THE USE OF ASDICS IN WHALING

[Summary of a report prepared by W. J. McCarthy, of H.M. Underwater Detection Establishment, Portland, and released by the Admiralty in October 1947.]

The location of whales is among the suggested commercial uses of asdic, one of the Royal Navy's methods of detecting enemy submarines. The principle employed is that supersonic waves, sent out through the water, echo when they strike a solid object. At the end of the war, the Admiralty was approached by Messrs Chr. Salvesen, of Leith, with the request that asdics might be made available to the whaling industry. It was eventually agreed that a number of pre-war asdic sets should be provided for fitting in whale-catchers, so that the possible benefits of asdics might be assessed.

During the summer and early autumn of 1945 asdic sets were fitted in two whale-catchers—*Southern Wilcox* and *Southern Wheeler*—then building at South Bank, Middlesbrough. These ships sailed for the Antarctic at the end of the year to join the remainder of the whaling fleet in the South Georgia area. A scientific officer from H.M. A./S. Experimental Establishment, Fairlie, was embarked in *Southern Wilcox* to carry out trials.

The asdic equipment fitted for trial consisted of a standard housing dome and the electrical components of two sets—Type 123A (trawler type), with a few modifications, and Type 136 (merchant-ship type). In the former the transmitting circuit derives its power from an h.f. motor-alternator; the amplifier is battery-driven. In the latter a valve oscillator supplies the transmitting circuit; the amplifier is an A.V.C. receiver driven from a 50 cyc./sec. supply. The normal Type 123A oscillator training system (flexible shafting) was replaced by an electrical system. Oscillator bearings were shown in the normal manner by a line of light on a magnetic compass. In Type 136 the standard training control gave relative bearings only, there being no gyro compass on board. The two outfits used a common chemical recorder.

Under the best conditions whales were detected at 2200 yards aurally and 1200 yards by recorder. It was possible to hold contact, using short transmissions, down to 60 yards. The constant yawing and alterations of course made it necessary to sweep, when in contact, continuously over a small arc, and the ratio of echoes to transmissions averaged only 1:3. It was found that a swimming whale produces no hydrophone effect (audible sound) in the asdic receiver, and leaves no detectable trace of true wake. This is due to its perfect streamlining and method of propulsion, which consists of a slow up-and-down sculling motion of the large horizontal tail, whose flukes are rigidly attached to the body and move as one unit; the flippers are probably also used. Undisturbed whales were occasionally heard to emit whistling noises, but these were of no value for listening detection.

It became apparent early in the season that when whales were over 800 yards from the catcher no assistance in detection was necessary. At this range they were undisturbed by noise from the catcher, and their frequent blowing gave enough visual indication of their course, a few points alteration to the ship's head being sufficient to close them.

Under 800 yards, however, aids in following submerged whales could be of very great benefit. A whale when being chased, i.e. stern on, presents a bad surface for reflection, and consequently gives faint echoes. Nevertheless, asdic contact could be held from 800 down to 60 yards, chiefly because of the marked doppler effect which provided the only means of distinguishing the whale from other targets such as ice and "blow-wakes". These "blow-wakes" are smooth patches of aerated water left by a whale after surfacing. Their cause is not known, but it is possible that they are produced by an excess of air leaving the nostril passages as the whale submerges. The whale's method of progress gives rise to a series of blow-wakes along his course, and as the catcher, when chasing, is invariably astern of the whale, these blow-wakes effectively mask the whale from the asdic except for short periods when none intervenes. This difficulty could, however, be largely countered, provided the whale was on a reasonably steady course, by steaming slightly to one side of its track.

The need to rely upon doppler effect favoured the use of telephones rather than the chemical recorder; good traces were in fact seldom obtained.

