

**Article XIV.**—OBSERVATIONS ON THE HABITS OF THE FIN-  
BACK AND HUMPBACK WHALES OF THE EASTERN  
NORTH PACIFIC.

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PLATES XXX-XL.

During the spring and summer of the year 1908, the writer spent four months of study at the three shore-whaling stations now in operation on the west coast of North America. The first station, visited in May and June, is located at Sechart, Barclay Sound, on the west side of Vancouver Island, British Columbia. The month of July was spent at Kyuquot, one hundred miles north of Sechart on the same coast, and August at Tyee, on the southern end of Admiralty Island, Alaska.

At the Vancouver Island stations, Humpbacks, *Megaptera versabilis* Cope, Sulphurbottoms or Blue Whales, *Balænoptera sulfureus* (Cope) and Finbacks, *Balænoptera velifera* Cope, are taken in varying numbers, the first-named being by far the most numerous. Occasionally a Sperm Whale, *Physeter macrocephalus* Linn., is also captured. At Tyee, Alaska, where the hunting is chiefly done in the bays and sounds, Finbacks and Humpbacks are taken exclusively. No Sulphurbottoms have as yet been secured, since at this locality they apparently rarely leave the open sea to come into the inland waters.

At each station, some time was spent on board the vessels studying and photographing the living whales, and it is intended to embody in the present paper the results of these observations. So few Sulphurbottoms were seen during my stay on the whaling steamers that the notes upon this species will be reserved for a future publication, when it is hoped that additional material will be at hand.

I. MEGAPTERA VERSABILIS *Cope*.

The following observations were made at Vancouver Island and Alaska, the movements of the Humpbacks of the two localities being alike so far as I could determine.

**RESPIRATION.** *Expiration.*—When coming to the surface the animal ascends *obliquely*, only the top of the head as far as the blowholes showing above the water. Instantly the spout is delivered. The cloud of vapor,

rising vertically, is narrow at the base, but spreads out at once forming a low, bushy column, rounded above, which rapidly disperses into a "puffy ball of spray." Fifteen feet is about the maximum height to which the spout of the *Megaptera* ascends, although Scammon says, "twenty feet or more." The height and density of the column, as in all whales, depends upon the time the animal has been below the surface, and the force with which the breath is expelled. If the period of submergence has been brief, the spout is usually thin, rising from eight to twelve feet into the air, and dissolving almost instantly. I have seen Humpbacks, which had been badly wounded, lying at the surface blowing every few seconds; the spout then could hardly be seen, although the opening and closing of the blowholes and the metallic whistling of the escaping breath were plainly distinguishable.

There seems to be some disagreement as to whether the *Megaptera* 'blow' in a single or double stream. Scammon says: "Like all other rorquals, it has two spiracles, and when it respire, the breath and vapor ejected through these apertures form the 'spout,' and rises in two separate columns, which, however, unite in one as they ascend and expand."<sup>1</sup> J. G. Millais accepts Scammon's view and adds that it "looks larger than that emitted by any of the other species of large Whale." His figures, however, show merely a single stream.<sup>2</sup> Packard, also, at second hand, records the blow of the Humpback as double, and "directed backwards toward the tail."<sup>3</sup>

From my own observations I cannot agree with these writers as to the divided character of the spout. I studied, with powerful field glasses, the expirations of a great number of Humpbacks, some of them only a short distance from the vessel, and could never distinguish a division of the vaporous column. Racovitza believes the spouts of both the *Megaptera* and *Balaenoptera* to be single, citing his own and the opinions of other authors, as follows: "Baer (1864) déclare avoir vu que le souffle du *Balaenoptera* est simple et que d'ailleurs on ne pourrait le voir double qu'en regardant l'animal de face. Rawitz (1900) a vu aussi les souffles des Mégaptères, des *Balaenoptera musculus* et *physalus*, simples. Henking (1901) le figure aussi simple chez le *B. physalus*. Moi-même je l'ai toujours vu simple quoique des Mégaptères et des Balénoptères aient soufflé, très près de moi, de face et de profil."<sup>4</sup>

<sup>1</sup> The Marine Mammals of the Northwestern Coast of North America, 1874, p. 42.

<sup>2</sup> The Mammals of Great Britain and Ireland, 1906, Vol. III, p. 239, plate facing p. 228, fig. 1, and plate facing p. 232.

<sup>3</sup> List of Vertebrates observed at Okak, Labrador, by Rev. Samuel Weiz, with Annotations. Proc. Boston Soc. Nat. Hist., 1866, Vol. X, p. 272.

<sup>4</sup> Résultats du Voyage du S. Y. Belgica, Zoologie, Cétacés, 1903, pp. 7, 8.

The drawing by Millais (*l. c.*, facing p. 228, fig. 1), is a fairly accurate delineation of the Humpback's spout, but it is quite unlike those shown on the plate facing p. 232, which are manifestly incorrect. Racovitza's figure (*l. c.*, p. 25, A), shows the spout directed more strongly backward than I believe would occur in a calm sea, unless the speed of the animal was great. As to the height he says, "s'élève dans les circonstances les plus favorables à une hauteur de 4 à 5 mètres" (*l. c.*, p. 25).

As noted by Racovitza and others, the expiration is accompanied by a loud, metallic whistling sound, which is undoubtedly produced by the rush of air through the blowholes. On a still day it can be heard for a considerable distance.

*Inspiration.*—Immediately after the delivery of the spout the inspiration occurs, and occupies from two to four seconds. This act is exceptionally well illustrated by the photograph (Plate XXX, Fig. 1) of a whale which rose to the surface partly under the vessel. The spout had just been delivered and the breath was being drawn forcibly into the lungs as the camera plate was exposed. It will be seen that the blowholes are greatly distended, forming a wide ellipse, and are protruded in a remarkable manner. In the excellent photograph of a spouting Sulphurbottom obtained by Glover M. Allen,<sup>1</sup> a great elevation of the outer eminences, which extend far above the apertures themselves, is shown. It would seem then, that the position of the blowholes is quite different during the two respiratory acts. In this connection Racovitza remarks: "L'orifice chez les *Mystacocètes*, au lieu d'être situé sur une proéminence conique comme pendant l'expiration, est maintenant largement béant, et la bosse de l'évent est tellement aplatie qu'elle se confond avec le contour régulier de la tête" (*l. c.*, p. 12). Racovitza's idea is thus just the reverse of what really happens. During expiration, as shown by Allen, it is not the blowholes themselves which are raised but the adjacent external eminences; and during inspiration, instead of being greatly flattened, the area surrounding the nasal apertures is distinctly elevated.

Millais speaks of the respiratory acts of the Humpbacks as follows: "If you watch any of the large Whales carefully at close range you will notice that the nostrils are only slightly opened during respiration, which lasts about five seconds. Immediately, however, the air is expended, they open wide for two seconds while the lungs are filled" (*l. c.*, pp. 239-240).

