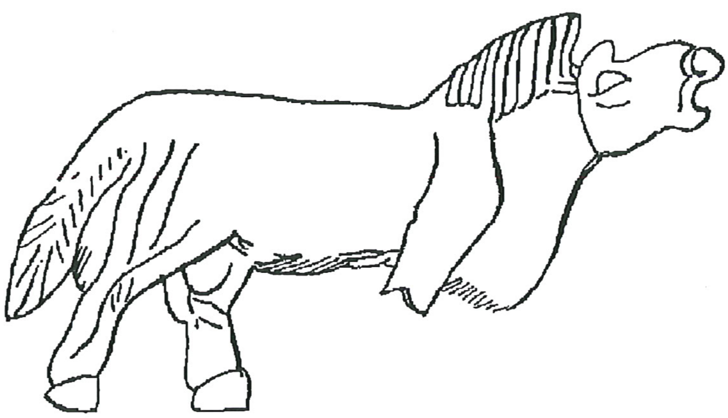
ARCHAEOZOOLOGY OF THE NEAR EAST
IV B

Proceedings of the fourth international symposium on the archaeozoology of southwestern Asia and adjacent areas

edited by

M. Mashkour, A.M. Choyke, H. Buitenhuis and F. Poplin



ARC - Publicatie 32
Groningen, The Netherlands, 2000

Cover illustration:
Przewalski from Susa (nacre – mother of pearl)
Dated to 2500 – 2000 BC, identified by F. Poplin

Printing: RCG -Groningen

Information: Centre for Archeological Research and Consultancy
Poststraat 6, 9712 ER Groningen, The Netherlands

ISBN 90 – 367 – 1243 - 2
NUGI 644 - 134

Contents

VOLUME B

Contents

VOLUME A

SEA TURTLE AND DOLPHIN REMAINS FROM RA'S AL-HADD, OMAN

Chris Mosseri-Marlio[1]

Abstract

The identification of large quantities of dolphin and marine turtle bone in the Bronze Age levels at Ra's al-Hadd, Oman, have underlined the need for further research to determine the importance of these animals and their raw materials in the assessment of past economies. Because of their relative scarcity on archaeological sites, little material is available to aid in the identification of these taxa. This paper serves as an introduction to dolphins and sea turtles in an archaeological context and outlines some of their more important diagnostic features. It is hoped that this will be a useful tool both for zooarchaeologists familiar with the more common terrestrial animals as well as the field archaeologist working on coastal sites without specialised knowledge of zooarchaeology.

Résumé

L'identification de grandes quantités d'ossements de dauphins et de tortues marines dans les niveaux de l'Age du Bronze à Ra's al-Hadd, en Oman, a montré la nécessité d'une étude plus approfondie pour la mise en valeur de l'importance de ces animaux et de leur apport comme matière première dans l'évaluation des économies anciennes. Du fait de leur rareté dans les sites archéologiques, il existe peu de documents permettant l'identification de ces taxons. Ce travail est une introduction à l'étude des dauphins et des tortues marines dans des contextes archéologiques qui met en valeur quelques-uns des caractères diagnostiques les plus pertinents. Cette présentation pourrait être utile aux archéozoologues, le plus souvent habitués aux restes d'animaux terrestres, mais aussi aux archéologues travaillant sur des régions côtières, sans connaissance particulière de l'archéozoologie.

Key Words: Zooarchaeology, Cetacean, Dolphin, Sea Turtle

Mots Clés: Archéozoology, Cétacés, Dauphins, Tortue de mer

Introduction

Ra's al-Hadd, lying at the eastern-most tip of the Arabian subcontinent, is an area with sites of great importance, not only for determining the archaeology and interaction of the various peoples within the Gulf area, but also for assessing the human environment during the Bronze Age. The assemblages discussed here came from excavations carried out in 1988-1989 and 1995 by the International Joint Hadd Project, a collaborative effort between Dr. Julian Reade of the British Museum, Dr. Serge Cleuziou of the C.N.R.S. and Professor Maurizio Tosi of I.S.M.E.O. in conjunction with the Ministry of National Heritage and Culture, Sultanate of Oman.

