for further discussions.

Of an allied nature is the chapter on the daily movements of *Tursiops* and *Phocoena*. The former showed great diversity, apparently independent from tides and tidal currents. Though being more a coastal than an open sea species, the bottle-nosed dolphin moves easily over long stretches of open water. In contrast, the harbour porpoise was bound to the immediate vicinity of the coast or to shallow water. It did not shun very shallow (kneedeep) or brackish water. It hunted also at night very close to the dyke.

In the North Sea area the yearly or migrational movements of cetaceans have been studied in the past on the bases of the numbers of stranded animals during the various months of the year and their geographical distribution. From British data it was concluded that *Tursiops* moves through the English Channel from southwest to northeast and that it passes Dover not before August or later. Strandings of this species are restricted to the southern English coast and hardly occur north of the Wash. If, therefore, the animals pass on to the North Sea, they must chiefly do that along the Belgian and Dutch coast. Comparison of the data of British and Dutch stranded bottle-nosed dolphins (total numbers over about 50 years in both cases) shows that in both areas there is a minimum in March and a maximum in August. Stress is layed on the fact that both curves for the strandings strikingly follow the curve of the water temperature. Observations on the occurrence of living animals in the Marsdiep area reveals quite another picture. Their numbers were small from June to December as compared with their relatively great abundance between February and May. The peak coincided with the presence of the Zuiderzee-herring, which migrated through the area in the same period "The image of those many dolphins, wildly hunting the herring schools with the gulls hanging over them and chasing them from the air, was sufficient proof of the importance of the shoals for the dolphins. " (p. 59). The author calculates that the dolphins needed to catch only 1 or 2 out of each 1000 herrings present, obviously an easy task. When with the end of the migration period of the herring in this area hunting became more difficult, the dolphins apparently moved to better fishing grounds. The question rises how the time of maximum strandings, August in Holland as well as England, can be brought into agreement with the spring maximum of the living population in the Marsdiep area. The author suggests that there are seasonal changes in mortality and that a high number of strandings need not be connected with great numbers of animals present. Besides it is possible that the Marsdiep area and surroundings were wintering quarters of populations living in more northern areas in summer time.

In spite of the author's efforts to collect all available data on strandings of the common porpoise in the areas surroundings the North Sea, the results (being a good summary in itself) do not allow to draw any conclusion. Too many factors of an incidental nature have polluted the data. With regard to the occurrence of living animals in the observed area, the limited material at least suggest some tendencies. *Phocoena* was absent or scarce here in March and April (notably during the mass migration of Zuiderzee-herring). The whiting is apparently much sought as food and it may be very numerous in the North Sea off Den Helder in winter or early spring. In May and June more porpoises approached the coast, coinciding with increasing numbers of newborn calves. In summer the porpoise could be seen in many Waddensea creeks. Therefore the increase in their appearance during May and June in the area probably was due to the animal's inshore breeding migration, which also is observed in other parts of the world. Many porpoises were present in the observed area during winter from December to February. Because of the slow gain and loss of heat of the water masses, the seasons in sea lag several months behind. The mentioned abundance of porpoises during winter may have represented the autumn migration, leaving colder water for deeper and warmer places. Such a behaviour is quite common in migrating sea animals. Though the migrational movements of porpoises often are obscured by tidal currents, fishing activities and the like the author summarizes several occasions in which an aimed swimming direction was evident. "I think it possible that *Phocoena* in the southern North Sea, were not influenced by the close proximity of land (as is the case in the Litlle Belt) and may have an innate direction of autumn migration : southwest, just as so many birds have. Maybe this direction could also be given by the innate use of tidal currents." (p. 77).

Both bottle-nosed and common porpoises are now rare species in the southern North Sea, which could certainly not be said during the earlier decades of the peroid described in this paper. The numbers of stranded *Tursiops* on the Dutch coast gradually increased up to a few years after World War II, remained stationary till 1965 and then fell sharply to practically zero. In the reviewer's opinion, affected by the fourth chapter of this paper, the observations on living animals are more valuable in evaluating the fate of the cetacean species in question. When in 1932 the dyke was closed, separating the Zuiderzee from the Waddensea, the Zuiderzee-herring (the main attraction for the bottle-nosed to show up in the Marsdiep area during winter) was cut off from its spawning grounds. By virtve of its existing stock the species was still abundant in the Waddensea in 1936 ; thereafter it decreased rapidly and the whole population had disappeared in 1940. The winter visits of *Tursiops* to the Marsdiep area took place in the normal way up to 1938. In this year they were very late (second half of March), but in view of the strong decrease of herring that took place in 1938, the numbers of *Tursiops* were still high. From 1939 on visits of *Tursiops* to the Marsdiep area have been of little importance. The relation with the disappearance of the Zuiderzee-herring appears clearly.

Many dead harbour porpoises stranded during the first years after the war, and nobody took the trouble to count them. From 1951 on the strandings were recorded again. The data have a sharp fall in 1965 in common with these data for *Tursiops*. In contrast with the (initial) abundance of stranded animals, the author noticed that the living porpoise had become rather rare in the Waddensea area during the war and learned later that the same holds for the Danish and German Waddensea and for the Dutch North Sea coastal waters. One can only guess what reason might have caused

the decrease of the porpoise around 1945 in such a large area. Disposal of war chemicals ?

It is stated several times that observations on living porpoises indicate a second decrease in number from 1960 on. Your reviewer, who can not find the relevant base for this conclusion in the paper, is content to follow the author. Though this statement, combined with a reference to the (multi-interpretable) stranding data is a poor introduction, the following discussion on the effects of pollution by the discharge of poisonous chemicals contains many veritable facts, the summary of which may be quite valuable to many a reader.

A number of Appendices contain the details about the observations on the presence of *Tursiops* and *Phocoena* in the Marsdiep area and annotated literature of food, reproduction and growth of these species.

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POLYCHLORINATED HYDROCARBONS AND HEAVY METALS IN HARBOUR PORPOISE *(PHOCOENA PHOCOENA)* AND WHITEBEAKED DOLPHIN *(LAGENORHYNCHUS ALBIROSTRIS)* FROM DANISH WATERS

by S. H. Andersen and A. Rebsdorff**.*

Introduction

The purpose of the present study was to investigate the level of persistent chlorinated hydrocarbons and heavy metals in different tissues of four harbour porpoises caught at Danish coasts and of one beached Whitenbeaked dolphin, and to compare the results with the levels in adjacent geographical regions. The investigations were also performed in a search for a possible explanation for the change in geographical distribution of the harbour porpoise in the North Sea area during the last 3 - 4 decades in connection with the many diseased animals taken in pond nets (ANDERSEN, 1972 & 1974).

Material

The samples originate from 5 male and 2 female harbour porpoises which had trapped themselves in pond nets in inner Danish waters in the period 1972—1973.
As for the trapped specimens, judging from their length and weight they have been

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