*Number of Respirations.*—The number of times the Humpbacks spout at each appearance is exceedingly variable; as a general rule, if the feed is

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<sup>1</sup> Some Observations on Rorquals off Southern Newfoundland. *Amer. Naturalist*, Vol. XXXVIII, No. 453, Sept., 1904, fig. 1.

far below the surface requiring a considerable period of submergence, the animals will blow six or seven times before descending, in order thoroughly to reoxygenate the blood. If, on the contrary, the dives are short, the intermediate respirations are usually few. However, I have seen individuals which were 'travelling,' or swimming long distances beneath the surface, rise to spout but once or twice and again descend. Scammon says that the Humpbacks will blow from one up to fifteen or twenty times, but this statement is, I think, somewhat exaggerated.

DRIVING.—The diving movements of the *Megaptera* are of two classes, viz: the 'sounding' or 'big dives,' when the animals descend to a considerable depth, and the short 'surface' or intermediate dives. The positions assumed during these actions are characteristic and quite distinct from each other.

*Sounding*.—Upon rising to the surface and delivering the spout, the Humpback depresses the head and begins to revolve. As the dive progresses the body is arched until it takes the form of an arc of a circle, the back slowly becoming visible. Finally, the dorsal fin appears and is soon prominently seen at the summit of the curvature. At this stage the animal has lifted itself high in the air and a greater portion of the body shows above the surface than at any other period during the dive. As the revolution continues, the flukes are drawn smoothly out of the water and elevated until the faces are at first parallel to the surface, then perpendicular to it. The whale is then in a *vertical* position, and remains so as the tail disappears.

These movements are illustrated by the photographs. Plate XXX, Fig. 2, and Plate XXXI, Fig. 1, show two Humpbacks in the act of sounding, the relative positions of the animals being about the same. In Plate XXXI, Fig. 2, the dive is slightly further advanced and the whale is exhibiting the maximum amount of the body above the surface. Plate XXXI, Fig. 3, is a posterior view of a sounding Humpback, *i. e.*, the animal is diving directly away from the vessel. The sharp ridge of the back posterior to the dorsal fin is shown, a breaking wave giving the effect of a patch of white upon it. In Plate XXXII, Fig. 1, the peduncle and flukes are exposed, the flat surfaces of the latter being horizontal to the water. The whale is *nearly* vertical in position. In the distance may be seen a second individual which has just spouted and is in the act of inspiring. The view is from behind. A small portion of the back is visible and the elevation of the blowholes is strikingly illustrated.

The next stage of the dive is shown in Plate XXXII, Fig. 2, where the flukes alone are seen, their flat surfaces being perpendicular to the water. The position of the animal at this time is vertical. The gradual disappearance of the tail is illustrated by Plate XXXIII, Figs. 1 and 2. Plate

XXXIII, Fig. 3, shows in profile two Humpbacks in the act of sounding; the flukes and 'small' of one are above the surface and the body of the other is at its greatest curvature.

Racovitza believes that the *Megaptera* rise obliquely and when sounding "l'animal descend obliquement mais dans une direction faisant un angle très aigu avec la verticale" (*l. c.*, p. 28). In confirmation of this view he gives a figure, drawn from a photograph, saying in explanation, "La direction du corps de l'animal est visiblement oblique. C'est donc obliquement qu'il plonge" (*l. c.*, p. 27, fig. 11). He does not, however, consider that the dive was not completed when his photograph was taken, and that in its further progress the body might reach the vertical position. This is what really happens, the animal descending directly downward. In regard to this point Rawitz remarks: "Fabricius (13) sagt, dass *Megaptera boops* schräg in die Tiefe herunter — und schräg aus ihr hervor tauche. Das letztere is richtig, das erstere nicht. *Boops* geht, wie man aus der später noch zu erwähnenden Stellung der Schwanzfinne erkennen kann, senkrecht in die Tiefe; *Musculus* dagegen geht in ziemlich schräger Stellung hinunter."<sup>1</sup>

Millais, also, says, "that it turns over and dives vertically there is no doubt" (*l. c.*, p. 40).

*Intermediate Dives.*—When the whale reappears after the big dive, several short or surface dives, of uncertain number and duration, are usually indulged in before it again sounds. The animal may swim just beneath the surface reappearing directly, or rise several hundred feet from the place where it descended. When going down for the intermediate dive, in most cases the back is but slightly arched, and there is comparatively little suggestion of the revolving motion so characteristic of the act of sounding. The movement is forward and somewhat downward, the anterior portion of the body gradually sinking lower until only the dorsal fin and the edge of the back directly posterior to it are above the water. Usually the tip of the dorsal is last to disappear. The flukes are never shown during this act. At times, during the intermediate dives, the *Megaptera* expose the whole of the back from the blowholes considerably beyond the dorsal fin.

The surface dives are well illustrated by the photographs. In Plate XXXIV, Fig. 1, the animal is in a typical position, the back being only slightly arched. This photograph and Plate XXXI, Fig. 1, are directly comparable and show well the great differences in attitude during the sounding and intermediate dives. In Plate XXXIV, Fig. 2, two Humpbacks are shown in the act of descending. The animal in the foreground

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<sup>1</sup> Ueber *Megaptera boops* Fabr., nebst Bemerkungen zur Biologie der Norwegischen *Mystacoceten*. Archiv für Naturgeschichte, 66 Jahrg. I, 1900, p. 96.

would soon have disappeared; the second whale has the back more strongly arched than is usual. A particularly interesting feature of this photograph is the beautiful illustration of the extreme types of variation in the dorsal fins of this species. I found, in the Pacific *Megaptera*, every gradation between the narrow, falcate fin, and its reduction to a low, rounded hump, as shown in the figure. Plate XXXIV, Fig. 3, is a photograph of a Humpback which was swimming at the surface with the whole dorsal region of the body, from the blowholes considerably beyond the fin, exposed.

*Time beneath the surface and Distance traversed.*—The periods of submergence are variable. When sounding, the animals remain below from five to twenty minutes; when taking the intermediate dives they may swim just beneath the surface, appearing every few seconds to spout, or be down for a number of minutes. If 'feed' is present the movements are undoubtedly controlled by the depth at which this is to be found.

The distance traversed by the *Megaptera* while below the surface depends entirely upon the conditions of the moment. When there is little feed and the whales are constantly moving or 'travelling,' they may rise a mile or more from the place of last appearance. If, on the contrary, feed is abundant, the animals may often spout within a short distance of the point at which they disappeared.

There is a belief, current among whalers, that the Cetaceans can remain under water for many hours without coming to the surface to respire. This owes its origin to the fact (which has been frequently observed) that whales will suddenly appear when for several hours previously there had been no sign of a spout, even at a distance. I believe this may be accounted for by the hypothesis, suggested by Racovitza, that both the *Megaptera* and *Balænoptera* frequently swim long distances at considerable speed without appearing to blow. Buchet<sup>1</sup> takes a contrary view, believing that whales sleep beneath the surface.

