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AUSTRALIAN CATCHES OF HUMPBACK WHALES

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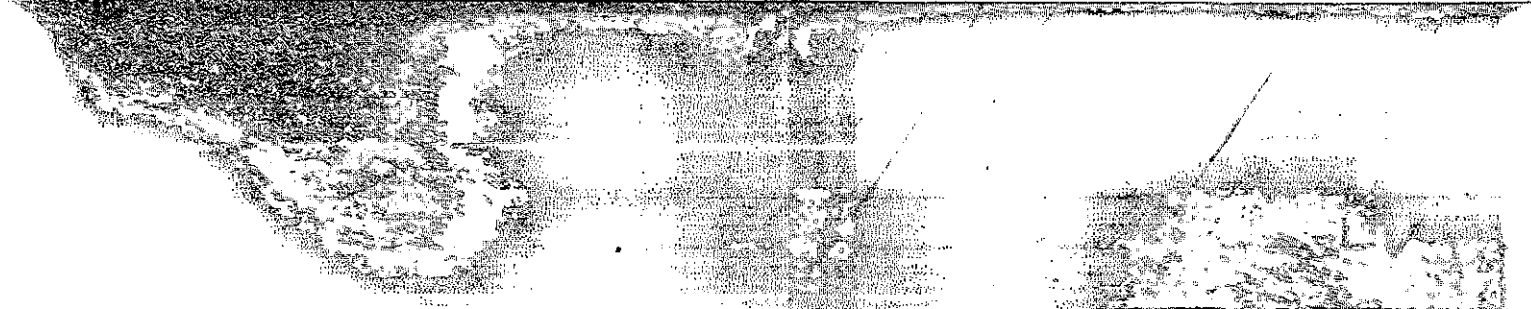

CONTENTS

SUMMARY

From the analyses of data obtained from recent catches on the east coast of Australia, at Norfolk Island, and from Antarctic Area V, it is concluded that the Group V (130°E. - 170°W.) population of humpback whales is at present in a relatively sound condition (compared with the Group IV population), but from the evidence of age distribution of adults sampled on the east coast of Australia, this population may have decreased slightly in recent years.

There is considerable evidence that the Group IV (70°E. - 130°E.) population of humpback whales has declined very seriously in recent years. This indicates that further protection of these stocks of humpback whales would be advisable.

Recoveries of whale marks during 1959 have demonstrated the movement of some individuals from the Group V population into the Group IV population, but it is probable that there is relatively little recruitment of individuals into the Group IV population by this means.

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AUSTRALIAN REPORT ON HUMPBACK WHALES

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I. INTRODUCTION

In 1959 the Australian whaling stations operating upon the Group V population of humpback whales filled their allotted quotas. Actual catches were: Tangalooma (27°11½'S. 153°23½'E.), 660 humpback whales; Byron Bay (28°37½'S. 153°38'E.), 150 humpbacks; Norfolk Island (25°S. 167°85'E.), 150 humpbacks.

Two whaling stations operated on the west coast of Australia upon the Group IV population of humpback whales during 1959. The station at Carnarvon (24°53'S. 113°38'E.), with a quota of 1000 humpback whales, took 541 humpbacks, six blue whales, and one fin whale. The station near Albany (35°05'S. 117°56'E.) had a quota of 120 humpback whales, but additional numbers were granted during the season. The total catch was 159 humpbacks and six blue whales.

In this report data collected from these humpback whales are analysed and compared with corresponding data from previous years' catches and also with the composition of the catches from Antarctic Areas IV and V taken in February 1959.

In the analysis of catches from the Group V population, the catches made at Norfolk Island are considered separately from the catches on the east coast of Australia as there is some evidence (Dawbin 1959) that during the northward migration of this population there is some degree of segregation between those humpbacks moving along the east coast of Australia and those passing the islands of the south-west Pacific Ocean.

II. CATCHES FROM THE EAST COAST OF AUSTRALIA

(a) Rate of Catching

Table 1 shows the total catch and average catch per catcher per day, at each whaling station for each of the last four years. At Tangalooma the average catch per catcher day was slightly higher in 1959 than

in previous years, in fact the average catch per catch day has increased slightly each year. This is likely be the result of a progressive improvement in catching processing efficiency each year rather than to a regul increase in the availability of humpback whales. At Byron Bay the average catch per-catcher day in 1959 wa similar to that of 1958 and 1956.

(b) Sex Ratio

Table 2 shows the percentages of females in the catches from 1956 to 1959. At both Tangalooma and By Bay the percentages of females in the catches of 1959 v similar to those of previous years.

(c) Mean Lengths

Table 3 shows the mean lengths of male humpback wh taken each year from 1956 to 1959. Table 4 shows corr ponding data for the females in the catches at each sta At Tangalooma the mean lengths of both males and female taken in 1959 were similar to those of previous years, while at Byron Bay the mean lengths of males and female taken in 1959 were higher than corresponding values in previous seasons.

Table 5 shows the mean lengths of males and female taken during 1959 from the northern (Australian coast) southern (Antarctic) regions of the Group IV and V popu lations of humpback whales. The mean lengths of both males and females taken from the east coast of Australia were higher than those of males and females taken in Ant arctic Area V during the same year. It is probable tha a greater degree of selection resulted in the higher mea lengths on the east coast of Australia. The high level of selection maintained on the east coast of Australia a the same time as a relatively rapid rate of catching ind cates that humpback whales continue to be plentiful in this population.

(d) Length Frequency Distribution

Tables 6 and 7 show the length frequency distribution of males and females respectively in annual catche at Australian whaling stations from 1956 to 1959. The distribution of lengths of both males and females taken on the east coast of Australia has been almost constant during these years.

Figures 1 and 2 show the length frequency distribution of males and females respectively, taken on the east coast of Australia and also in Antarctic Area V during 1959. In both sexes, individuals taken on the east coast of Australia were distributed round greater mean lengths than those taken at the southern part of the migration path. This difference in the catches from the two regions was more obvious in the case of females than males. As suggested earlier, there appears to have been more successful selection of larger whales on the east coast of Australia than in the Antarctic. Since females attain greater lengths than males, differing degrees of selection in two regions of the same population are likely to be reflected in greater differences between the samples of females than the samples of males.

(e) Sexually Immature Whales

The percentages of sexually immature whales may be estimated from the records of body length or found directly if the gonads are examined. By the former method, male humpbacks at, or less than, 36.75 ft in length are classed as immature (Chittleborough 1955a) and females at, or less than, 38.50 ft are regarded as being immature (Chittleborough 1955b). When considering the data from the examination of gonads, immature males are defined as those having a total testis weight of 4 kg or less, while those females which have not yet ovulated are classified as immature. The latter method does not include puberal females which had ovulated for the first time only a few days before being killed. Females in this condition are commonly taken at some Australian stations. Table 8 shows the percentages of sexually immature males and females in recent catches of Australian whaling stations using the methods described above. On the east coast of Australia the percentages of immature males and females taken during 1959 were similar to those of the previous years' catches.

(f) Age Distribution

(1) Ovaries.- The number of ovulations recorded from the ovaries of a female humpback whale gives an index of the age of that female (Chittleborough 1959a). Since some females taken at Australian stations are about to ovulate, while others have very recently ovulated when killed, only those ovulations which had occurred prior to the season of killing were used for evidence of age.

Figure 3 shows the relative age distribution as in cated by numbers of previous ovulations in females samp on the east coast of Australia from 1956 to 1959. The distribution has fluctuated somewhat in the samples fro year to year, but the distributions were similar in 195 and 1959 when the samples were larger than in other yea

(2) Ear Plugs.- As discussed by Chittleborough (1959a) the ear plugs of humpback whales afford the mos reliable method of age determination applicable to both sexes and to all age classes, although ear plugs from very young (immature) individuals may contain poorly de laminations which are difficult to distinguish. Figure 4 and 5 show the age distribution (based upon ear plug laminations) of males and females respectively within sa from the east coast of Australia in 1957, 1958, and 195 In the samples of males (Fig. 4) the age distribution wa similar in each of the three years, but the proportion c older males (over 15 years of age) decreased from 1957 t 1959. Within the samples of females (Fig. 5) the age distribution has fluctuated in the samples from year to this is likely to be the result of random variations wit the smaller samples of females. However, the age distr ution within the sample of the females taken in 1959 (Fi was very similar to that of the males sampled in the sam year (Fig. 4).

Table 9 shows the mean ages of adult individuals (over 5 years of age) in the samples of males and female On the east coast of Australia the mean age of the adult males in the samples decreased from 1957 to 1959, and th mean age of the adult females sampled in 1959 was less t that of those examined in 1957. Owing to the small num of adult females sampled in 1958, less reliance can be placed upon the mean of this sample.

Figures 6 and 7 show the mortality curves calculate per 100 mature whales for males and females respectively based on the age distribution as determined from collect of ear plugs. For these purposes, all individuals of m than five years of age were considered to be sexually ma Each curve was calculated by fitting a straight line (by the method of least squares) to the logarithms of smoothe frequencies for year classes six years and above. Indi of less than six years of age were omitted from the calcu lations because these year classes were less likely to be sampled at random by the gunners. Samples obtained from east coast of Australia in 1957 and 1958 have been added together for the calculation of mortality rates because c the small numbers (especially of females) sampled in thes years.

Table 10 shows the adult mortality rates calculated according to Ricker (1948) from the adult mortality curves. On the east coast the mortality rate of the males sampled in 1959 was higher than that of the combined samples of males taken in 1957 and 1958. As the numbers sampled were relatively large (see Fig. 4) it is probable that there has been an increase in the adult mortality rate of males in the Group V population.

The mortality rate of the adult females in the sample from the east coast in 1959 was less than that of the combined samples of 1957 and 1958 (Table 10), but this may not reflect a change in the adult mortality rate of females in the Group V population. The relatively small number of females sampled in 1958 (Fig. 5), consisting largely of young mature individuals, may have caused the calculated mortality rate for the combined samples of 1957 and 1958 to have been too high.

The adult annual mortality rate calculated for the combined samples of male humpbacks taken in 1957 and 1958 on the east coast of Australia is similar to that found by Purves and Mountford (1959) for southern fin whales from the "Sanctuary" population which was regarded as being in a stable condition when sampled. Following the (perhaps unreal) hypothesis that the adult annual mortality rate calculated for the males sampled in 1957 and 1958 on the east coast of Australia represented a stable population of humpbacks unaffected at that time by commercial operations, then in this case adult recruitment = adult mortality = .092. If, as indicated by Purves and Mountford, the rate of recruitment of females is the same as that of males, and recruitment rates are similar on the east and west coasts of Australia, the theoretical recruitment rate of adults (.092 for each sex) may be compared with the calculated adult mortality rates. The ratio of recruitment to mortality is the "replacement index."

Table 11 shows the estimates of replacement index of adults for the males and females taken on the east and west coasts of Australia. This indicates that unless there was a compensatory increase in the rate of recruitment of adults on the east coast in 1959, the adult males and females in this population are now being killed at a slightly faster rate than they are being replaced. The replacement index shown for the adult females in the combined samples of 1957 and 1958 from the east coast is considered to be too low because, as discussed earlier, ear plugs were collected from

relatively small samples of females in each of these years, and they may not be sufficiently representativ of the population.

(g) Rate of Breeding

Although something is known of the rate of ovula in female humpback whales (Chittleborough 1954, 1958a 1959a), it is difficult to obtain direct evidence of rate of breeding. It is even more difficult to obta a reliable measure of the natural mortality rates app to young individuals each year before reaching sexual maturity. If it is assumed that the sample of adult the lowest annual mortality rate best represents the population before commercial operations began, and th ical values are applied for the natural mortality dur the first five years of life, an estimate of the birt may be made.