The Ra's al-Hadd sites have produced one of the most important bodies of environmental evidence yet recovered in the region, comprising large quantities of fish bone, molluscs, terrestrial animal bone, charcoal and other botanical remains, as well as bones of sea turtles and dolphins (Cartwright, 1994, 1998). The dolphin and sea turtle assemblages suggest the possibility that raw materials associated with these two animals were exploited, and that the bone deposits represent more than simply food refuse. The assemblages, comprising approximately 12,000 identifiable fragments, have been assessed not just on the basis of traditional zooarchaeological methods such as body part distribution, evidence of cut marks and spatial patterning, but also using animal behaviour and textual evidence from classical sources describing exploitation of these two taxa in the Arabian region. A full

[1] 43 Madeira Park, Tunbridge Wells, Kent, TN2 5SY England.

assessment of the material will appear along with a comprehensive study of the environmental evidence in the British Museum's forthcoming monograph on the Ra's al-Hadd sites.

The aim of this paper is twofold: firstly to introduce these two taxa as animals useful as economic indicators of the sites on which they are found, and secondly to outline their most diagnostic features through plates so that they may be more easily identified. One of the most important questions to be asked is whether their traditional place at the bottom of faunal "laundry lists" in zooarchaeological reports underlies what might be perceived as their unimportance, or perhaps only marginal contribution to life during the archaeological period. It is of course fair to say that their remains are often scanty in comparison to other taxa. However, to assume that they are of little importance on this basis seems erroneous for two reasons. The first is that sea turtles and dolphins are not part of the faunal analyst's usual repertoire, and as such they may be passed over unidentified within the faunal assemblage. Dolphin vertebrae, for example, the most frequently found dolphin element in the Ra's al-Hadd samples, are in many ways similar to terrestrial animal vertebrae, particularly if broken and revealing only the vertebral body. While sea turtle shell is easily recognisable, the smaller elements, such as phalanges, carpals and tarsals, (the only sea turtle elements found whole in the Ra's al-Hadd sea turtle assemblages), might be confused with eroded analogous elements from land animals. Further illustration of the vagaries of identifying these taxa is provided by the misidentification of "dolphin carpals" from the site of Saar (Crawford *et al.* 1997). Thus identification problems are perhaps the first hindrance in our understanding of these two taxa on archaeological sites.

Secondly, the kinds of information about processing techniques and taphonomy that are suggested by the Ra's al-Hadd assemblages indicate that these bones would not appear in great numbers unless one were to find, by chance, a processing site. Admittedly, such sites do not come to light often. A report on a dugong processing site in the Persian Gulf (Prieur and Guerin 1991) suggests that because of the bulky size of the creatures, and the need to transport away only those resources that were required, bone accumulation was restricted to the work area. Similarly, dolphins are heavy, slippery and difficult to transport once out of the water; that they should have been processed near to the area where they were removed from the sea seems reasonable. Ethnographic studies of cetacean butchery indicate that meat and fat can be removed from the carcass without any bone whatsoever, leaving little in the archaeological record to indicate their use except at processing sites (Savelle and Friesen 1996). Abundant sea turtle remains from Ra's al-Hadd also suggest that concentrated processing of these animals was being carried out within a restricted area.

The remarkable feature of both taxa is the amount of body fat contained in each. While butchery marks indicate that both animals were exploited for their meat, the use of their fat, perhaps as fuel or for some other artisanal purpose such as waterproofing, cannot be overlooked. Even using the conservative MNI (minimum number of individuals) count of 98 cetaceans from the Ra's al-Hadd assemblages, a low estimate of the fat present from dolphins at the site is in the region of 4000 kg. It is difficult to imagine a resource such as this being wasted, and cut marks on the hyoid bones--in some cases on both ventral and dorsal aspects--suggest careful cutting activity that may have been a result of mandibular fat extraction. The fat in this region of the animal, as well as the fat associated with the "melon", or forehead, has unique properties, being liquid in the living animal. Its low viscosity makes it a desirable lubricant in the present day for precision instruments (Lantz and Gunasekera 1955).