Both Humpbacks and Finbacks, when two or more individuals of the same species are associated, will frequently swim side by side in such proximity as to almost touch each other. When diving, they will leave the surface together and reappear at exactly the same instant. Millais has recorded something similar to this in the case of *B. musculus*: "Occasionally they turn under water and reappear half a mile astern of the vessel. It is difficult to understand how whales communicate with one another when they 'double' in this fashion, but on three occasions three Blue Whales turned simultaneously under water and came up half a mile astern of the vessel, and almost at the same spot" (*l. c.*, p. 255).

<sup>1</sup> Quelques observations sur les Balénoptères des Eaux Islandaises. Bull. Soc. Zoolog. de France, Vol. XX, 1895, p. 30.

*The Track.*—A smooth, circular patch of water at the place of disappearance invariably accompanies the dive of both the *Megaptera* and *Balænoptera*. This is shown in Plate XXXII, Figs. 1 and 2. It is, I believe, a purely physical phenomenon produced by interrupted wave action and suction as the great animal descends. It is analogous to the disturbance caused by the sudden descent of any large body into the water.

The peculiar mirror-like appearance of the track has led Racovitza into error regarding its origin. Even though admitting the absence of sudoriporous and sebaceous glands in the skin of the Cetaceans, he nevertheless maintains that “il y a incontestablement une couche de graisse extrêmement mince, qui s'étend à la surface de l'eau et qui lui donne cet aspect bien connu de miroir” (*l. c.*, p. 15). In his endeavor to discover a satisfactory origin for the 'slick,' he evolves a theory which is at best improbable and ignores the possibility of explaining the phenomenon from a physical standpoint. He says: “Les observations suivantes pourront peut-être nous mettre sur la trace de la vérité.

“Thiercelin (1866 vol. I) à propos de la Baleine franche australe dit que... ‘du souffle... tombent quelques gouttelettes de matière grasse.’ Si cette observation se vérifie, car on ne peut l'admettre sans hésitation, on aurait ainsi la source de la ‘grasseur’ mentionnée, mais une autre observation que j'ai faite dans le détroit de Gerlache me paraît fournir une explication plus plausible. J'ai remarqué à la surface de l'eau, parmi les gros Balénoptères et Mégaptères du détroit, des masses informes de couleur rouge entourées de ‘grasseurs.’ C'étaient à ne pas en douter les excréments de ces animaux. Les Phoques et les Manchots avaient des excréments pareils, dont la couleur s'explique par la nourriture de ces animaux consistant en *Euphausia* abondamment pourvues de pigment rouge. Les *Euphausia*, comme tous les animaux planctoniques, possèdent de nombreuses gouttelettes grasseuses dans leurs tissus, gouttelettes qui doivent jouer le rôle de flotteurs chez les animaux passant leur vie entre deux eaux. Cela étant, les restes de la digestion des mammifères et oiseaux qui s'en nourrissent doivent contenir de la graisse. Il est donc possible que les grands Cétacés laissent suinter constamment par l'anus de petites quantités de matière grasse qui pourraient être l'origine des ‘grasseurs’ observées” (*l. c.*, p. 15).

The masses of red color which he observed may have been due to the excrement of the whales, or, what is quite as probable, to the presence at the surface of *Euphausia* themselves. It is highly improbable that excretory oil is constantly emitted by Cetaceans; and if so, that it would be of sufficient amount to cause a large slick at each disappearance of the animal beneath the water. Moreover, the excrement is forcibly ejected in a considerable quantity at one time, at least by the Finbacks, as I had an excellent

opportunity of observing. On August 19, while on board the steam whaler 'Tyee Jr.,' Capt. Chas. Grahame, hunting in the waters of Frederick Sound, Alaska, three Finbacks rose about one hundred and fifty feet from the vessel. They sounded immediately, and as the nearest whale went down a conspicuous brick-red patch, five or six feet in diameter, suddenly appeared at the surface and drifted directly under the bow of the vessel. I examined it with the greatest care and determined its identity as excrement beyond doubt. Capt. Grahame confirmed my opinion, saying that he had frequently observed the same occurrence. When whales are feeding near the surface, the presence of greasy matter might readily be accepted and has been recorded in the case of *B. physalus* by Millais, who says: "In the vicinity of the feeding operations the sea is suffused with a mass of oily matter, in which numerous small marine creatures, too small for the eye of man to see, are present" (*l. c.*, p. 268).

PLAY.—Numerous drawings have been published showing the *Megaptera* in the act of jumping or 'breaching,' but photographic evidence has hitherto been lacking. My notes give records of jumping Humpbacks for almost every day that I spent on board the whaling steamers. The animals always emerged from the water in a vertical position or very nearly so, frequently showing even the tips of the flukes, and invariably falling back upon the side. Plate XXXV, Fig. 1, is a photograph of a Humpback which had thrown itself entirely out of the water. The whale is shown breast forward and is falling upon its right side. The left pectoral limb is prominently displayed at an acute angle with the body; the caudal portion of the animal has already disappeared.

The figures of breaching Humpbacks given by Scammon (*l. c.*, pl. viii), Racovitza (*l. c.*, pl. iii, fig. 11 A and B) and Millais (*l. c.*, facing p. 232) seem to be correct; however, I have never seen the posterior part of the body held in the position shown in fig. B of Racovitza's drawing, which is duplicated by Millais. On July 8, and August 20, Humpbacks thrust the anterior half of the body into the air, fell sideways and sank back out of sight. An individual, on June 9, plunged along the surface, the head, chin and greater portion of the back out of water; the animal was in exactly the position figured by Racovitza (*l. c.*, pl. iii, fig. 12), excepting that the pectorals were not elevated as in his drawing. On June 9, a whale thrust the head to a considerable distance beyond the blowholes, obliquely out of the water. This again occurred twice in the case of another individual on August 21, when the photographs reproduced in Plate XXXV, Figs. 2 and 3, were taken. The mouth in Plate XXXV, Fig. 2, is seen to be widely open, the mandible being below the surface, and the outer edges of the baleen laminae showing distinctly. In Fig. 3, the mouth is closed. At these appearances the spout was *not* delivered.



The *Megaptera* frequently assume an inverted position, having the peduncle and flukes out of the water, and thrashing the latter in every direction. This action has been figured by Scammon (*l. c.*, pl. viii) and designated as "lobtailing." I witnessed it on several occasions and obtained three pictures, Plate XXXVI, Figs. 1, 2 and 3, which, although hardly successful, are nevertheless of interest as being the first photographic records of the performance. In Fig. 3 the broad, superior surface of the right lobe of the flukes and the sharp, dorsal edge of the "small" may be seen. There was some variety in this action, at times the tail being waved rather slowly back and forth without touching the surface. Again the water would be lashed into foam, the spray almost concealing the thrashing flukes. On the morning of August 19, from the masthead, I saw in the distance numerous clouds of water thrown into the air. With field glasses I could plainly see that a school of Humpbacks were responsible for the disturbance. The animals were breaching, sometimes two at once. This continued for three minutes. How many individuals were taking part in the performance could not be determined.