In the present series of samples the lowest adul mortality rate was that from the combined samples of males taken in 1957 and 1958 from the east coast of Australia. Following Ottestad's (1956) assumptions natural mortality for immature (fin) whales (i.e. 0.2 .025, .025, .025 respectively for each of the first f years of life) this would result in a total mortality 34.2 per cent. before maturity. The mortality curve culated per 100 adult male humpbacks in the combined coast samples of 1957 and 1958 included 9.63 males in sixth year class. Assuming 34.2 per cent. natural mo ality (and no fishing mortality) in the preceding five there would have been 14.64 males born per 100 adult Since the sex ratio is practically 1 : 1, this means approximately 30 young (males + females) would be prod each year by 100 male and 100 female adults.

If the total juvenile mortality of humpback whale was as high as 50 per cent. (as suggested by Purves ar Mountford (loc. cit.) for southern fin whales), the cc ponding calculation of the birth rate would be 38.5 bi per 100 adult females each year. Both of the estimat given above are well below the generally accepted birt rate of an average of one calf born every second year adult female humpback (Matthews 1937; Chittleborough but similar to the suggestion by Dawbin (personal comm unication) that the female humpback may give birth on average of only once in three years. If in fact the rate of humpbacks is close to 50 births per 100 mature females per year (i.e. one calf every second year), then the total natural mortality of juvenile humpbacks be as high as 61.5 per cent.

(h) Discussion

While the composition of the catches of humpback whales taken in 1959 on the east coast of Australia compared favourably in most features (e.g. rate of catching, sex ratio, size of whales, percentage immature) with the composition of catches of earlier years, there is some evidence of a recent decline in the age distribution of adults, resulting in slightly higher adult mortality rates. Unless this was matched by a complementary increase in recruitment (by means of a slight increase in birth rate or an increase in survival rates of juveniles) this population would have decreased slightly in size. The rate of recruitment of adults into a population of humpback whales is apparently low, because of a slow rate of breeding and considerable mortality of young before reaching maturity.

III. CATCHES AT NORFOLK ISLAND

In 1959 the average catch per catcher day (Table 1) was slightly lower than in previous years. It may be significant that in 1959 the gunner who had previously operated the single catcher at Norfolk I. remained at Byron Bay and two new gunners shared the hunting at Norfolk I.

The percentages of females in the catch made in 1959 (Table 2) was within the range of that of previous seasons' catches. The males taken in 1959 were distributed around slightly lower lengths than in previous years (Table 6), while the length frequency distribution of the females taken in 1959 was similar to that of earlier years (Table 7) but with relatively fewer small individuals. As a result the mean length of males taken in 1959 was lower (Table 3) and that of females higher (Table 4) than in previous years.

In 1959 the percentage of immature males in the catch was higher than in previous years at that station but lower than in recent catches on the west coast of Australia (Table 8). The percentage of immature females in the catch at Norfolk I. during 1959 was very low and below that of any other Australian station.

From the evidence of numbers of ovulations (Fig. 8) the small sample of females taken at Norfolk I. in 1959 contained a higher proportion of relatively old individuals

(with over 15 ovulations) than in the catches of any yea at other Australian stations. The limited data vailat from the relatively small samples of humpback whales tak in recent years in the vicinity of Norfolk I. do not ind icate any significant change in the portion of the popu- lation which migrates past this island.

IV. CATCHES FROM THE WEST COAST OF AUSTRALIA

(a) Rate of Catching

Table 1 shows that in 1959 the average catch per catcher day at Carnarvon was similar to that at Albany a both values were much less than those achieved on the ea coast of Australia. Figure 9 shows the average catches per catcher day for each year of operation at Carnarvon and Albany. At Carnarvon the rate of catching increased from 1951 to 1953, presumably as general efficiency impro Since 1953 the rate of catching has fallen fairly regular each year to the present minimum in 1959. At Albany the rate of catching increas d from 1952 to 1955, declined ve considerably to 1957, and has since remained at a low level.

(b) Sex Ratio

The percentage of females in the catch at Carnarvon during 1959 (Table 2) was higher than in any previous sea continuing the trend of increasing proportions of females in the catches each year on the west coast since 1951 (Chittleborough 1958b). This is shown in Figure 10 wher the percentage of females in weekly catches at Carnarvon are plotted for the same months of several years.

Although the percentage of females in the catch at the smaller station near Albany has fluctuated from year t year, there has been a similar trend towards higher per- centages of females in recent catches. From 1952 to 1955 the percentage of females exceeded 50 per cent. in only one of the four seasons, whereas from 1956 to 1959 females exceeded males in the catches of three of the four years.

(c) Mean Lengths

At Carnarvon the mean lengths of both males (Table 3) and females (Table 4) have decreased each year from 1956 to 1959 and in the last season were lower than in any year at other Australian stations with the exception of the catch at Albany in 1958.

At Albany the mean lengths of males (Table 3) and females (Table 4) taken in 1959 were similar to those of the catch in 1957, and generally less than corresponding values for the catches of most of the earlier years (see Table 3 of Chittleborough 1958b).

In the comparison of the mean lengths of males and females taken from the northern (west coast of Australia) and southern (Antarctic) regions of the Group IV population during 1959 (Table 5), the catch made between 75°E. and 99°E. longitude of the Antarctic is used rather than the total catch from Antarctic Area IV (70°E. - 130°E.). The reason for this is that it has been shown (Chittleborough 1959b) that in 1959 the catch from the eastern portion of Antarctic Area IV (from 110°E. - 130°E.) contained a high proportion of individuals from the Group V population. The mean lengths of males and females taken from the west coast of Australia in 1959 were practically the same as those of males and females taken in the same year in Antarctic Area IV (from 75°E. to 99°E.), indicating that these samples were representative of the population in that year.

(d) Length Frequency Distribution

Figures 11 and 12 show the length frequency distribution of males and females respectively taken on the west coast of Australia each year from 1956 to 1959. The lengths of both males and females have decreased from year to year, the decline being relatively small each year from 1956 to 1958 and abrupt in 1959. Figure 13 shows the length frequency distribution of males and females taken on the west coast of Australia and in the Antarctic (between 75°E. and 99°E.) during 1959. In each sex the length frequency distribution of the catch from the breeding area was almost identical with that of the catch from the feeding area of this population.

(e) Sexually Immature Whales

In 1959 the percentage of immature males and females in the catches from the west coast of Australia increased greatly (Table 8) to the highest levels since whaling commenced on that coast in 1949. Similar high percentages of immature males and females were taken during February 1959 from the Antarctic between 75°E. and 99°E. longitude (Chittleborough 1959b).

FO 369

(f) Age Distribution

(1) Ovaries.- Figure 14 shows the frequency distri
ution of the numbers of ovulations in samples of females
from the west coast from 1956 to 1959. This shows that
there has been a progressive increase each year in the
proportions of the younger females in the catch and corr
pondingly fewer of the older females. Almost all of th
females with only one previous ovulation would not have
given birth to any offspring. Thus at least 50 per cen
of the females taken in 1959 were shot before having suc
in breeding.

(2) Ear Plugs.- Figures 15 and 16 show the age dis-
tribution of males and females respectively in samples of
the catches from the west coast of Australia in 1957, 195
and 1959, based on the numbers of laminations within the
plugs. These figures show that in both sexes the prop-
ortions of young individuals have increased each year whi
the older whales have become correspondingly fewer during
this period.

In both sexes the mean ages of adults (all individua
over 5 years of age) taken on the west coast have decreas
from 1957 to 1959 (Table 9).

Figures 6 and 7 show the adult mortality curves calcu
lated per 100 adults, from the samples shown in Figures 1
16. The mortality curves for males and females in sample
from the west coast were steeper than corresponding adult
mortality curves for east coast humpbacks, indicating hig
mortality rates in the west coast (Group IV) population.
This difference between east and west coast samples is
especially marked in the case of males (Fig. 6).

On the west coast from 1957 to 1959 the adult mortali
curves for both males and females have become steeper each
year, indicating increasing adult mortality rates over thi
period as shown in Table 10. The adult mortality rate of
the males is much higher than that of females, confirming
previous evidence (Chittleborough 1959a) that the male
portion of the Group IV population has declined more rapidl
than the female.

From the estimates of adult replacement index obtained
from samples of males and females taken from the west coast
population (Table 11), it is evident that this population
is declining rapidly. While it is theoretically possible
for compensatory increases in the birth rate and survival

values during the early years of life to raise the rate of recruitment of adults to some extent in the face of high fishing pressure, the mortality rates have now reached such high levels that the Group IV population of humpback whales must have decreased drastically.

Ricker (1948) has stressed that the mortality rates estimated from age frequencies are in effect "ancient history," saying further: "They pertain to past years, to the time when the year classes involved were being recruited to the catchable size range, and are independent of what survival rates have prevailed since that time." Considering this statement in the light of the intense hunting of the Group IV population during 1959, concentrated as it was largely upon immature individuals, the situation with regard to this population becomes even more serious.

(g) Location of Whales Captured

Figure 17 shows the track of the northward migration of humpback whales in the vicinity of the Carnarvon Whaling Station as indicated by the positions of whales killed during the last nine years supplemented by observations from vessels in this region. Portion of the population passes through the northern part of Shark Bay while the remainder continues northwards outside of Dorre and Bernier Islands to rejoin those passing through the bay. The southward migration apparently follows a similar course.

During the earlier years of whaling operations from Carnarvon, sufficient numbers of humpback whales were found within Shark Bay, where conditions were more favourable for hunting than in the open ocean. However, in recent years the supply of whales within Shark Bay has been insufficient and hunting has extended seawards. This is demonstrated in Table 12 which shows the number and percentages of humpback whales taken each year outside the limits of Shark Bay as marked in Figure 17. In 1958 and 1959, in spite of ranging inside and outside Shark Bay, catchers were unable to fill the quota at the Carnarvon station.

A similar trend has been observed in the region of Albany. During the initial seasons of whaling operations almost the entire catches were taken in King George Sound which is adjacent to the whaling station,

FO 369

but in succeeding years the catches were spread farther along the coast. It is noteworthy that the recent ca have been spread along the coastline rather than farthe out to sea.

The scarcity of humpback whales within Shark Bay a King George Sound (close to the Carnarvon and Albany st respectively) in recent years has led to the suggestion that the whales may have become frightened away from th localities. A similar theory was advanced 45 years ag when humpback whales practically disappeared from the vicinity of South Georgia after intensive hunting, but is now accepted that the humpbacks in that region were severely depleted that they have still not recovered.

Recent changes in composition of catches from the w coast of Australia (for example the higher adult mortali rates) cannot be satisfactorily explained by the suggest that the whales might be avoiding the localities where whaling is being carried out.

(h) Climatic Conditions

It has been suggested that adverse weather conditio in the region of Carnarvon during the 1958 season were responsible for the poor quantitative result in that yea but analysis of meteorological records from Carnarvon sh little difference in weather conditions between the 1957 season and that of 1958. In fact at Carnarvon during th 1958 whaling season there were fewer days with strong wi than in the 1957 season. The meteorological records fro Carnarvon for the 1959 whaling season also show no relati ship to the even poorer quantitative result of whaling in that season. Even if adverse weather conditions such as the frequent occurrence of strong winds did depress the r of catching at a particular station during one season, th would not be sufficient in itself to explain a particular poor qualitative result (such as high adult mortality rat

In the region of Albany, where winter weather condit are generally more severe than at Carnarvon, weather con- ditions might exert more influence upon whaling (especiall upon the rate of catching). Examination of meteorologica records shows that there was less rainfall and greater average visibility at Albany during the 1959 season than in the 1958 season. This could have been the cause of th slightly higher rate of catching in 1959 than in 1958 (Fig. 9), and could have enabled slightly greater numbers whales to be taken in 1959. However, the age distributio

of the catch at Albany during 1959 was very similar to that of the catch at Carnarvon during the same season, consisting mainly of young (especially immature) individuals.