The butchery marks found on the sea turtles from Ra's al-Hadd also suggest that raw materials beyond meat were exploited. Cuts on the phalanges at the distal end of the flippers both on palmar and plantar aspects may be indicative of hide removal. Sea turtle leather is highly prized for its suppleness and strength. The extent to which the outer shell of the sea turtle was used in jewellery or other decorative items will never be resolved as the keratinous scutes have a high organic component and do not preserve well. However by the Ur III period, economic texts describe a robust trade in both sea turtle scutes and eggs, citing the delivery of over 5000 sea turtle items (Potts, 1990). During the first century AD in the Gulf region trade continued apace with "tortoiseshell" being one of Arabia's foremost trade items, and it was much coveted in the Roman provinces as veneer for furniture and even walls (Casson 1989). There is ethnographic evidence for the use of the bony shell, or carapace, as domestic receptacles (Doe 1978). In addition to its highly prized meat, sea turtle eggs would have been plentiful on nesting beaches. There is a well established Green Turtle colony at Ra's al-Hadd at the present, and the longevity of nesting beaches as well as philopatry, or nesting beach fidelity, is a known aspect of sea turtle biology (Miller 1996). Thus it is highly likely that sea turtles visited the beaches around Ra's al-Hadd during the archaeological period.

Identification of sea turtle and dolphin remains—photographic plates

Naturally, the most desirable method for making identifications is with locally collected reference material. One of the problems with collecting sea turtle skeletons is that they are very quickly scavenged by dogs, seagulls etc., and the important smaller elements of the autopodia are often missing. Difficulties occur in the collection of dolphin reference material because of the enormous quantity of rancid fat involved. In the absence of reference collections or even bone atlases for these two taxa, the following photographic plates are shown.

Sea turtle shell and bone

Sea turtle bone is generally more lightweight and porous than mammal bone. The carapace (the bony shell covering the back) and plastron (the underbelly shield) have the characteristic pitted appearance associated with the keratinous sheath covering it. Carapace and plastron surfaces resemble horncore and third phalanx surfaces of the bovids (Plate 1). This is due to the nature of horn and keratinous sheath growth and attachment. The interior of reptile bone has a spongy appearance. Because each bone has only one growth centre, no epiphyses are present. As the bones of sea turtles are suited to life in an aquatic environment and not designed for load bearing on land, the morphology of articular surfaces is less well defined than in the terrestrial animals, giving the bones, particularly at the ends, a rounded "eroded" appearance. Frequently the cortical bone near the epiphysis has fine striations which give the appearance of small gathers.

Carapace and plastron are the most easily recognisable elements of the sea turtle, with their slightly pitted and highly vascularized surfaces described above as well as their "sandwich" appearance in cross-section (Plate 2). The bony plates making up the carapace and plastron are joined by sutures, but in archaeological material from Ra's al-Hadd breaks occurred frequently at suture lines. Plastron elements are generally thinner and denser than carapace (Plate 3). Even in small sections, these elements can be highly diagnostic because of their unusual shape.

It should be noted that the humerus (Plate 4) is larger than the femur (Plate 5) in sea turtles. The radius and ulna (Plate 6) do not fuse but are joined by soft tissue. Carpals, tarsals and phalanges were the only elements in the Ra's al-Hadd assemblages that were found whole, a selection from the reference collection is shown here (Plate 7). The hooked claw of the forelimb is one of the few skeletal markers that can be used to determine sex. Both sexes have claws on the forelimb, but in the males, these take on a strongly hooked appearance. The carpals and tarsals vary slightly from species to species, and may be good diagnostic indicators for determining, for instance, the difference between Green Turtle (prized for its food) and the Hawksbill Turtle (prized for its scutes). Again, it should be pointed out that good identification manuals for sea turtles are not available, since sea turtles have many other soft tissue features that are of use to biologists in their identification of the living animal.

Dolphin bone

The bone of the cetacean skull is quite thin and prone to breakage. Thus, no photographs of dolphin skulls will be included here. However, the bones of the dolphin inner ear are dense and preserve particularly well. Their unusual shape makes them easily identifiable (Plate 8).

