NOTES ON BALEEN PLATES AND ON ARRANGEMENT OF PARASITIC BARNACLES OF GRAY WHALE

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INTRODUCTION

While we were investigating gray whales (*Eschrichtius robustus*) caught during the winter of 1966–67 at the shore station of the Del Monte Fishing Company, Richmond, California, under a special scientific permit issued to the Marine Mammal Biological Laboratory of the U. S. Bureau of Commercial Fisheries, we made some observations on the baleen plates and parasitic barnacles. These results are reported here.

THE ASYMMETRY OF WEAR OF BALEEN PLATES

Fig. 1 shows the length of the baleen plates of two gray whales. Measurements were made on every 5th or 10th plate, from the gum line to the tip of the

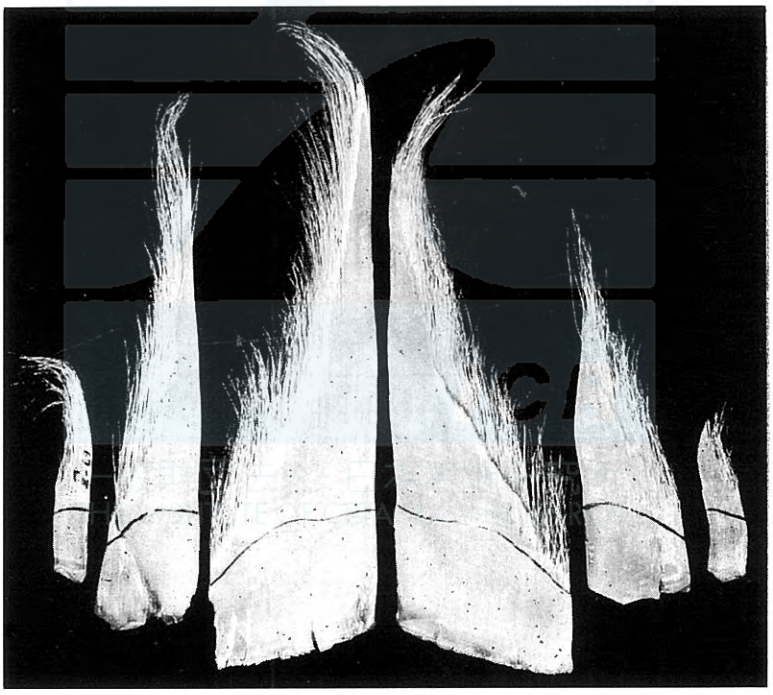

Fig. 1. 10th, 50th and 90th baleen plates of a gray whale (sides to center), No. 1967–8, posterior view. Black line indicates the gum line.

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plate along the lateral edge. As seen in this figure, the length of the baleen plates in the anterior part of the series is not bilaterally symmetrical. The plates on the right side are shorter than those in the corresponding positions on the left side. This asymmetry appears to be the rule among the California gray whales, for among 31 whales observed by us, there were only 3 animals in which the baleen plates of the anterior part of the right side were longer or nearly equal with those of the left.

As seen in Fig. 2 the distance between growth marks on the surface of the baleen plates is the same on the left and right sides, but the plates on the right side show heavier wear on the lingual edge. So it is reasonable to conclude that this asymmetry has been caused not by the slower growth of the right plates but by heavier wear on the right.