FEEDING.—When feeding, the *Megaptera* open the mouth and take in quantities of the floating *Euphausia*, then turn on the side and raise the under jaw, the water rushing out in streams from between the plates of baleen. One lobe of the flukes and, at times, one fin are thrust above the surface, a considerable portion of the body sometimes being exposed. Mil-lais believes that the Humpbacks do not elevate the pectoral, differing in this respect from the Finbacks and Sulphurbottoms (*l. c.*, p. 239). This, however, is incorrect, for I have seen feeding Humpbacks thrust the fin straight upward as they rolled on the side. At other times this did not occur, and very little of the body was visible above the surface. Although Plate XXXV, Fig. 2, shows the mouth open, I do not believe the animal was feeding at the time; it was apparently indulging in play, and sank back out of sight without performing any of the motions which usually accompany the feeding operation. Rawitz (*l. c.*, p. 101) believes that in order to close the mouth the *Megaptera* throw themselves upon the back. This is too absurd to require comment.

Food.—When *Euphausia* are obtainable the west coast *Megaptera* apparently seldom eat anything else. I examined carefully the stomachs of all the whales which were brought in at the stations during my stay, and aside from a few worms (which unfortunately were not identified) nothing but *Euphausia* were found. Mr. Victor H. Street, Manager of the Tyee, Alaska, station, reported that one Humpback had been taken there which contained in its stomach a great quantity of codfish (probably *Gadus macrocephalus*), the largest being about sixteen inches in length. This is

the only authentic record which has reached me of fish having been eaten by Pacific Humpbacks.

## II. BALÆNOPTERA VELIFERA Cope.

The following observations were made during my stay on board the steam-whaler 'Tyee, Jr.,' Capt. Chas. Grahame, which hunts from the Tyee, Alaska, station.

RESPIRATION. *Expiration*.—The Finback's spout contrasts so strikingly with that of the *Megaptera* that the two can never be confused, even when seen at a considerable distance. The column of vapor, under normal conditions, rises *vertically* to a height of from eighteen to twenty feet, and takes the shape of a narrow inverted cone, rounded superiorly. If no wind is blowing the vapor disperses slowly, drifting off in a club-shaped cloud; when dissolving it never assumes the spherical form so characteristic of the Humpback's spout. The photograph reproduced in Plate XXXVII, Fig. 1, gives an excellent idea of the Finback's spout. The view is lateral, and the column has risen to its full height. It will be noted that it is directed slightly forward, thus showing the effect of the light wind which was blowing at the time. The form assumed as the vapor drifts away is illustrated by Plate XXXVII, Fig. 2. This photograph is a posterior view; the animal's head is below the surface, and the dorsal fin may be seen just emerging from the water.

Plate XXXVII, Fig. 3, is of special interest. Two Finback whales are in the act of taking a surface dive, the dorsal fins and a small portion of the back alone being visible. However, an irregular spout is rising vertically from the water directly in front of the whale at the right. *Thus the animal is blowing after the head has again been submerged in the regular progress of the dive.* Considerable water would, of course, be thrown up in such a case, accounting for the reduced height and the irregularity of the spout.

The diagrammatic figures of the Finback's spout given by von Baer<sup>1</sup> and Henking,<sup>2</sup> have been commented upon by Racovitza (*l. c.*, p. 7), and Allen (*l. c.*, p. 613, 614), and will not be discussed here. The only published photograph of the spout of this species with which I am familiar is that presented by Millais (*l. c.*, facing p. 272). This picture shows two Finbacks in the act of blowing. The spout of the one at the right is rather indistinct, and that of the whale on the left has so evidently been 'improved' that it is

<sup>1</sup> Noch ein Wort über das Blasen der Cetaceen, mit bildlichen Darstellungen. Bull. de l'Acad. Imp. des Sci. de St. Pétersbourg, Vol. VII, 1864, p. 338.

<sup>2</sup> Über das Blasen der Wale. Zool. Anzeiger, Vol. XXIV, p. 105.

of little value. The stream of vapor is represented as rising vertically until the maximum height is reached, then, bending over, as descending almost to the water, parallel to the ascending column. It is not probable that even a strong wind could produce such a departure from the normal type of spout.

My observations agree with those of other writers that the Finbacks blow in a single stream. As to the height to which it ascends, estimates vary. Packard says, "about ten feet high" (*l. c.* p. 272); Millais gives "from ten to fifteen feet" (*l. c.*, p. 268); Allen (*l. c.*, p. 621) records twenty feet as a maximum spout for *B. musculus*, which he says he could not distinguish from that of *B. physalus*. This estimate I believe to be correct. As previously noted (*antea*, p. 214), the height is variable and depends upon circumstances.

Scammon has stated that the noise produced by the Finbacks during respiration is "quite distinguishable from that of other whales of the same genus" (*l. c.*, p. 35). As to the latter point I cannot say, but it is certainly sharper and very different from the respiratory sounds of the *Megaptera*.

*Inspiration.*—The inspiration is performed exactly as in the Humpbacks and, so far as I could determine, occupies about the same time — from two to four seconds.

*Number of Respirations.*—Ordinarily there seems to be more regularity as to the number of respirations between the periods of submergence than in the *Megaptera*, although this depends to a great extent upon circumstances. I found that the Finbacks usually blew about four times at fifteen second intervals before arching the back to sound.

*DIVING.*—As in the case of the *Megaptera*, the positions assumed by the Finbacks during the sounding and surface dives are quite distinct.

*Sounding.*—The animals rise obliquely, exposing the top of the head to a point considerably beyond the blowholes, and deliver the spout. The head is then depressed, the inspiration completed and the anterior portion of the back becomes visible. As the dive progresses, the body is strongly arched and, when the dorsal fin appears at the summit of the curvature, the maximum amount of the animal is exposed above the surface. The body then gradually sinks until by the time the dorsal has again reached the water, it has disappeared.

Plate XXXVIII, Fig. 1, shows a Finback in the act of sounding. The attitude of this whale is typical, and very similar to that assumed by the Humpbacks, as will be seen by a comparison of Plate XXXI, Fig. 1, and Plate XXXVIII, Fig. 1. The flukes were never shown by the many individuals which I studied, my observations in this respect agreeing with those of Racovitza, Millais, True, Allen and other writers. Scammon, however, says: "In beginning the descent, it assumes a variety of positions: some-

times rolling over nearly on its side, at other times rounding, or perhaps heaving, its flukes out, and assuming nearly a perpendicular attitude" (*l. c.*, p. 35).