The most frequently found dolphin elements in the Ra's al-Hadd assemblages are the vertebrae. These follow the generalised mammalian organisation with the exception of the cervical vertebrae which are greatly reduced and partially fused together into one immobile unit. The vertebral epiphyses can remain unfused until quite late in life (Young 1981). Plate 9 shows vertebrae of *Delphinus* sp. It is worth noting that the shape of the vertebral body of the first few thoracic dolphin vertebrae is reminiscent of the more bean-shaped thoracic vertebrae of the bovids, one of which is shown for comparison. Where diagnostic neural arches and transverse processes have been broken, it is possible that confusion could occur between dolphins and land animals.

Elements of the forelimb (flipper) are shown in Plate 10. The three dimensional shape of the humerus gives way to a flattened radius and ulna, which show quite marked anterior-posterior symmetry. Distal to this, carpals form a neat jigsaw of cuboid and trapezoidal bones with characteristic pitting reminiscent of almond shell (Plate 11). As with the radius and ulna, their general organisation is flat. Phalanges are the most distal elements, and are even flatter still, with a rectangular shape that is nipped in at the waist (Plate 12).

Acknowledgements

I would like to thank Caroline Cartwright and Julian Reade of the British Museum for their help and encouragement in this project, and offering me the opportunity to do the research which became the basis for my MSc dissertation. Louise Martin of the Institute of Archaeology, London, introduced me to the material in the first instance, and made the reference collection available for study. Carl Phillips, also of the Institute of Archaeology, London, was a great source of help in locating reference materials and for encouraging my interest in faunal analysis in the Arabian region.. Helen Chatterjee of the Grant Museum of Zoology, UCL, provided specimens for photography.

Bibliography

Cartwright, C., 1998. Seasonal aspects of Bronze and Iron Age communities at Ra's al-Hadd, Oman. *Journal of Environmental Archaeology* 3: 97-103.

Cartwright, C., 1994. Preliminary results of the study of fish remains from a 3rd millennium BC site, HD1, at Ra's al-Hadd, Oman. In: W. Van Neer (ed.), *Fish exploitation in the Past.* Proceedings of the 7th meeting of the ICAZ Fish remains Working group. Tervuren, Annales du Musée Royale de l'Afrique Centrale, Sciences Zoologiques no. 274.

Casson, L., 1989. *The Periplus Maris Erythraei*. Princeton, Princeton University Press.

Crawford, H., R. Killick and J. Moon, 1997. *The Dilmun Temple at Saar*. London, New York, Kegan Paul International.

Doe, B., 1992. *Socotra, Island of Tranquility*. London, Immel.

Lantz, A.W. and C. Gunasekera, 1959. *Commercial Utilisation of Dolphins (Porpoises) in Ceylon.* Department of Fisheries, Ceylon NTIS 3.

Miller, J.D., 1996. Reproduction in sea turtles. In: P. Lutz and J. Musick (eds.), *The Biology of Sea Turtles*. Boca Raton USA, CRC Press.

Potts, D.T., 1990 . *The Arabian Gulf in Antiquity, Volume I. From Prehistory to the Fall of the Achaemenid Empire*. Oxford, Clarendon Press.

Prieur, A. and C. Guerin, 1991. Découverte d'un site préhistorique d'abbatage de dugongs à Umm al-Qawain (Emirats Arabes Unis). *AAE* (Arab. Arch. and Epig.) 2(2): 72-83

Savelle, J. and T. Friesen, 1996. An Odontocete (Cetacea) meat utility index. *Journal of Archaeological Science* 23: 712-713.

Young, J.Z., 1981(3rd edition). *The Life of Vertebrates*. Oxford, Clarendon Press.