Yet another opinion which has been advanced to explain the low catch at Carnarvon in 1959 was that the water temperatures on the west coast of Australia in that winter were considerably higher than in previous winters. As a result of this it was suggested that the whales reached equitable water temperatures farther south on the Australian coast than usual and so did not continue to migrate northwards past Carnarvon. This opinion is not founded upon accurate records of water temperatures taken systematically over several succeeding years, nor is it supported by the evidence from the catches of whales.

In 1959 the average catches per catcher per day at Carnarvon and at Albany were relatively low (Fig. 9) and almost identical (0.82 and 0.92 respectively). This indicates that humpback whales were no more abundant on the southern part of the coast (in the region of Albany) than they were further north (near Carnarvon).

The distribution of ages within the catch at Albany was the same as that within the catch at Carnarvon during 1959, and in each sex the length frequency distribution of the catch on the west coast of Australia was almost identical with that of the catch from the western portion of Antarctica Area IV during the same year. This indicates that the catches from the west coast of Australia during 1959 were representative of the catchable part of the population.

Analysis of the catches from the Group IV population of humpback whales during 1959 shows that the adults were poorly represented in the breeding area (west coast of Australia) and also in the feeding area (Antarctic). It can only be concluded that this change in the population has been brought about by overfishing rather than by theoretical changes in climatic conditions.

(i) Discussion

The Group IV population of humpback whales has declined very seriously in recent years. From purely biological considerations this population needs to be given protection for a number of years so that it can regenerate.

It may be relevant here to review briefly the p
war humpback whaling in the region of French Equator
Africa (Congo). After a lapse of twelve years, hum
whaling was resumed there in 1949 and reached a peak
1950, but catches then declined and whaling ceased i
(Budker 1954). After a further rest of six years,
was re-opened in 1959 in spite of recommendations th
population required a longer period of protection (s
Budker). A quota of 500 humpbacks was granted for
but only 200 were taken. Although full details are
available, it would appear that the population which
in the region of the Congo was so severely depleted
will require many more years of protection in order
recover.

V. WHALE MARKS RECOVERED DURING 1959

Details of whale marks recovered at Australian w
stations during 1959 are listed in Table 13. The mo
of two of these marked whales should be considered in
report. The marks were fired into humpback whales i
vicinity of Moreton Island on the east coast of Austr
one in 1954 and the other in 1955. Both were recove
at the Carnarvon Whaling Station on the west coast in
This proves that at least some of the Group V humpbac
moved westward in the Antarctic during the summer of
59 and mingled with the whales in the eastern part of
Group IV population (Chittleborough 1959b) moved nort
to the west coast of Australia instead of returning t
Group V population.

However, from the comparisons of the catches in
on the east coast of Australia with those from the wes
coast, as reviewed in this report, it is considered th
relatively few of the Group V population were present
west coast of Australia in that year. At present the
compositions of the stocks in the two regions (east an
west coasts of Australia) differ so much and the degre
interchange is apparently so low that they can still b
regarded as distinct populations.

VI. ACKNOWLEDGMENTS

The co-operation of the whaling companies, enabling data to be collected from their respective stations, is gratefully acknowleged.

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TABLE 1

TOTAL CATCHES OF HUMPBACK WHALES AND AVERAGE CATCHES PER CATCHER DAY AT AUSTRALIAN WHALING STATIONS

GROUP V POPULATION

Year	Tangalooma		Byron Bay		Norfolk Island	
	Total Humpbacks	Av.Catch per Catcher/Day	Total Humpbacks	Av.Catch per Catcher/Day	Total Humpbacks	Av.Catch per Catcher/Day
1956	600	4.69	120	2.67	150	2.14
1957	600	4.84	121	3.66	120	1.85
1958	600	4.92	120	2.55	120	2.14
1959	660	5.24	150	2.68	150	1.67

GROUP IV POPULATION

	Carnarvon		Albany	
1956	1000	1.97	119	1.59
1957	1018	2.11	102	0.66
1958	885	1.20	82	0.72
1959	541	0.82	159	0.92

TABLE 2

% FEMALES IN RECENT CATCHES OF HUMPBACK WHALE AT AUSTRALIAN STATIONS

GROUP V POPULATION

Year	Tangalooma		Byron Bay		Norfolk Island	
	No. Sexed	% Females	No. Sexed	% Females	No. Sexed	% Females
1956	600	32.2	120	35.0	150	38.7
1957	600	29.7	121	42.1	120	22.5
1958	600	29.0	120	29.2	120	47.5
1959	660	32.4	150	35.3	150	40.0

GROUP IV POPULATION

	Carnarvon		Albany	
1956	1000	38.3	119	50.4
1957	1018	48.4	101	42.6
1958	885	46.6	82	56.1
1959	541	52.7	159	52.8

TABLE 3

MEAN LENGTHS OF MALE HUMPBACK WHALES IN RECENT CATCHES AT AUSTRALIAN STATIONS

GROUP V POPULATION

Year	Tangalooma		Byron Bay		Norfolk Island	
	Number	Mean Length (ft)	Number	Mean Length (ft)	Number	Mean Length (ft)
1956	407	40.63	78	40.74	92	41.31
1957	422	40.50	70	39.67	93	41.24
1958	426	40.81	85	41.71	63	41.35
1959	446	40.80	97	41.97	90	40.75

GROUP IV POPULATION

	Carnarvon		Albany	
1956	617	40.52	59	38.53
1957	525	39.89	58	38.78
1958	473	39.48	36	37.57
1959	256	37.70	75	38.71

TABLE 4

MEAN LENGTHS OF FEMALE HUMPBACK WHALES IN RECENT CATCHES AT AUSTRALIAN STATIONS

GROUP V POPULATION

	Tangalooma		Byron Bay		Norfolk	
Year	Number	Mean Length (ft)	Number	Mean Length (ft)	Number	M
1956	193	41.73	42	42.40	58	
1957	178	41.83	51	40.23	27	
1958	174	42.09	35	42.47	57	
1959	214	41.94	53	43.32	60	

GROUP IV POPULATION

	Carnarvon		Albany	
1956	383	42.38	60	41.95
1957	493	41.71	43	40.62
1958	412	41.51	46	39.65
1959	285	39.72	84	40.44

TABLE 5

MEAN LENGTHS OF HUMPBACK WHALES TAKEN DURING 1959 FROM THE NORTHERN (AUSTRALIAN COAST) AND SOUTHERN (ANTARCTIC) REGIONS OF MIGRATION PATHS

	Males		Females	
	Number	Mean Length (ft)	Number	Mean Length (ft)
GROUP V POPULATION				
Antarctic 155°-169°E. (February)	301	40.28	201	41.26
East Coast of Australia (June - August)	543	41.00	267	42.22
GROUP IV POPULATION				
Antarctic 75°-99°E. (February)	488	37.98	541	39.65
West Coast of Australia (June-September)	331	37.93	369	39.88

TABLE 6

LENGTH FREQUENCIES IN ANNUAL CATCHES AT AUSTRALIAN S

MALES

Length (feet)	East Coast				Norfolk Island				West	
	1956	1957	1958	1959	1956	1957	1958	1959	1956	195
30	1							1		
31	-									
32	1									
33	2	2					1		2	
34	-	-	1				-		-	4
35	7	5	6	6	2	2	-	4	11	13
36	11	14	8	11	4	1	1	4	28	28
37	22	20	18	14	4	5	1	4	30	40
38	25	46	31	42	3	4	2	8	55	77
39	56	57	45	50	6	3	4	13	78	98
40	97	94	76	82	8	14	11	15	131	102
41	82	88	114	96	16	15	12	18	114	69
42	81	96	84	93	17	19	12	13	102	71
43	51	40	75	81	15	18	10	3	72	38
44	27	23	26	43	11	7	5	4	29	27
45	15	3	15	18	3	4	3	3	18	13
46	6	4	12	6	2	-	-		2	3
47	-			1	1	1	1		3	
48	1								1	
Total	485	492	511	543	92	93	63	90	676	583

TABLE 7

LENGTH FREQUENCIES IN ANNUAL CATCHES AT AUSTRALIAN STATIONS

FEMALES

Length (feet)	East Coast				Norfolk Island				West Coast			
	1956	1957	1958	1959	1956	1957	1958	1959	1956	1957	1958	1959
30												
31		1	1						1			1
32		-	-						1			2
33	1	-	1	1					-	1	1	2
34	1	1	1	-					6	2	10	26
35	3	7	1	1	4				11	18	10	30
36	4	7	3	6	1		1	3	7	26	17	22
37	15	13	5	11	4	2	1	2	13	28	30	42
38	10	17	14	15	3	2	-	1	33	56	47	35
39	11	16	12	19	3	-	2	3	58	59	64	55
40	22	14	18	15	6	2	4	3	37	55	52	46
41	23	29	22	29	4	2	5	4	48	63	53	30
42	30	33	30	33	5	5	5	7	53	77	61	24
43	42	24	26	36	5	4	6	12	68	55	45	16
44	34	27	22	41	4	1	10	9	43	34	29	19
45	20	18	26	26	6	4	10	11	26	39	20	10
46	9	12	15	18	4	-	6	1	20	17	11	4
47	8	4	7	13	5	1	1	3	10	5	8	5
48	2	4	4	2				1	7	1		
49		1	1	-					1			
50		1		1								
Total	235	229	209	267	58	27	57	60	443	536	458	369

TABLE 8

PERCENTAGES OF SEXUALLY IMMATURE MALE AND FEMALE HUMPBACKS FROM RECENT AUSTRALIAN CATCHES

EAST COAST

	Males				Females		
	By Length		By Examination		By Length		By Ex
Year	No. Taken	% ≤ 36'9"	No. Examined	% Testes ≤ 4kg	No. Taken	% ≤ 38'6"	No. Exami
1956	485	4.7	60	3.3	235	14.9	146
1957	492	5.5	215	6.1	229	20.1	183
1958	511	4.1	205	8.3	209	12.4	121
1959	543	4.1	273	2.9	267	13.9	205
NORFOLK ISLAND							
1956	92	6.5	-		58	22.4	48
1957	93	3.2	-		27	14.8	-
1958	63	3.2	-		57	3.5	-
1959	90	11.1	-		60	8.3	47
WEST COAST							
1956	676	6.8	-		443	10.2	279
1957	583	9.8	488	13.5	536	16.2	521
1958	509	13.0	439	18.0	458	17.9	438
1959	331	30.2	254	34.6	369	36.6	353

TABLE 9

MEAN AGE OF ADULT HUMPBACKS (OVER 5 YRS) IN SAMPLES FROM THE EAST AND WEST COASTS OF AUSTRALIA

		Adult Males		Adult Females	
		No. Examined	Mean Age (yrs)	No. Examined	Mean Age (yrs)
East Coast	1957	157	14.82	75	14.07
	1958	80	14.63	46	11.28
	1959	214	12.76	105	12.85
West Coast	1957	111	10.47	143	10.69
	1958	136	8.80	149	10.66
	1959	91	8.02	137	10.08