*Intermediate Dives.*—The movements of the surface dives are so similar to those of the Humpbacks that a detailed description is unnecessary. A comparison of Figs. 1 and 2, Plate XXXVIII, where the whales are in the same relative positions, gives an exact idea of the difference in appearance during the sounding and intermediate dive.

Millais says (*l. c.*, p. 267) that the animals roll over and show the eye when swimming near the surface, but this was never done by the Finbacks I observed. True also states (*l. c.*, p. 92) that the eye was not exposed by the Newfoundland specimens.

In Plate XXXVIII, Fig. 3, two Finbacks are shown during the short dive. The anterior portion of the back alone is exposed, the dorsal fins having not yet reached the surface. Plate XXXIX, Fig. 1, is of interest chiefly because it shows a peculiar depression or groove running longitudinally just beneath the ridge of the back. This may also be seen in the whale at the left in Plate XXXVIII, Fig. 3, and in the Humpback shown in Plate XXX, Fig. 2. Allen (*l. c.*, p. 618) has noted a similar groove just posterior to the blowholes in the case of a spouting Sulphurbottom. Thus it would seem that this depression extends the length of the back, nearly as far as the dorsal fin. Allen has suggested that it might be caused by the muscular contraction incident to the raising of the eminences about the blowholes when spouting; this hypothesis, however, is precluded, since my photographs show it to be present in whales which were not respiring. It may possibly be due to the action of the scapular muscles as the whale uses the flippers in descending.

Plate XXXIX, Fig. 2, is a posterior view of a Finback which has just been struck by the harpoon. An interesting feature of this photograph is the indication along the dorsal ridge of the neural spines of the vertebræ. The admirable photographs of Newfoundland Finbacks obtained by Dr. F. W. True give several stages of the dive not shown by my own figures.

*Time beneath the surface and Distance traversed.*—I have observed that the Finbacks, when feeding, often rise to respire with considerable regularity, but in general the time the animals will remain submerged is most uncertain. I timed the disappearance of several individuals. This is not always possible for, if a number are close together, one cannot be sure he is observing the same animal. The following table, however, was taken when the whales were either alone or sufficiently separated from the remainder of the school to make identification absolute.

- A. 8 minutes and 5½ minutes.
- B. 7, 8, and 7 minutes.
- C. 13, 5, 20, 4, 23, and 11 minutes (three individuals).
- D. 5 and 6 minutes.
- E. 8, 10½, and 3 minutes.

The longest period of submergence was twenty-three, and the shortest three, minutes. Among the Atlantic Finbacks which he timed, Millais found the longest period to be fifteen, and the shortest four, minutes (*l. c.*, p. 268).

As in the *Megaptera*, the distance these whales swim while beneath the surface, and the direction of the course, is most uncertain, depending entirely upon circumstances.

**FEEDING.**—When feeding, the Finbacks turn on the side, the water spouting from between the baleen laminæ as the mouth is closed. At this time the pectoral fin is erected and, with one lobe of the flukes, is prominently displayed above the surface. The animal frequently rolls from side to side exposing nearly the entire length of the body. Plate XL, Fig. 1, shows a Finback in the act of feeding, the fin and one lobe of the flukes alone being visible. A photograph of two feeding whales is reproduced in Plate XL, Fig. 2.

**Food.**—The stomachs of both the Vancouver Island and Alaska Finbacks contained only *Euphausia* with the exception of a single individual. This animal, taken on August 18, had eaten an enormous quantity of herrings (*Clupea pallasii*); four barrels (estimated) were taken from the stomach as well as a few *Euphausia*. Mr. Street stated that this was the first case of a Finback containing fish which had come under his notice.

**AFFECTION.**—On August 20 a large female Finback, accompanied by her calf, was harpooned. The first iron failed to kill the animal, and while the gun was being reloaded, the calf remained by its wounded mother, swimming rapidly about her and showing the greatest concern. When the whale was finally dispatched by the second harpoon, the young Finback refused to leave the boat and was eventually killed. Plate XL, Fig. 3, shows the calf near its mother. The latter is fast to the vessel by the line, which may be seen in the lower left hand corner of the picture.

In conclusion the writer wishes to acknowledge his indebtedness to the Pacific Whaling Co., and Dr. L. Rissmuller of Victoria, B. C.; also to the Tyee Co., of Tyee, Admiralty Island, Alaska and Capt. I. N. Hibberd. By generously extending the privileges of their stations and vessels, these gentlemen made it possible to obtain the observations and photographs

which form the subject matter of the present paper. Thanks are also due to Messrs. J. Quinton, S. C. Ruck and V. H. Street, managers of the several stations; and to Captains Balcom, Larsen and Grahame, for the many courtesies received at their hands.



FIG. 1. HUMPBACK PARTLY UNDER VESSEL.

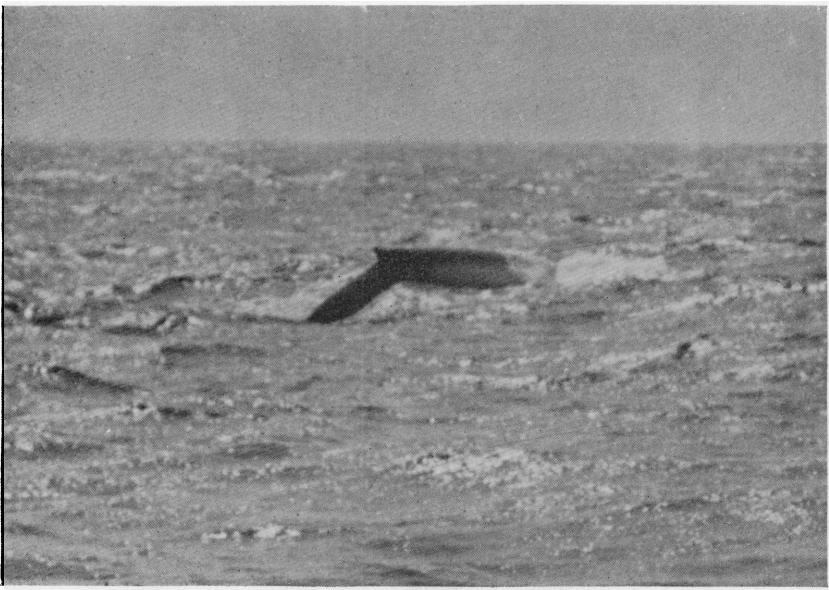


FIG. 2. HUMPBACK SOUNDING.