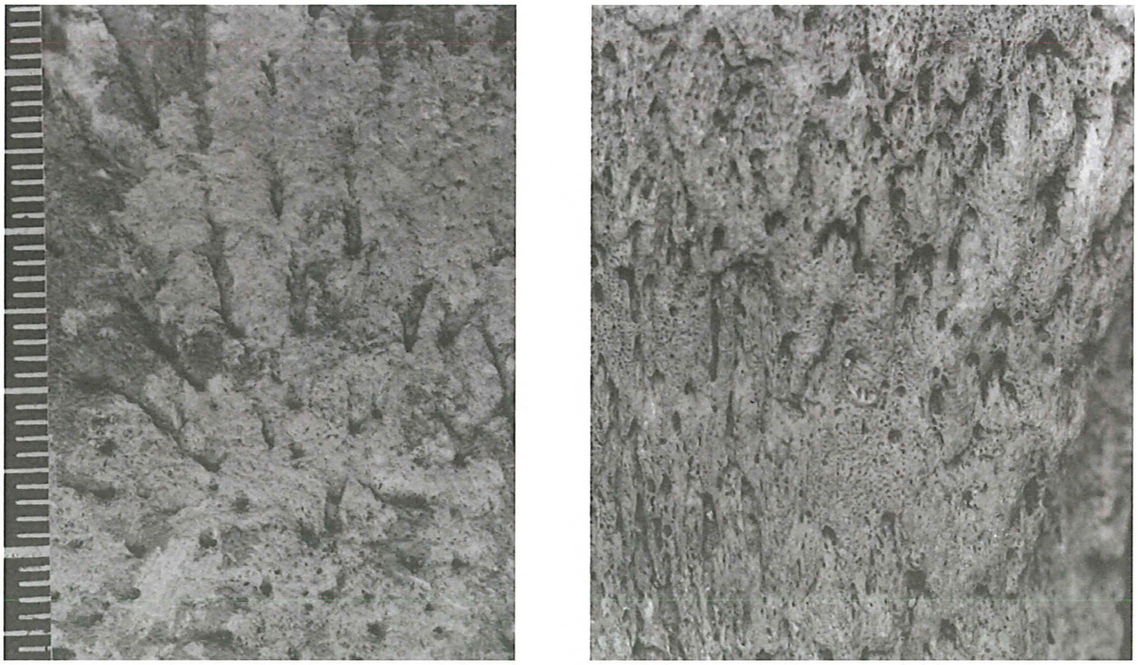


Plate 1. Sea Turtle carapace (left, compared with horn core of *Bos taurus*, right)