TABLE 10

ADULT MORTALITY RATES FROM SAMPLES OF TWO POPULATIONS OF HUMPBACK WHALES

		East Coast of Australia		West Coast of Australia		
		1957 + 1958	1959	1957	1958	1959
Males	Annual Mortality (a)	.092	.121	.246	.290	.421
	Instantaneous Mortality (i)	.097	.129	.283	.343	.547
Females	Annual Mortality (a)	.144	.118	.165	.168	.206
	Instantaneous Mortality (i)	.156	.126	.180	.184	.230

TABLE 11

ESTIMATES OF ADULT REPLACEMENT INDEX FROM SAMPLES OF HUMPBACK WHALES FROM THE EAST AND WEST COASTS OF AUSTRALIA

	East Coast		West Coast		
	1957 - 1958	1959	1957	1958	1959
Males	1.00	0.76	0.37	0.32	0.22
Females	0.64	0.78	0.56	0.55	0.45

TABLE 12

ANNUAL CATCHES OF HUMPBACK WHALES AT CARNARVON STATION SHOWING PROPORTIONS TAKEN OUTSIDE SHARK BAY

Year	Total Catch	Catch Outside Shark Bay	
		Number	%
1951	650	14	2.2
1952	600	7	1.2
1953	600	6	1.0
1954	600	4	0.
1955	500	4	0.8
1956	1000	25	2.5
1957	1018	53	5.2
1958	885	213	24.1
1959	541	282	52.1

TABLE 1

WHALE MARKS RECOVERED FROM HUMPBACK WHALES STRALIAN WHALING STATIONS IN 1959

Mark Number	Release			Recovery		
	Date	Location	Remarks	Date	Location	Remarks
A233	10.7.58	34°03'S. 151°13'E.	35-36 ft	20.7.59	27°01'S. 153°30'E.	Male 41 ft 2 in.
11689	6.10.54	Moreton I.		26.8.59	25°21'S. 112°56'E.	Male
		ca. 27°S. 153½°E.	30 ft			
11794	28.6.55	Moreton I.		4.7.59	26°58'S. 153°29'E.	Male 39 ft 7 in.
		ca. 27°S. 153½°E.	40 ft			
11798	28.6.55	Moreton I.	39 ft	4.7.59	26°58'S. 153°29'E.	Same whale as 11794
11846	6.7.55	Moreton I.	38 ft	Aug.1959	Moreton I.	In cooker
			(lact.female			
11981	23.7.55	Moreton I.	(41 ft	24.7.59	27°11'S. 153°32'E.	Female 44 ft 6 in.
12138	26.7.55	Moreton I.	38 ft	3.9.59	Carnarvon W.A.	In cooker
14155	18.6.56	34°32'S. 118°28'E.	33 ft	23.9.59	Carnarvon W.A.	In cooker
15132	27.6.59	Norfolk I.		27.6.59	Norfolk I.	Male 42 ft 3 in.
15146	27.6.59	Norfolk I.		27.6.59	Norfolk I.	Male 39 ft 10 in.
		(Moreton I.				
16690	3.7.56	(ca. 27°S. 153½°E.	37 ft	15.6.59	27°01'S. 153°30'E.	Male 43 ft 6 in.
16812	5.7.56	Moreton I.	40 ft	24.6.59	27°02'S. 153°29'E.	Male 40 ft 1 in.
16859	9.7.56	Moreton I.	41 ft	20.7.59	Moreton I.	In cooker
18343	Japanese -	Antarctic waters		12.7.59	Norfolk I.	Female 43 ft 9 in.
		(off Moreton I.	Adult whale			
19549	19.9.58	(ca. 27°S. 153½°E.	modified mark	7.7.59	26°59'S. 153°29'E.	Male 41 ft 4 in.
510				15.8.59	24°43'S. 113°06'E.	Female 39 ft 3 in.
719				29.6.59	35°02'S. 117°58'E.	Male 36 ft 1 in.
720	U.S.S.R. marks			29.6.59	35°02'S. 117°58'E.	Same whale as 719
1227				1.8.59	25°04'S. 113°17'E.	Male 38 ft 3 in.
1275				20.8.59	24°42'S. 112°47'E.	Female 39 ft 3 in.
1290				23.9.59	Carnarvon W.A.	In cooker

FO 369

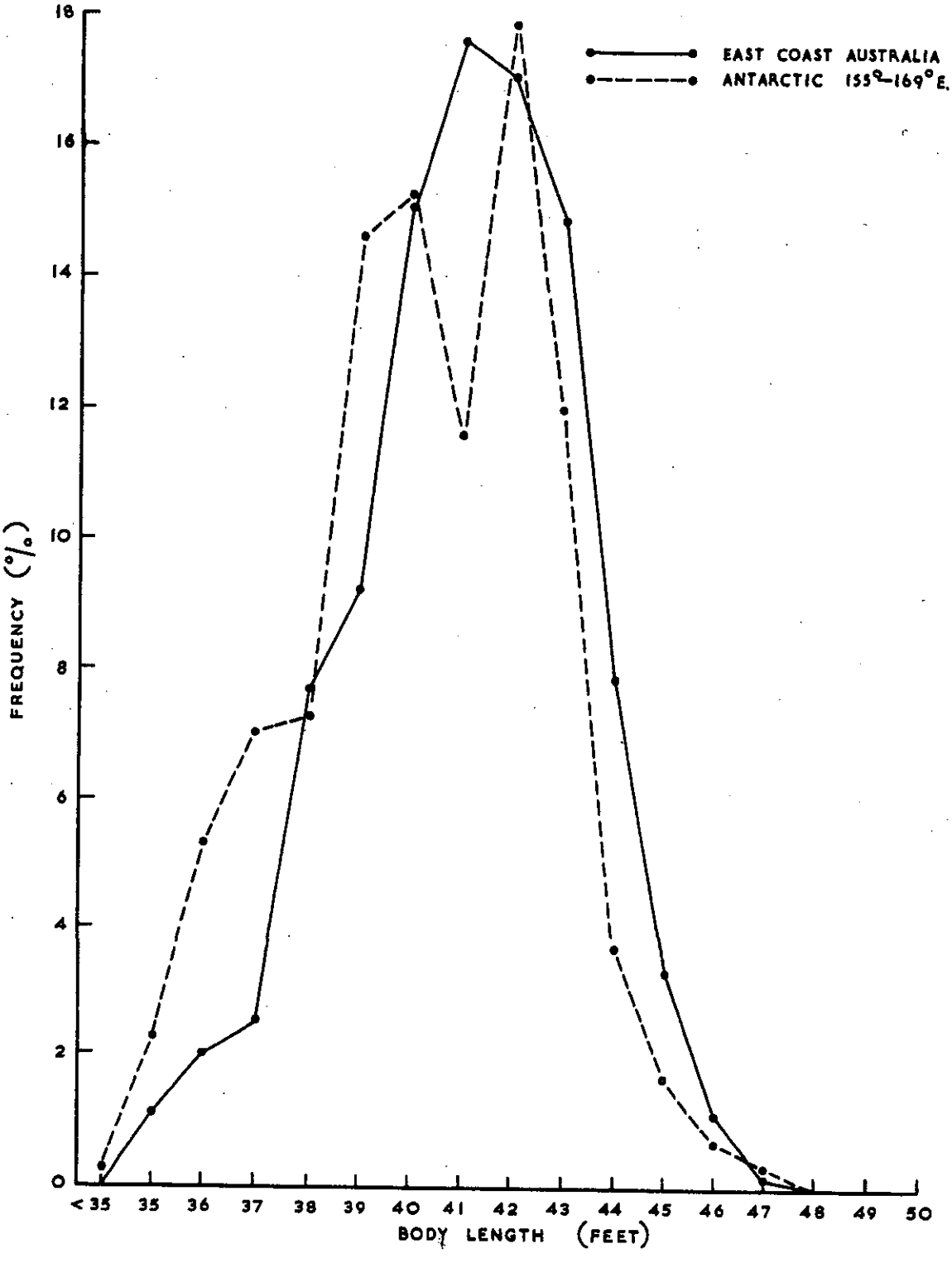

Fig. 1.- Length frequency distribution of male humpback whales taken from the Group V population during 1959.

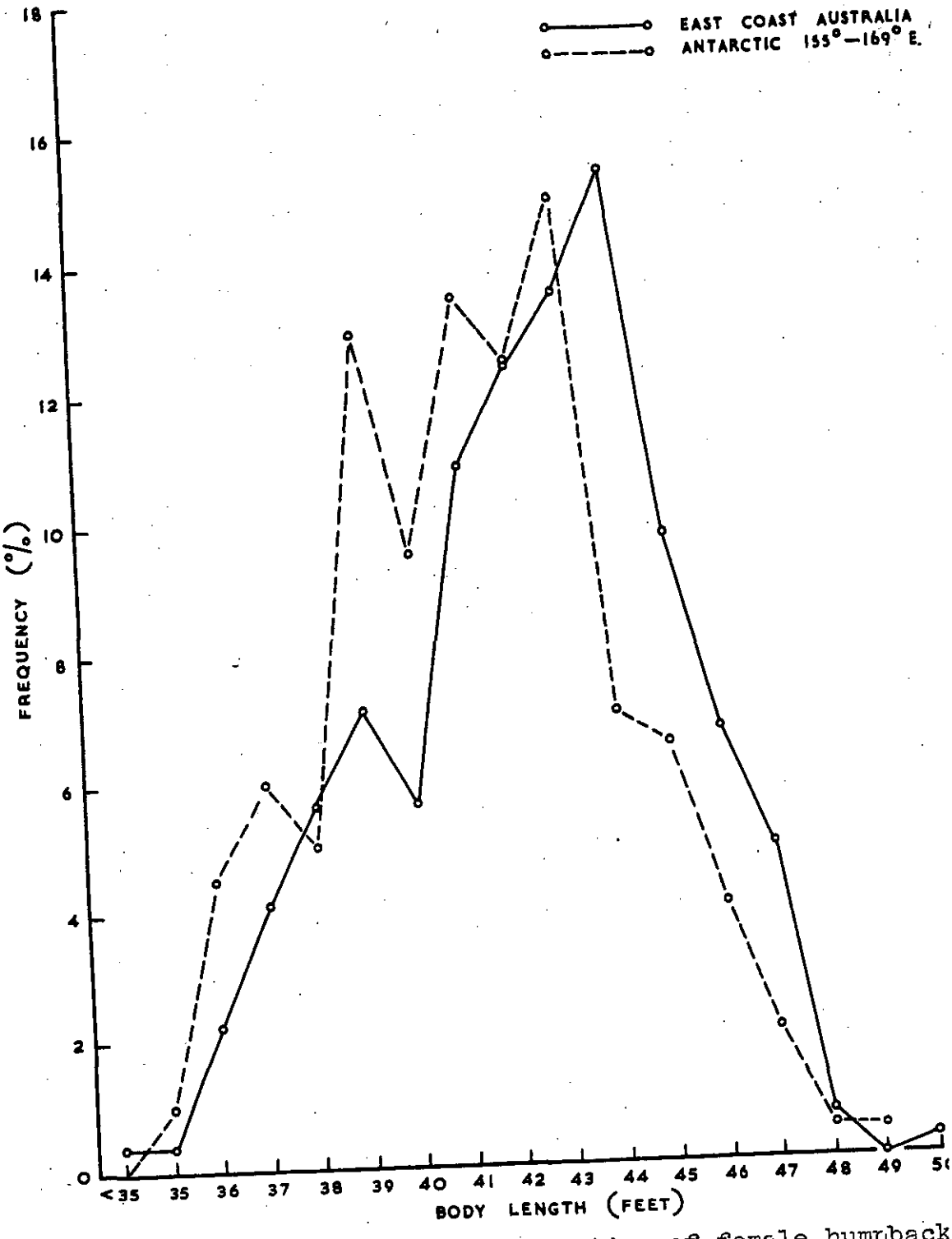

Fig. 2.- Length frequency distribution of female humpback whales taken from the Group V population during 1959.