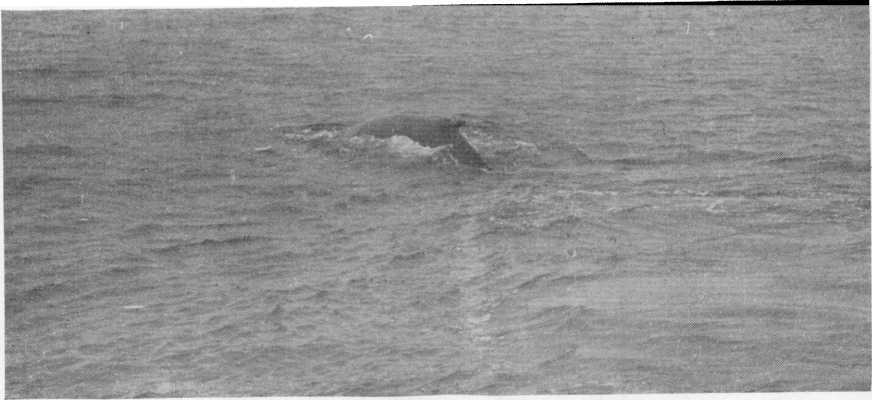


FIG. 1. HUMPBACK SOUNDING.

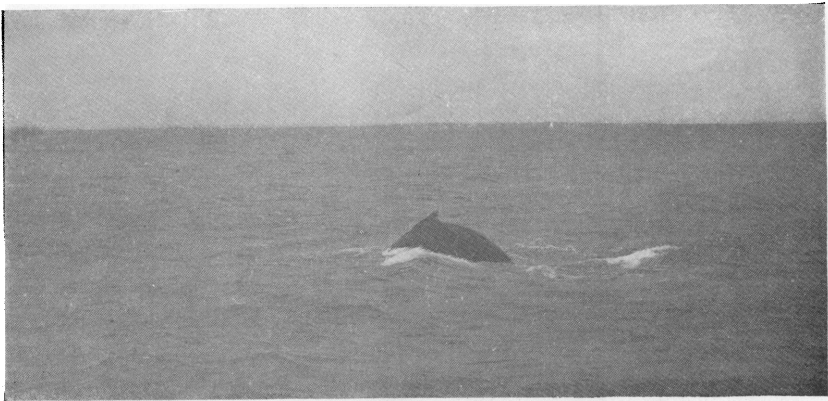


FIG. 2. HUMPBACK SHOWING MAXIMUM AMOUNT OF BODY.



FIG. 3. HUMPBACK SOUNDING : POSTERIOR VIEW.



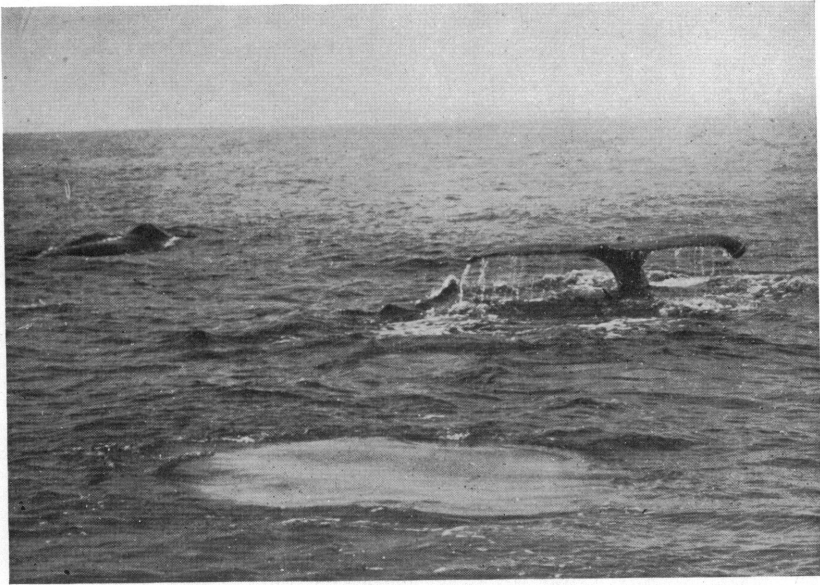


FIG. 1. HUMPBACKS; BLOWHOLES (INSPIRATION), FLUKES, 'SLICK' (IN FOREGROUND).



FIG. 2. HUMPBACK, FLUKES PERPENDICULAR TO WATER.





FIG. 1. HUMPBACK, FLUKES DISAPPEARING.

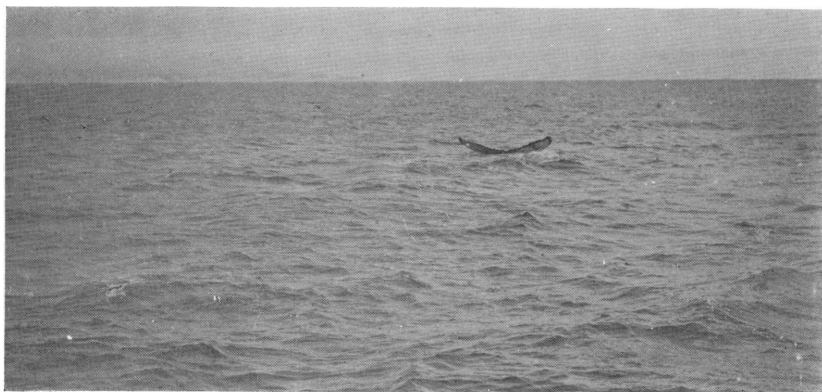


FIG. 2. HUMPBACK, FLUKES DISAPPEARING.



FIG. 3. HUMPBACKS, SOUNDING (VIEW IN PROFILE).



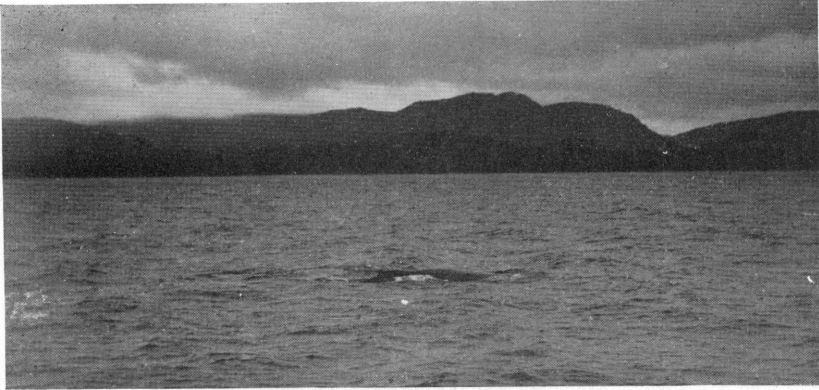


FIG. 1. HUMPBACK, TAKING SURFACE DIVE.