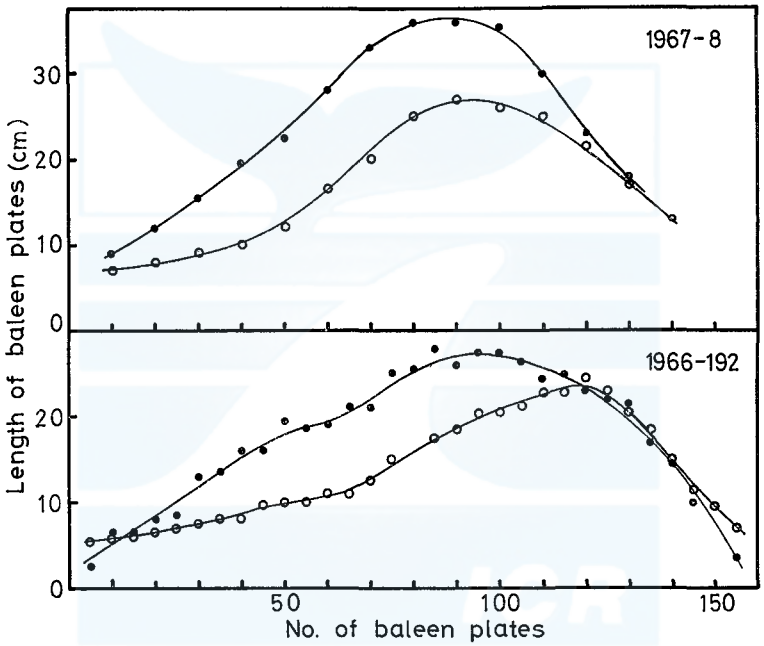

Fig. 2. Length of baleen plates of gray whales, no. 1967–8 12.6 m female and no. 1966–192 13.6 m female. Opencircle indicates the right and the closed the left. Curves are drawn by hand.

The gray whale feeds on benthic organisms and sometimes even swallows sand or pebbles (Tomilin, 1954; Pike, 1962; Rice and Wolman, in press). Scammon (1874) and Wilke and Fiscus (1961) reported that feeding gray whales had surfaced with head and lips besmeared with mud, and that they apparently had expelled mud through the baleen. These observations suggest that gray whales scoop the mud or sand on the bottom to collect benthic organisms.

Gunther (1949) mentioned that the movements of the rorquals from side to side appears to be restricted by the structure of body and that fin whales have the

TABLE 1. MEASUREMENTS OF BALEEN PLATES OF CALIFORNIAN GRAY WHALE

	% of length of right to the left			No. of baleen plates	
	A	B	C	Right	Left
Sample no.	31	16	20	9	11
Range	60.9–105.6	51.1–120.0	55.6–116.7	139–172	138–163
Mean	86.6	82.2	74.5	155.8	155.5
Standard error	1.92	4.29	3.31	—	—

A: Maximum length. B: Length at middle of series.
C: At 50 cm from anterior-most bristle.

Fig. 3. Rostrum region of the gray whale, Top: left side, bottom: right side. For explanation see text.

tendency to swim on one side to turn sharply to one direction. The same would be true also for gray whales feeding at the bottom, and it would be difficult for them to scoop the bottom with the anterior part of the lower lip while swimming in normal posture. This is supported by the observation that the number of colonies of barnacles infesting the left side of the head region exceeds that of the right side. On the skin of the right side of the rostrum we often observed many healed or open wounds, probably scratches caused by hard substances on the bottom.

From these considerations we speculate that the asymmetric wear of the baleen plates of the gray whale is the result of feeding movements in which the whales scoop the sediment mostly with the right anterior region of the baleen plate rows.

No asymmetry was found in the number of baleen plates (Table 1).

WATER CURRENT ON THE BODY SURFACE SUGGESTED BY THE ORIENTATION OF THE BARNACLES

There are many colonies of barnacles, *Cryptolepas rhachianecti* DALL, on the skin of gray whales. They are especially numerous on the rostrum and flippers, fairly numerous on the upper edge of the lower lip, the area between the eye and the base of the flipper, and on the tail peduncle. There are few barnacles on the other parts of the body.

These barnacles are directed approximately towards the anterior end of the whale, and all the barnacles in a colony are oriented in the same direction. The orientation of barnacles at any point on the body is nearly the same in all whales.

We think that the orientation of the barancles is affected by the direction of the water current at the point where the barnacles are growing, and the anterior end of the barnacles coincides with the mean direction of the current.