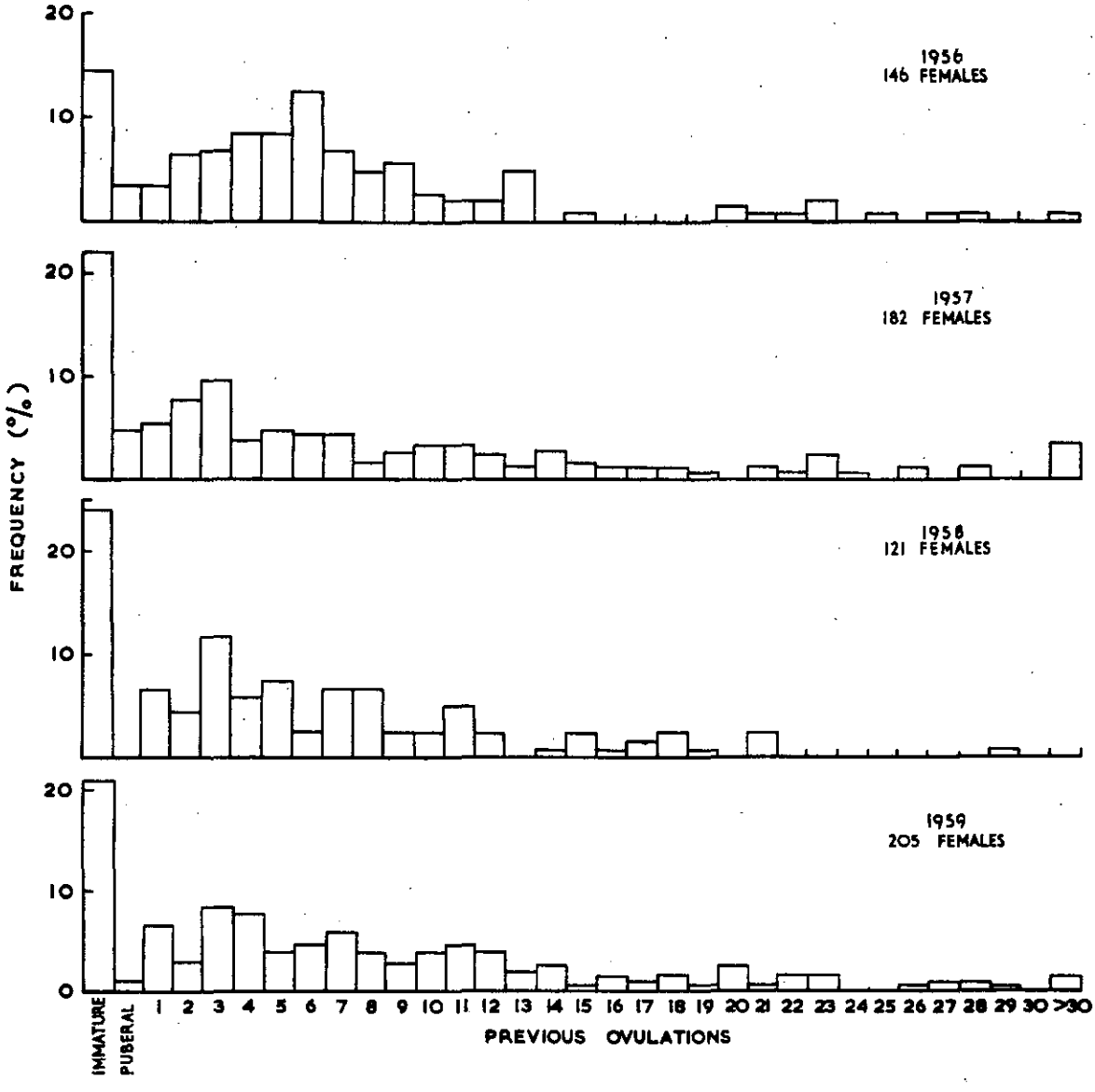

Fig. 3.- Distribution of numbers of ovulations within samples of female humpbacks examined on the east coast of Australia.

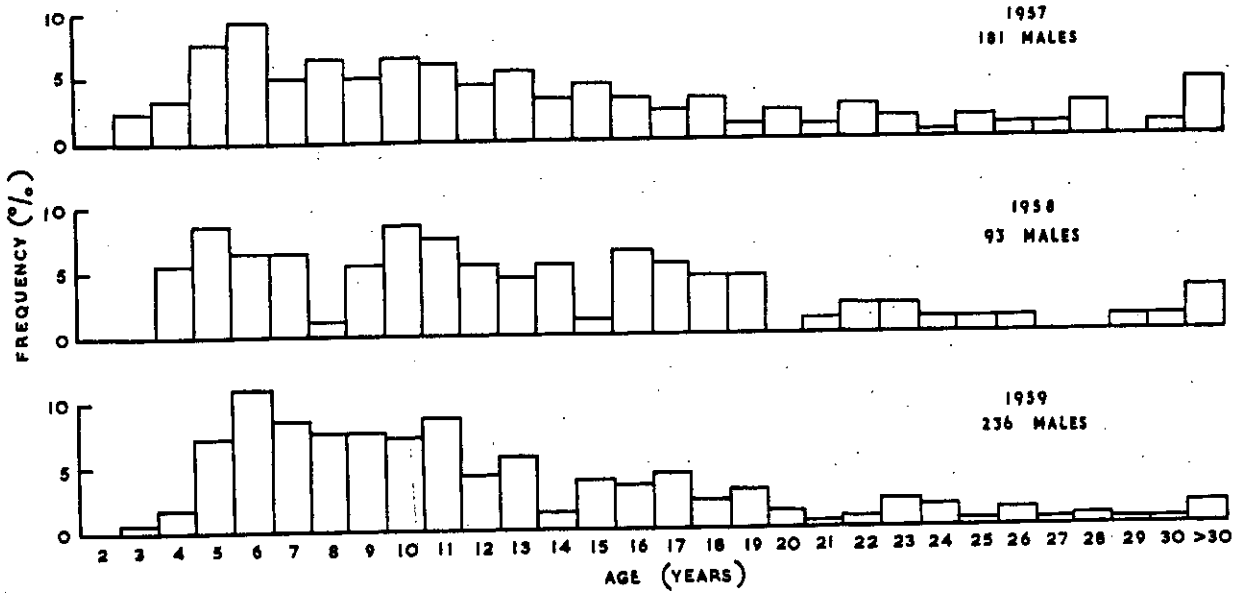

Fig. 4.- Age distribution within samples of male humpback whales taken on the east coast of Australia in 1957, 1958, and 1959.

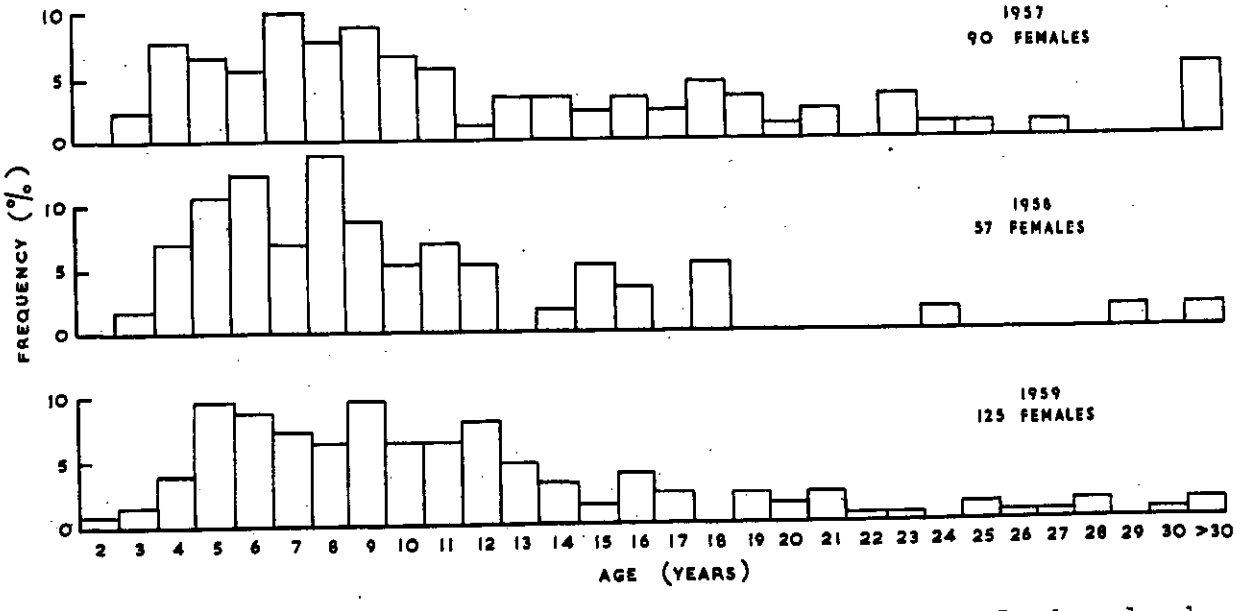

Fig. 5.- Age distribution within samples of female humpback whales taken on the east coast of Australia in 1957, 1958, and 1959.

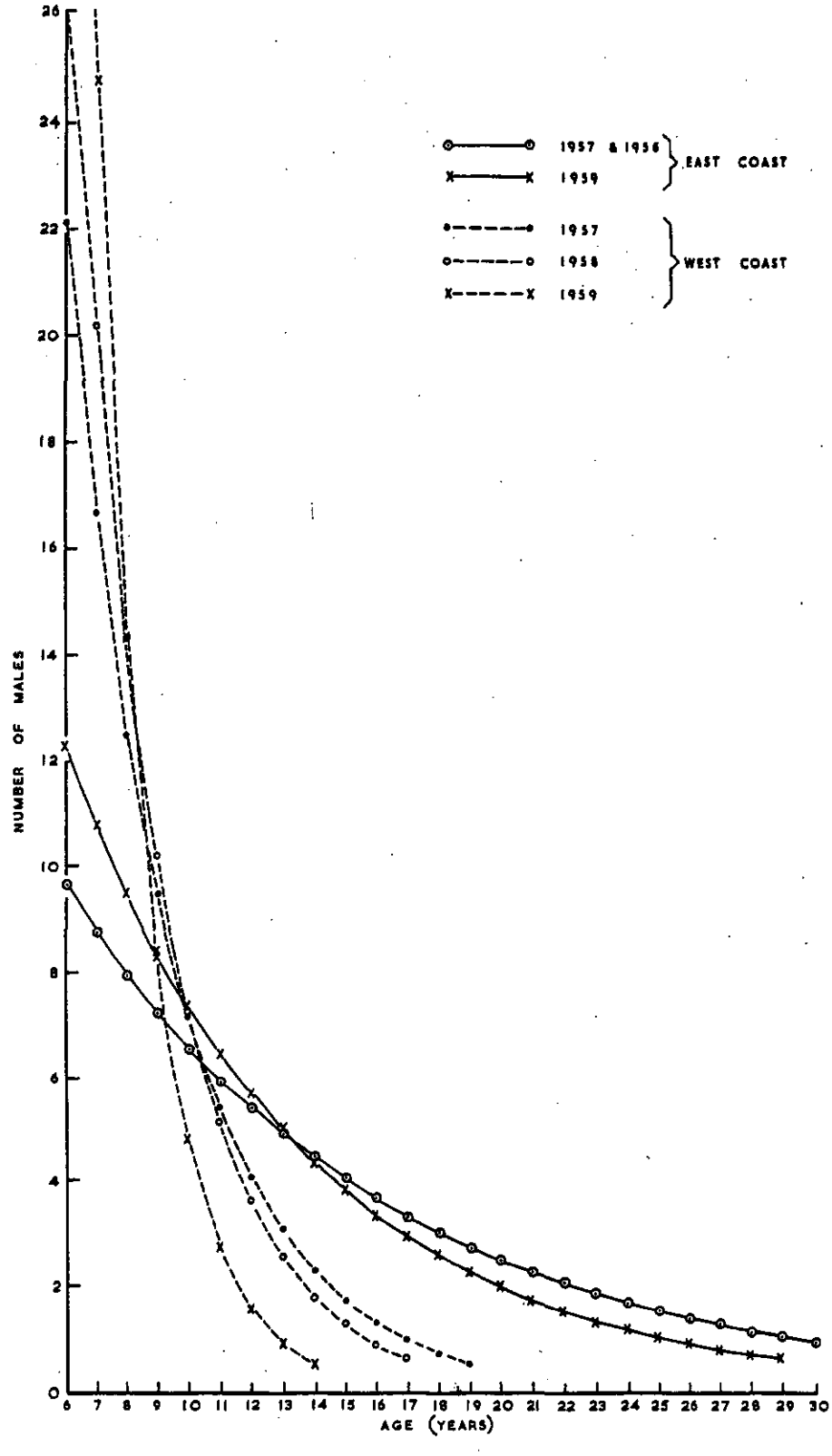

Fig. 6.- Mortality curves calculated per 100 mature males from the east and west coasts of Australia.