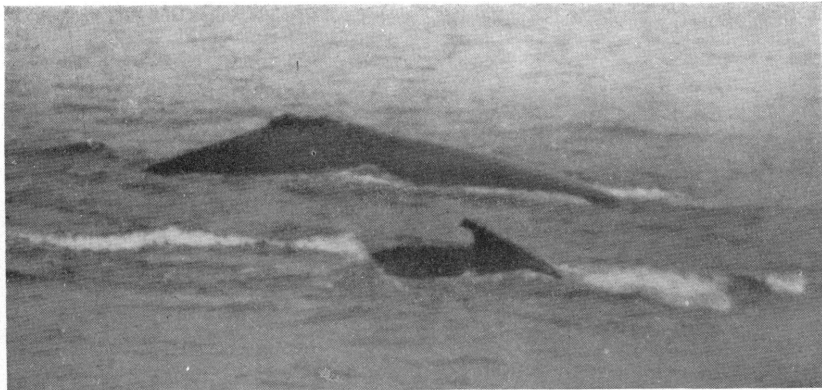


FIG. 2. TWO HUMPBACKS, TAKING SURFACE DIVE.

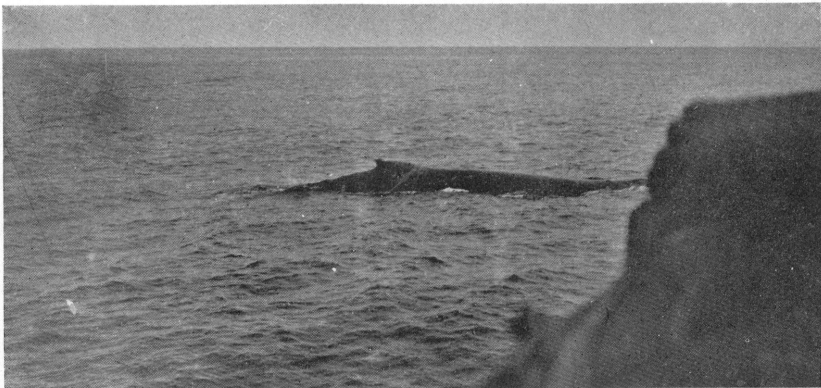


FIG. 3. HUMPBACK, SHOWING A GREAT PORTION OF BACK.





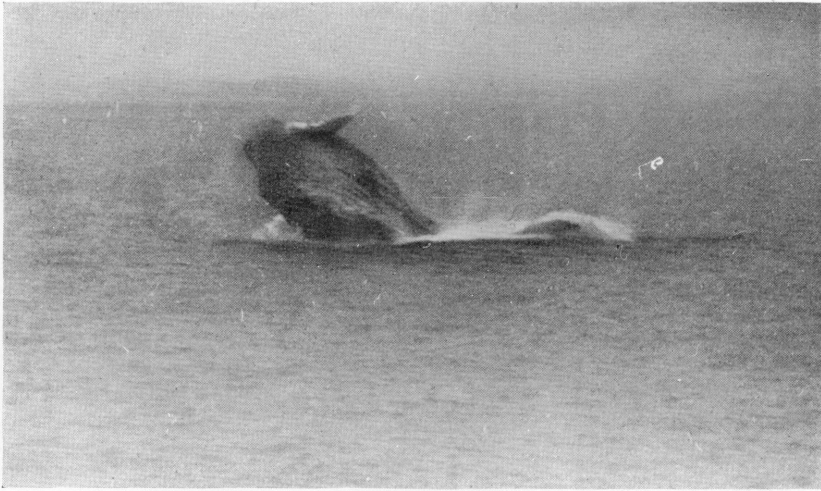


FIG. 1. HUMPBACK 'BREACHING'.

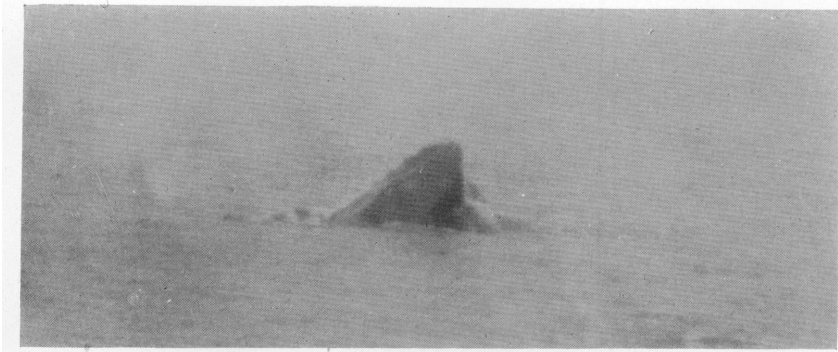


FIG. 2. HUMPBACK WITH MOUTH OPEN.



FIG. 3. HUMPBACK MOUTH CLOSED.





FIG. 1.



FIG. 2.



FIG. 3.

FIGS. 1-3. HUMPBACKS 'LOBTAILING' — THRASHING THE WATER WITH FLUKES.





FIG. 1. FINBACK SPOUTING.



FIG. 2. FINBACK'S SPOUT DISSOLVING.

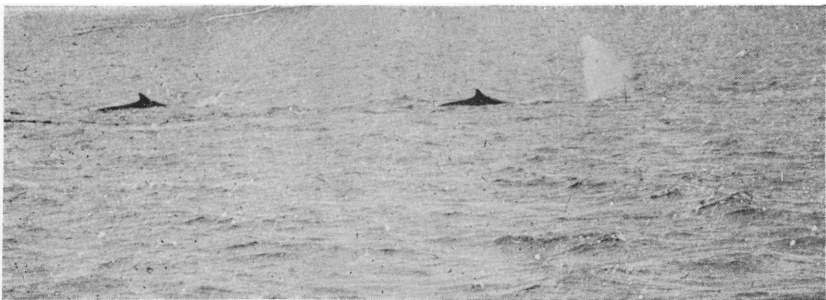


FIG. 3. IRREGULAR SPOUT OF A FINBACK.



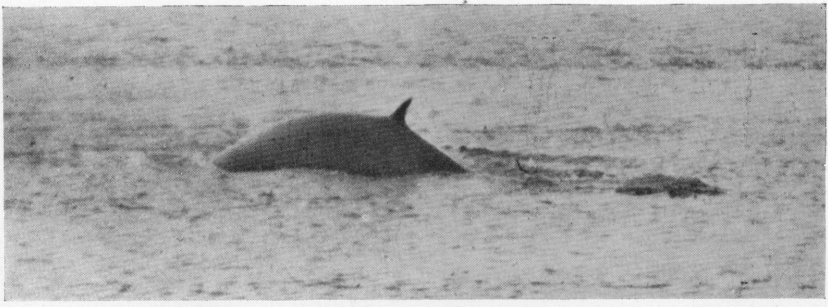


FIG. 1. FINBACK SOUNDING.



FIG. 2. FINBACK TAKING SURFACE DIVE.