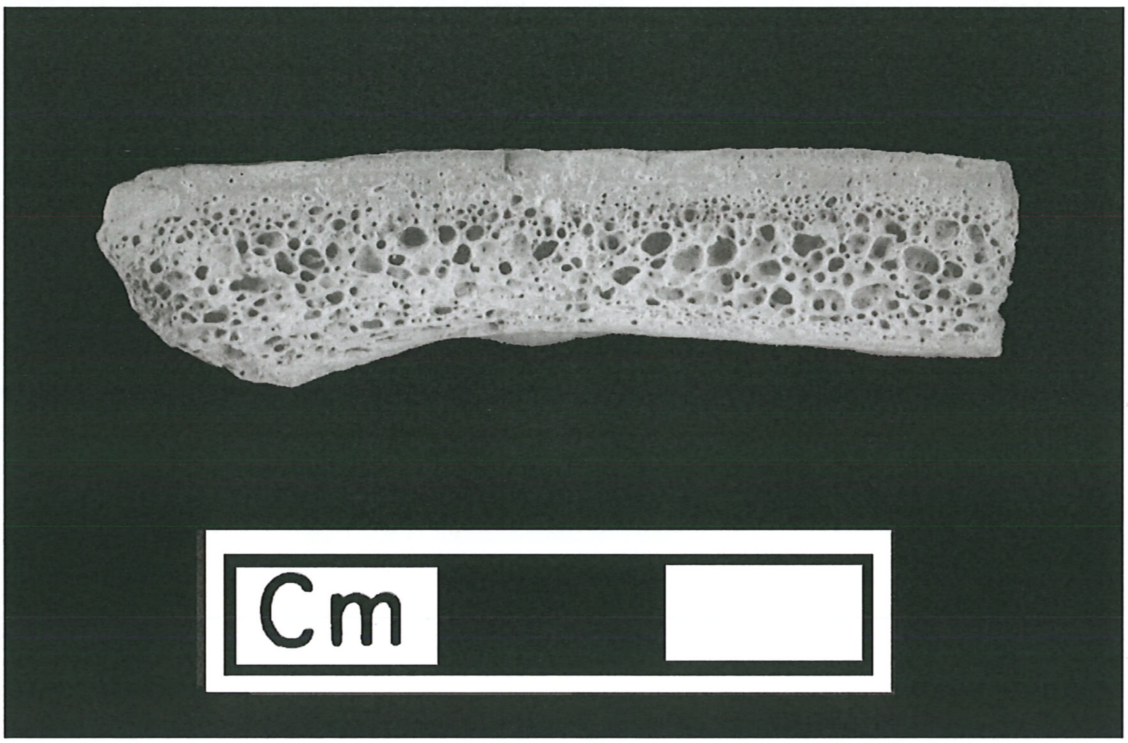


Plate 2. Cross-section showing "sandwich" appearance of sea turtle carapace

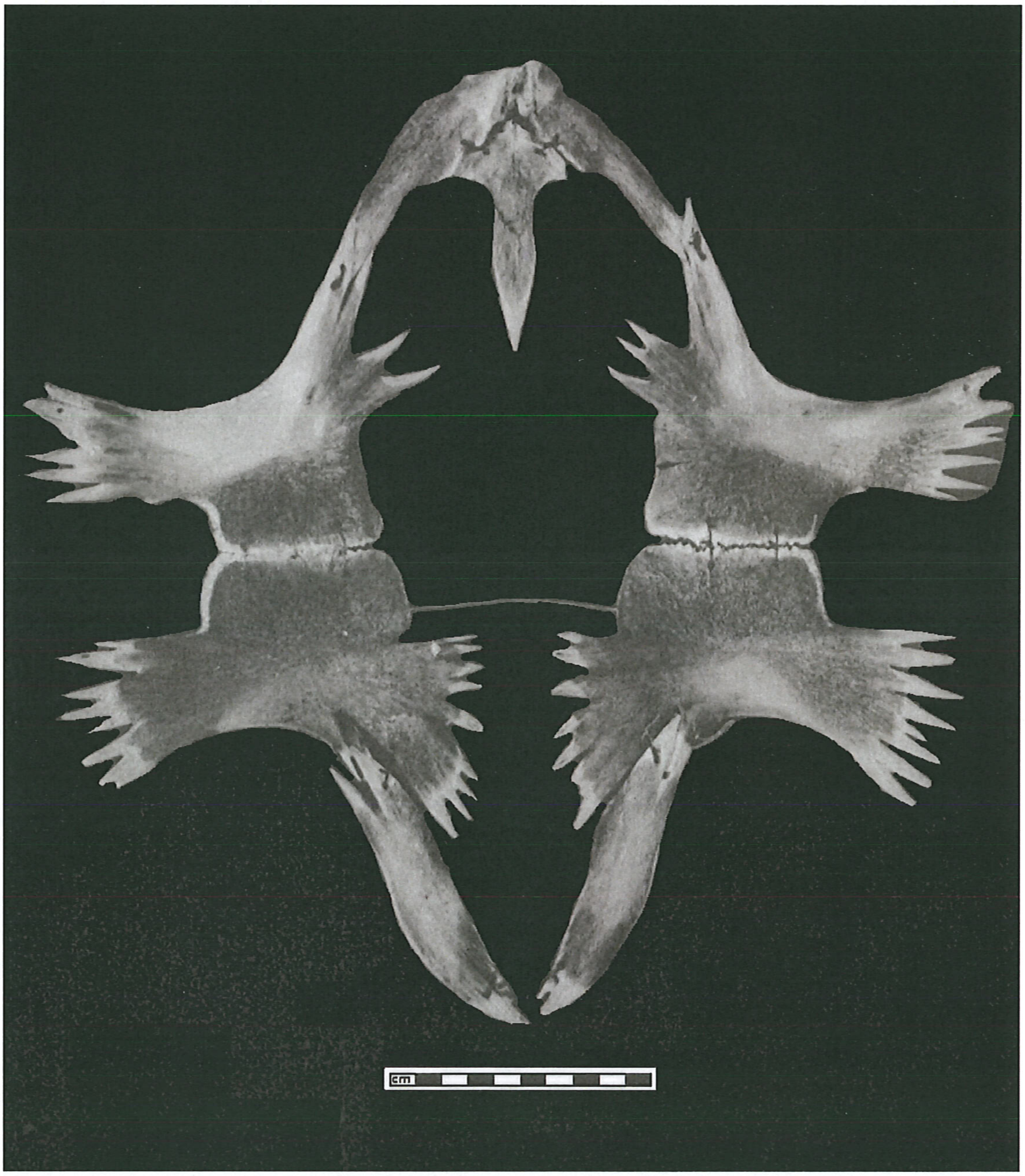


Plate 3. Plastron elements of Sea Turtle

Plate 4. Humerus of Sea Turtle

Plate 5. Femur of Sea Turtle. Note difference in scale size from Plate 4

Plate 6. Radius and ulna of Sea Turtle

Plate 7. Carpals, tarsals and phalanges of Sea Turtle

Plate 8. Periotic bones (left) and tympanic bullae (right) of dolphin