Valuable assistance could therefore be given by the asdic to the gunner down to a range of 60 yards; it is, however, below this range that such assistance would be still more valuable. This could not be given by the equipment available for several reasons. Below 60 yards the transmission is indistinguishable from the echo, and at such close ranges the whale, until near the surface, is below the asdic beam. If the dome is not housed in time (an operation which takes some 50 sec. and which renders the set unworkable) it is likely, after a harpoon has been fired, to part the forerunner as the catcher rides over it. There were also other limitations which affected the usefulness of the asdic: the slow oscillator-training speed often permitted contact to be maintained only at irregular intervals when whales altered course suddenly at short range; and if the catcher passed close to an iceberg, the latters' long underwater spurs were liable to damage the dome.

To be of real assistance to the gunner, it is evident that the asdic set should possess the following features:

(i) The underwater fittings must be flush with the hull, or capable of being raised or lowered in 5 sec., to avoid fouling the forerunner. They must be strong enough to withstand damage from ice.

(ii) The training of the oscillator must be rapid and compass bearings available so that contact may be maintained at short range. Bearing accuracy is only required to within 10°.

(iii) Echoes must be distinguishable from transmission down to ranges of 10 yards. The maximum range need not exceed 800 yards.

(iv) The oscillator must be capable of holding contact down to 20 fathoms at 40 yards, to enable contact to be maintained with a whale at 45° depression from the ship, i.e. before it sounds too deep.

(v) Telephone listening is needed to allow doppler discrimination. A permanent recorder trace is unnecessary.

The investigation has shown that the existing equipment which it is permissible to use for commercial purposes, while being of some assistance in the

catching of whales, does not justify the expense of fitting and maintenance. It fails to give assistance at a particularly vital period, when the catcher is very close to a submerged whale and it is essential to forecast with reasonable accuracy the position in which it will surface. On the other hand, an asdic set which will perform the necessary functions should not be impossible to construct. The design of such a set would present a task of considerable interest.

THE ANTARCTIC WHALING SEASONS OF 1946–47 AND 1947–48

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The Antarctic whaling season of 1946–47 was the second season in which whaling on a substantial scale took place since its virtual suspension in 1941. It may be recalled that during the war most of the factory ships were lost, and whereas 34 had operated in 1938–39, only 9 were available in 1945–46. In 1946–47 the number had increased to 15, made up according to nationality as follows: Great Britain 3, South Africa 1, Norway 7, Netherlands 1, U.S.S.R. 1, and Japan 2. In addition three land stations operated at South Georgia.

The Antarctic catches in 1945–46 were disappointing, but 1946–47 was a much more successful season. The catches of the pelagic factories in the two seasons are compared in the table below, which is derived from provisional figures published in *Norsk Hvalfangst-tidende*. (A Blue whale unit is 1 Blue, 2 Fin, 2½ Humpback, or 6 Sei whales; there are 6 barrels to a ton of oil; Sperm whales are excluded from the total of Blue whale units since the oil is not mixed with that of baleen whales, and is used for other purposes.) The table shows that in 1946–47 there was a rather increased proportion of Blue and Sperm whales in the catches, and there was a marked improvement in the number of units taken per factory and in the production of oil per unit. The figures for the two seasons are not strictly comparable, since the size and efficiency of the ships, the weather conditions, etc., are variable factors, but the whales were clearly more plentiful and presumably in better condition. Humpbacks, which are still protected by international agreement, were reported also to be plentiful at least in some parts of the Antarctic whaling grounds.

Antarctic pelagic catches

Season	Blue	Fin	Sperm	Blue whale units	No. of factory ships	Units per factory	Barrels of whale oil (excl. Sperm)	Barrels per unit
1945–46	3,524	7,732	*c.* 200	7,390	9	821	730,503	99
1946–47	8,870	12,875	1,299	15,308	15	1,021	1,730,318	113

The season, during which baleen whales may be caught, lasted from 8 December 1946 to 7 April 1947 inclusive, and it will be seen that the total catch came very near to the overall limit of 16,000 Blue whale units agreed upon at recent international conferences. This overall limit was referred to in a previous article (see the *Polar Record*, No. 31, January 1946, pp. 347–49). Factory ships furnish weekly reports of their catches of Blue whale units, which are forwarded to the International Bureau for Whaling Statistics, and the factories are required to cease whaling if a total of 16,000 units is reached before