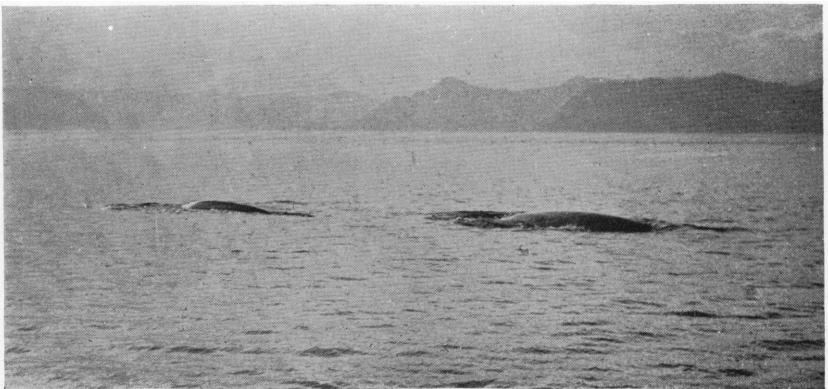


FIG. 3. TWO FINBACKS TAKING SURFACE DIVE.





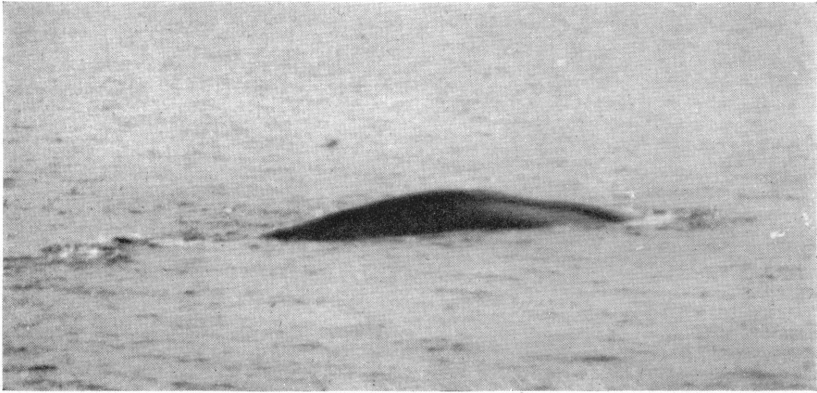


FIG. 1. FINBACK SHOWING DEPRESSION ON BACK.

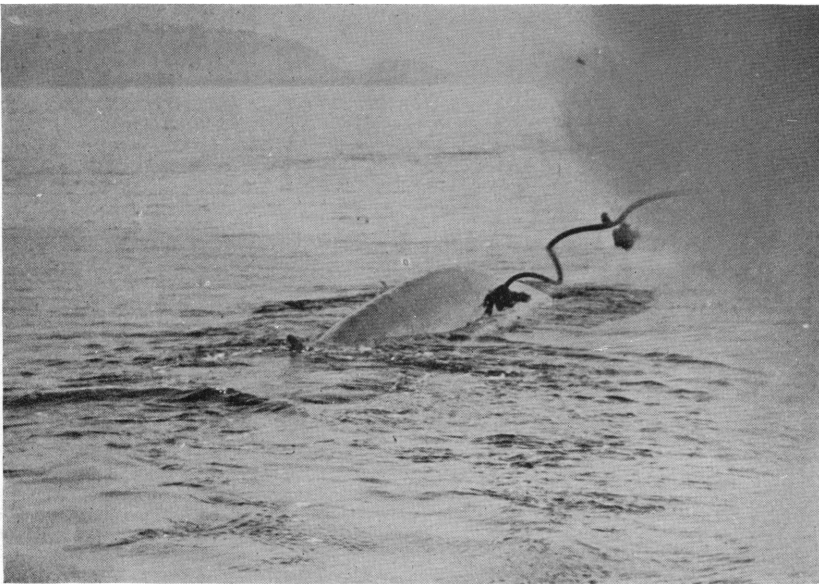


FIG. 2. FINBACK STRUCK BY HARPOON.



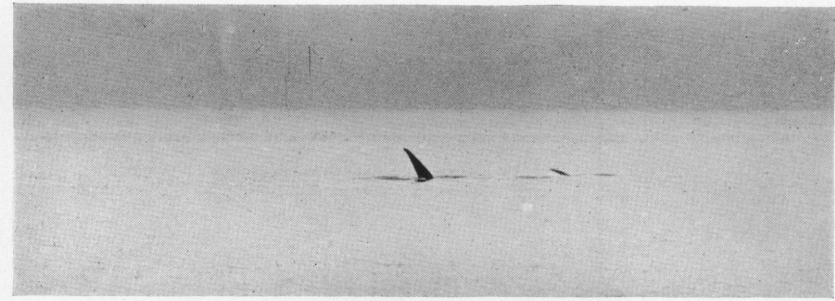


FIG. 1. FINBACK FEEDING, SHOWING FIN AND FLUKE.

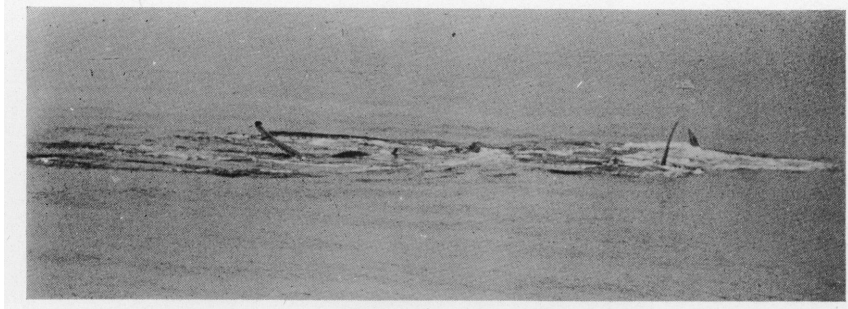


FIG. 2. TWO FINBACKS FEEDING.

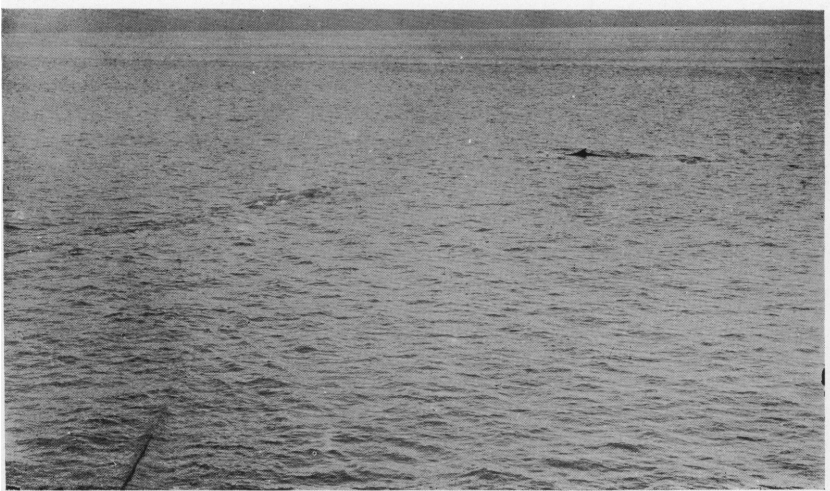


FIG. 3. YOUNG FINBACK NEAR MOTHER.