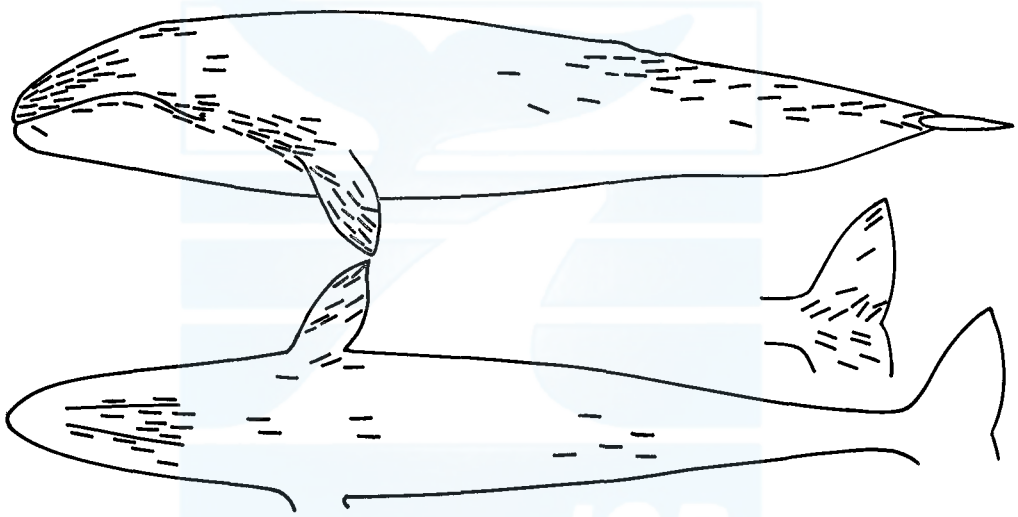

Fig. 4. Diagramatic figure of the orientation of barnacles on the gray whale

Fig. 4 is a diagrammatic figure of the orientation of the barnacles on the gray whale. This figure is based on sketches of each part of the body of six animals, and some photographs taken in the same whaling season. Each small rod represents approximately one colony. We found no significant bilateral asymmetry in the orientation.

On the upper jaw and the dorsal side of the tail peduncle the water seems to flow obliquely upward. But in the area between the angle of the gape and the anterior insertion of the flipper, the water seems to flow obliquely downward from the gape to the flipper. These flow patterns agree with those on the body of *Delphinus* and *Phocoenoides*, as determined from the arrangement of dermal ridges and from a photograph of a swimming *Delphinus* (Purves, 1963). Purves (*loc. cit.*)

reported that the dermal ridges on the flippers and flukes are arranged perpendicular to the leading edge. But in the case of the gray whale the barnacles are oriented obliquely from the anteroproximal to the posterodistal edge of the fins on both dorsal and ventral sides. Probably the gray whale usually holds its flippers in a ventroposterior position, so the mean direction of the current will be oblique to the long axis of the flipper. On the tail flukes it is not unreasonable to think that the current moves in a posterodistal direction, when the flexibility and somewhat posteriorly convex shape of the flukes are considered.

On the ventral side of the body the water seems to flow parallel with the body axis. The orientation of some colonies of barnacles suggests a downward flow slightly below the mid-line of the tail peduncle.

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REFERENCES

GUNTHER, E. R., 1949. The habits of fin whales. *Discovery Rep.*, 25 : 113–42.

PIKE, G. C., 1962. Migration and feeding of the gray whale (*Eschrichtius gibbosus*). *J. Fish. Res. Bd. Can.*, 19 (5) : 815–38.

PURVES, P. E., 1963. Locomotion in whales. *Nature*, 197 (4865) : 334–7.

RICE, D. W., and A. M. WOLMAN, (In press). The gray whale : life history and ecology. *Amer. Soc. Mammal., Spec. Publ.* No. 3.

SCAMMON, C. M., 1874. *The marine mammals of the northwestern coast of North America.* John H. Carmany & Co., San Francisco. 319 pp.

TOMILIN, A. G., 1954. Adaptive types in the order Cetacea. *Zool. Zh.* 33 (3) : 677–92 (cited in Pike, G. C., 1962).

WILKE, F., and C. H. FISCUS, 1961. Gray whale observations. *J. Mammal.* 42 (1) : 108–9.