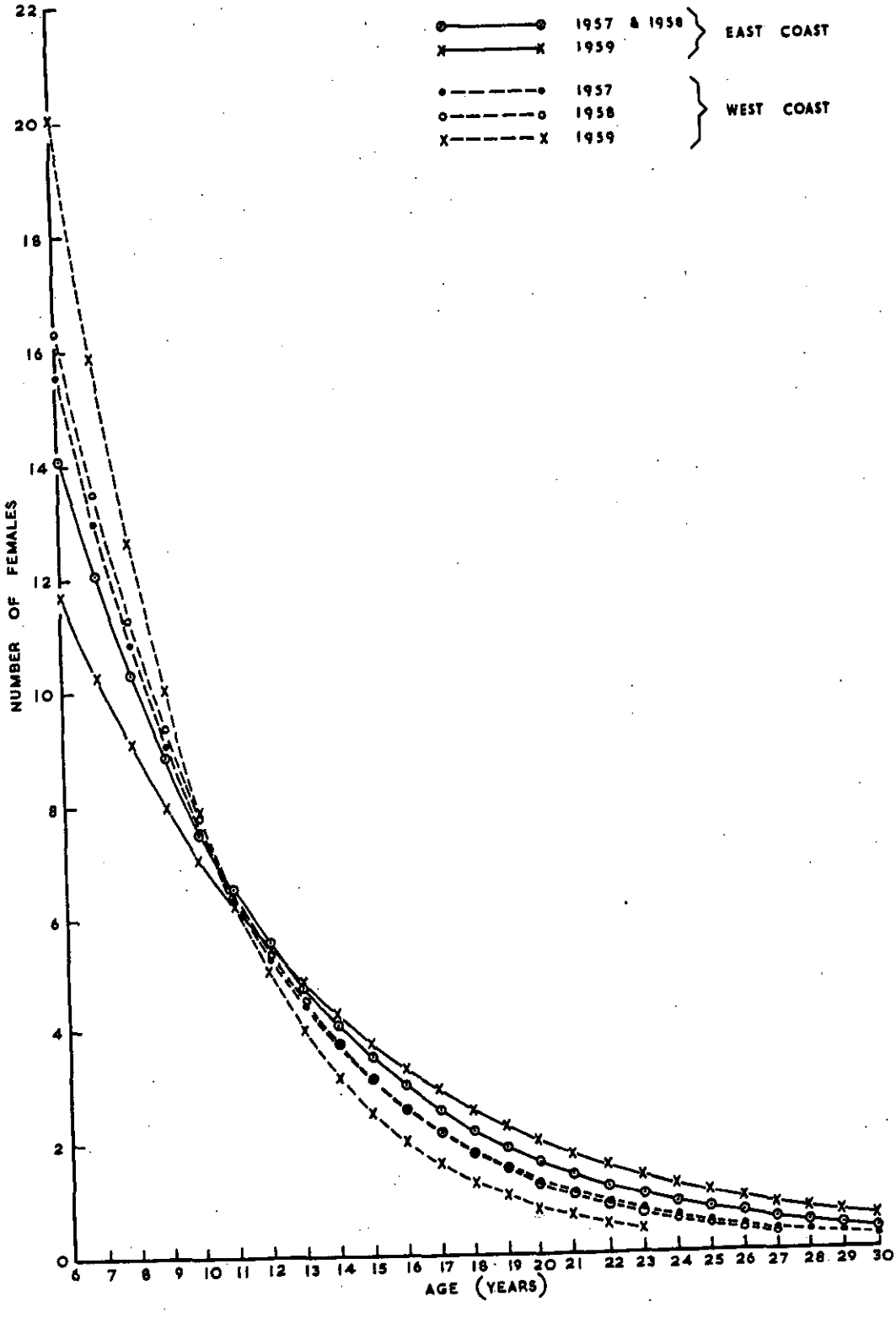

Fig. 7.- Mortality curves calculated per 100 mature females from the east and west coasts of Australia.

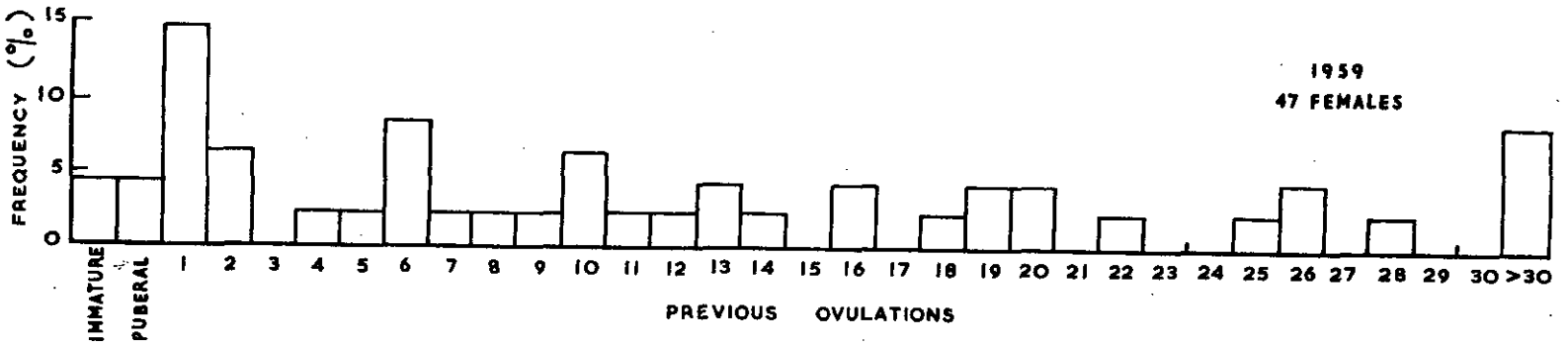

Fig. 8.- Distribution of numbers of ovulations in female humpback whales sampled at Norfolk I. in 1959.

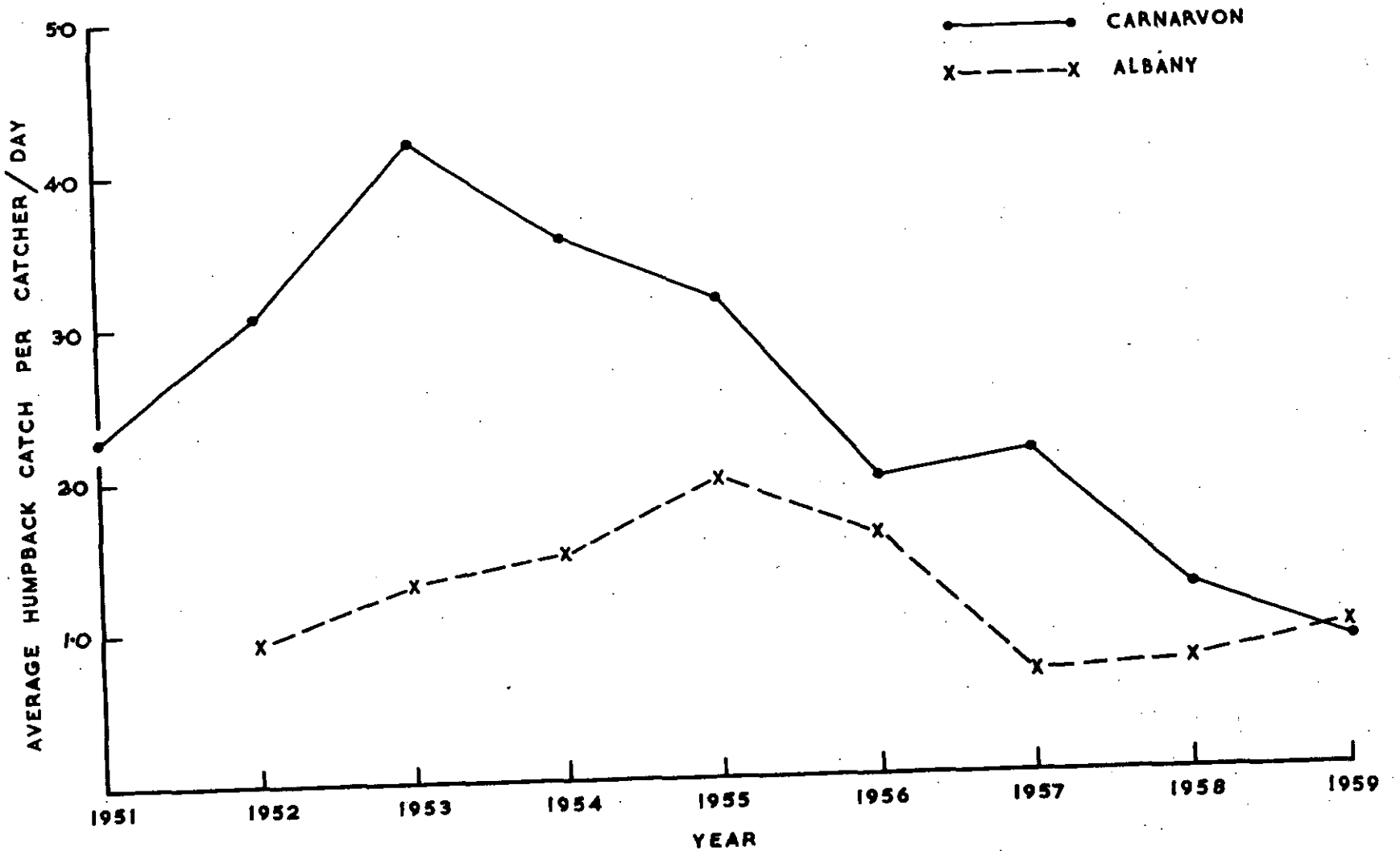

Fig. 9.- Availability of humpback whales at west coast stations each year.