Plate 9. Dolphin vertebrae compared to that of *Bos*. Upper left: dolphin thoracic; Upper right: dolphin lumbar; Lower left: dolphin caudal; Lower right: *Bos*. The unfused vertebral bodies of dolphin vertebrae have a smoother profile than *Bos*

Plate 10. Humerus, radius and ulna of dolphin. Distal epiphyses of radius and ulna are unfused

Plate 11. Carpals of dolphin. Note "almond shell" appearance

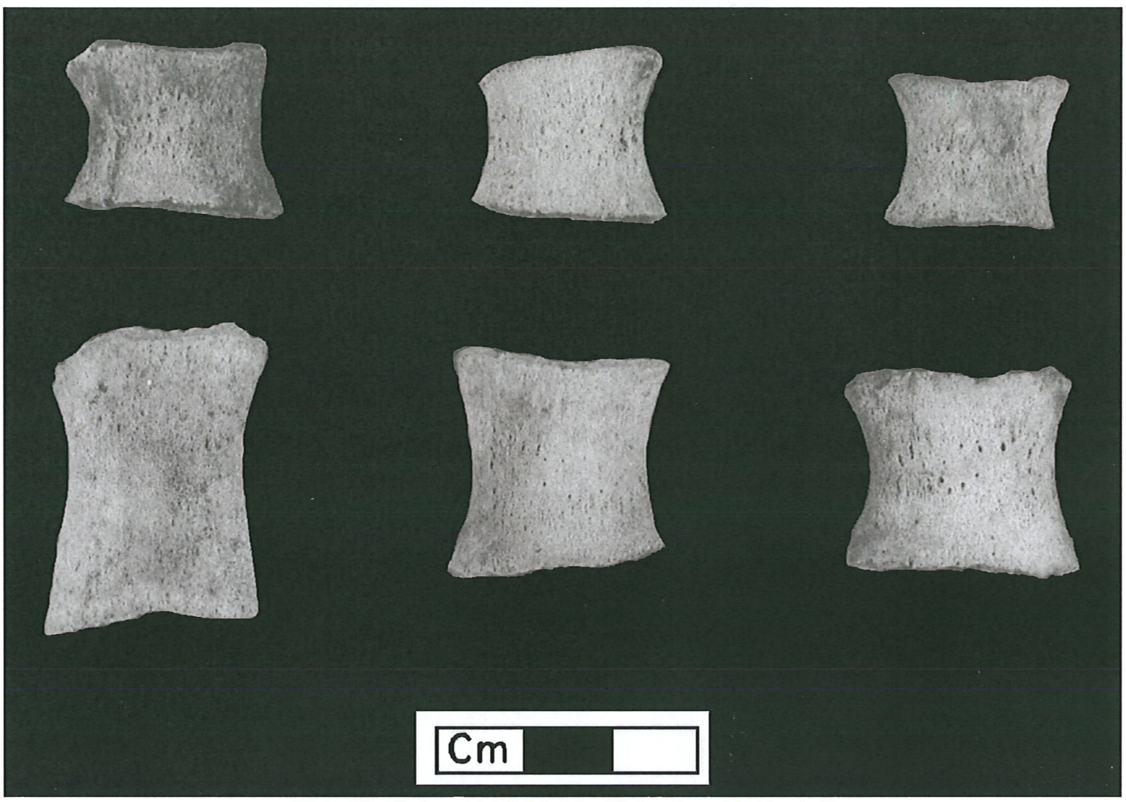


Plate 12. Phalanges of dolphin. Note nipped in "waist"