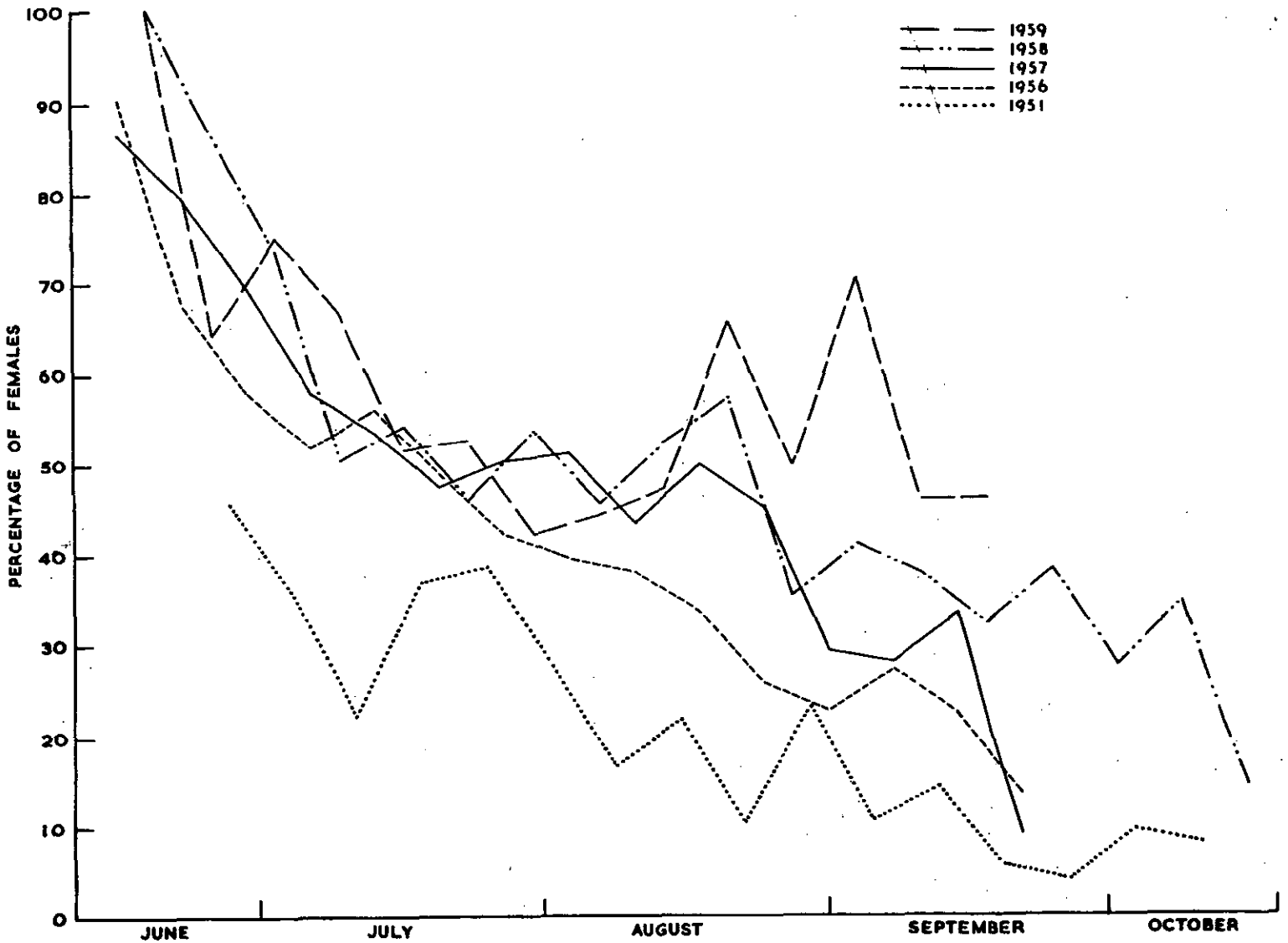

Fig. 10.- Percentage of female humpback whales in weekly catches at Carnarvon 1951, 1956-1959.

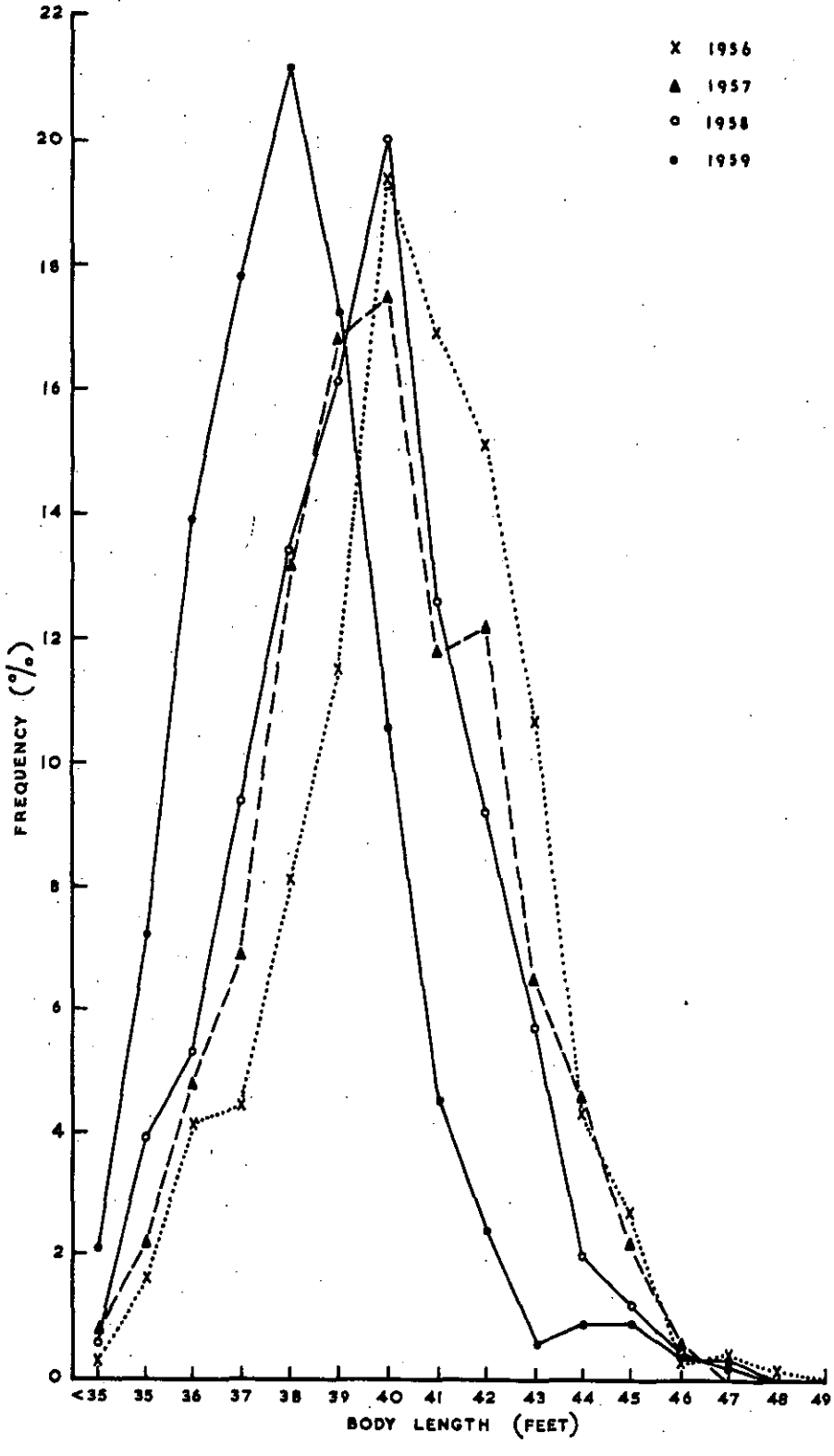

Fig. 11.- Length frequency distributions of male humpback whales taken off the west coast of Australia.

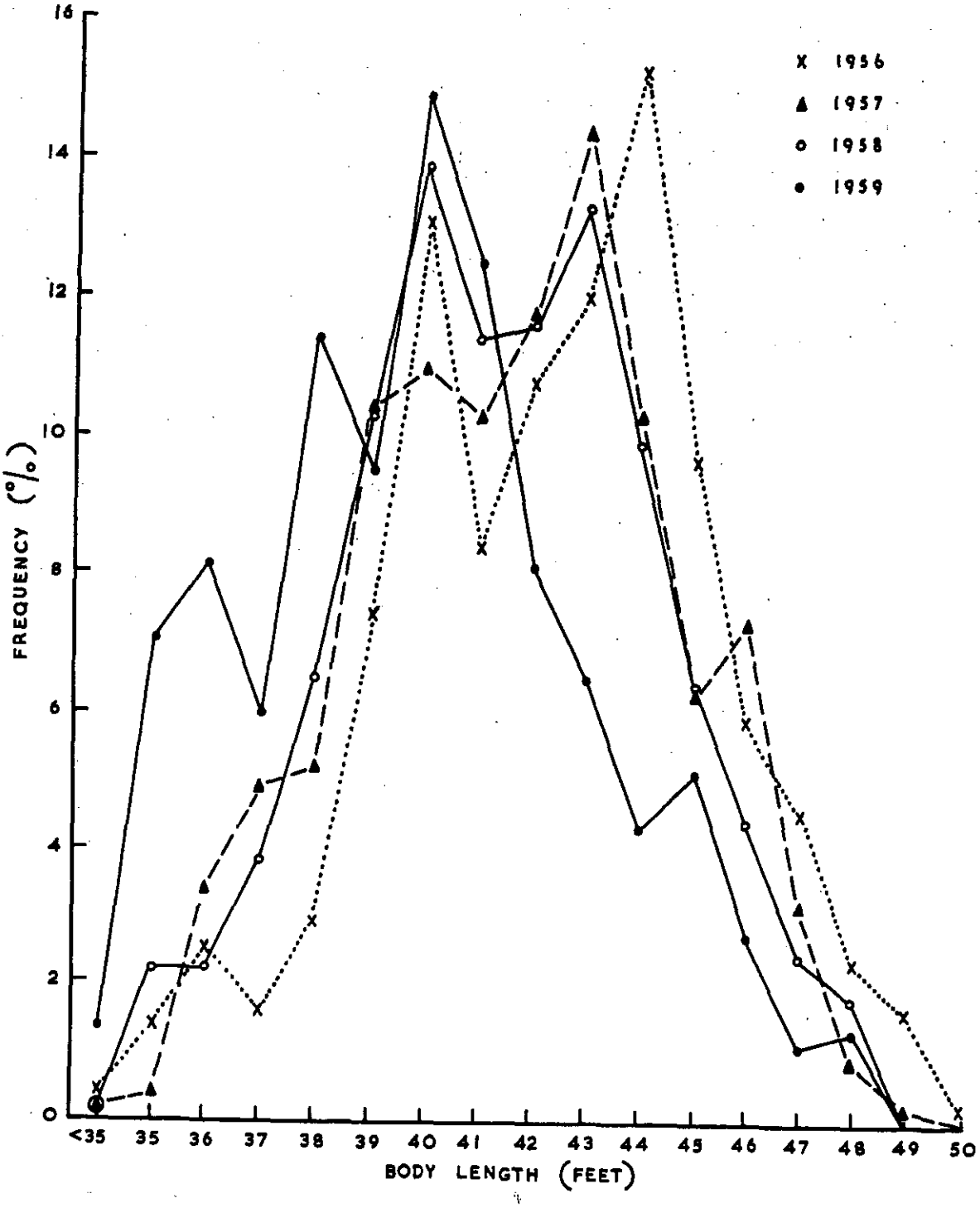

Fig. 12.- Length frequency distribution of female humpback whales taken off the west coast of Australia.

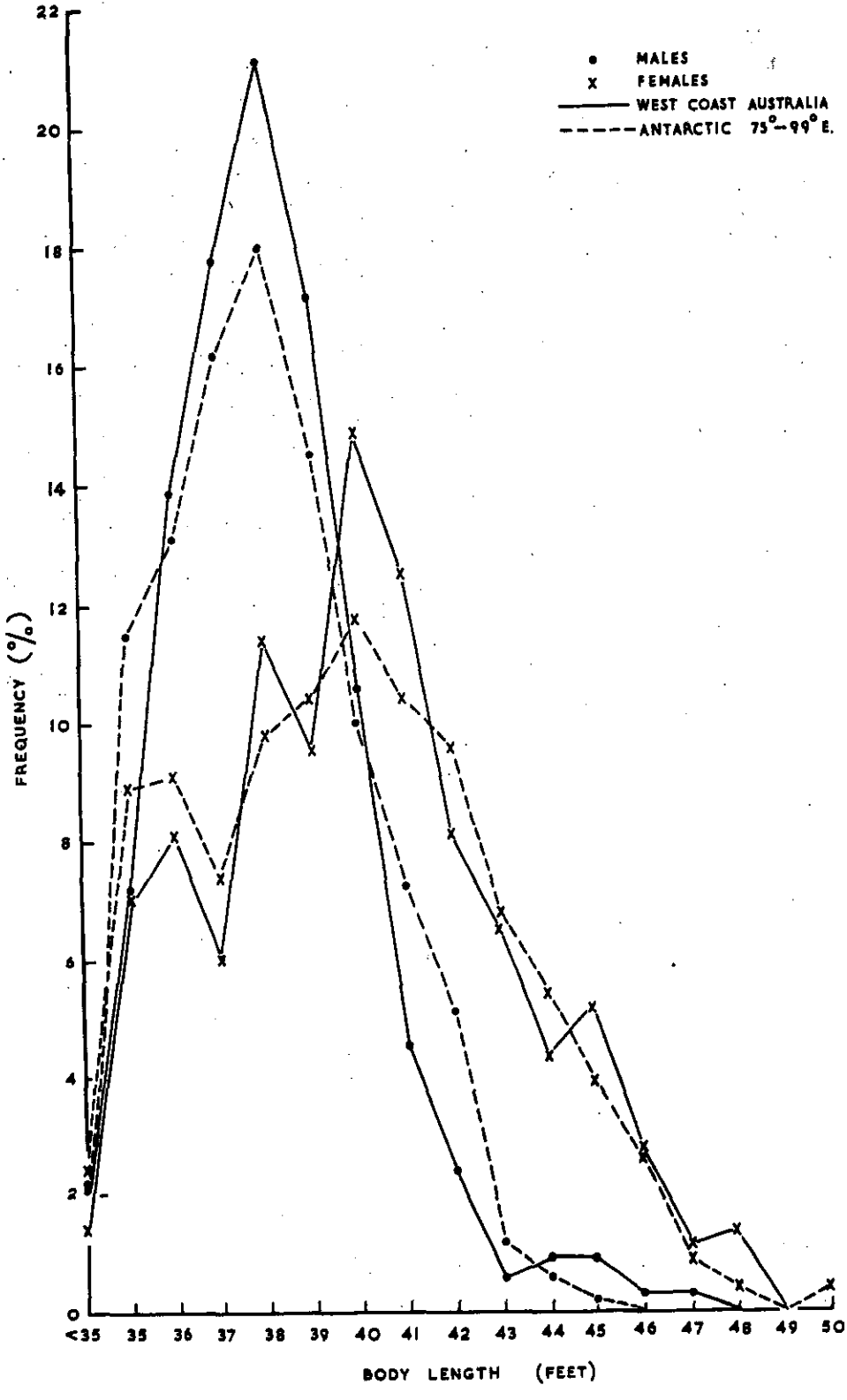

Fig. 13.- Length frequency distribution of humpback whales taken from the Group IV population during 1959.

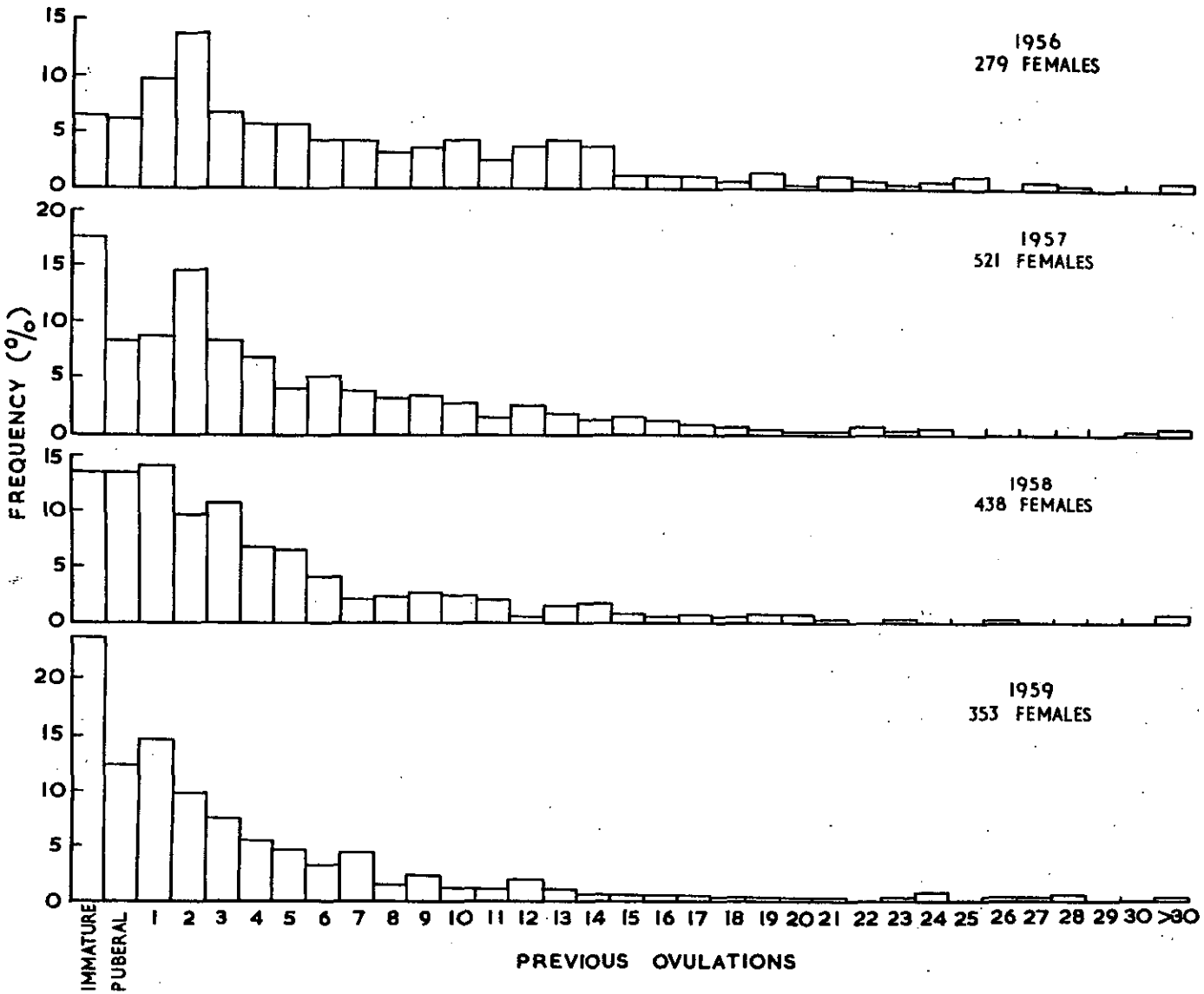

Fig. 14.- Distribution of numbers of ovulations within samples of female humpbacks examined on the west coast of Australia.

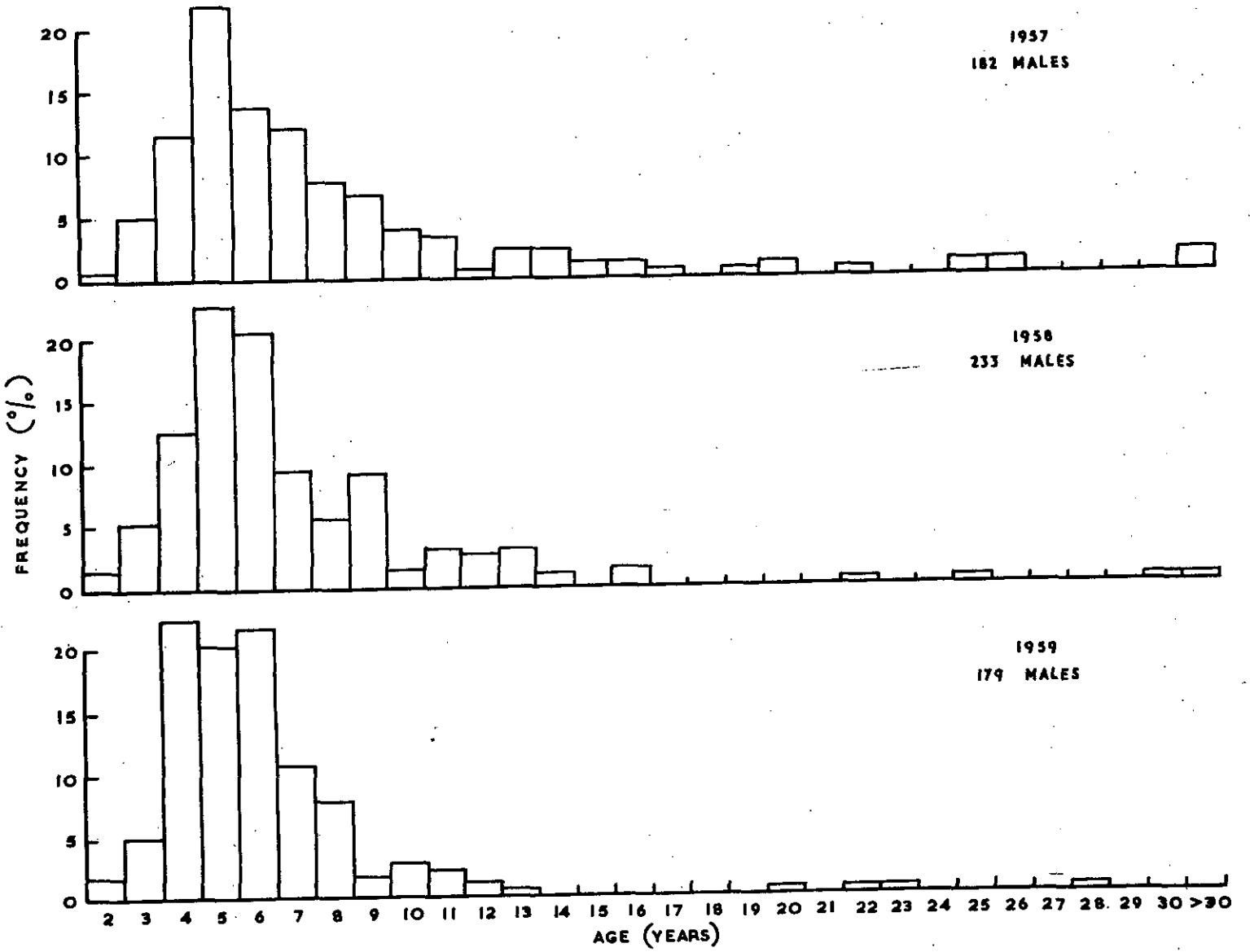

Fig. 15.- Age distribution within samples of male humpback whales taken on the west coast of Australia in 1957, 1958, and 1959.

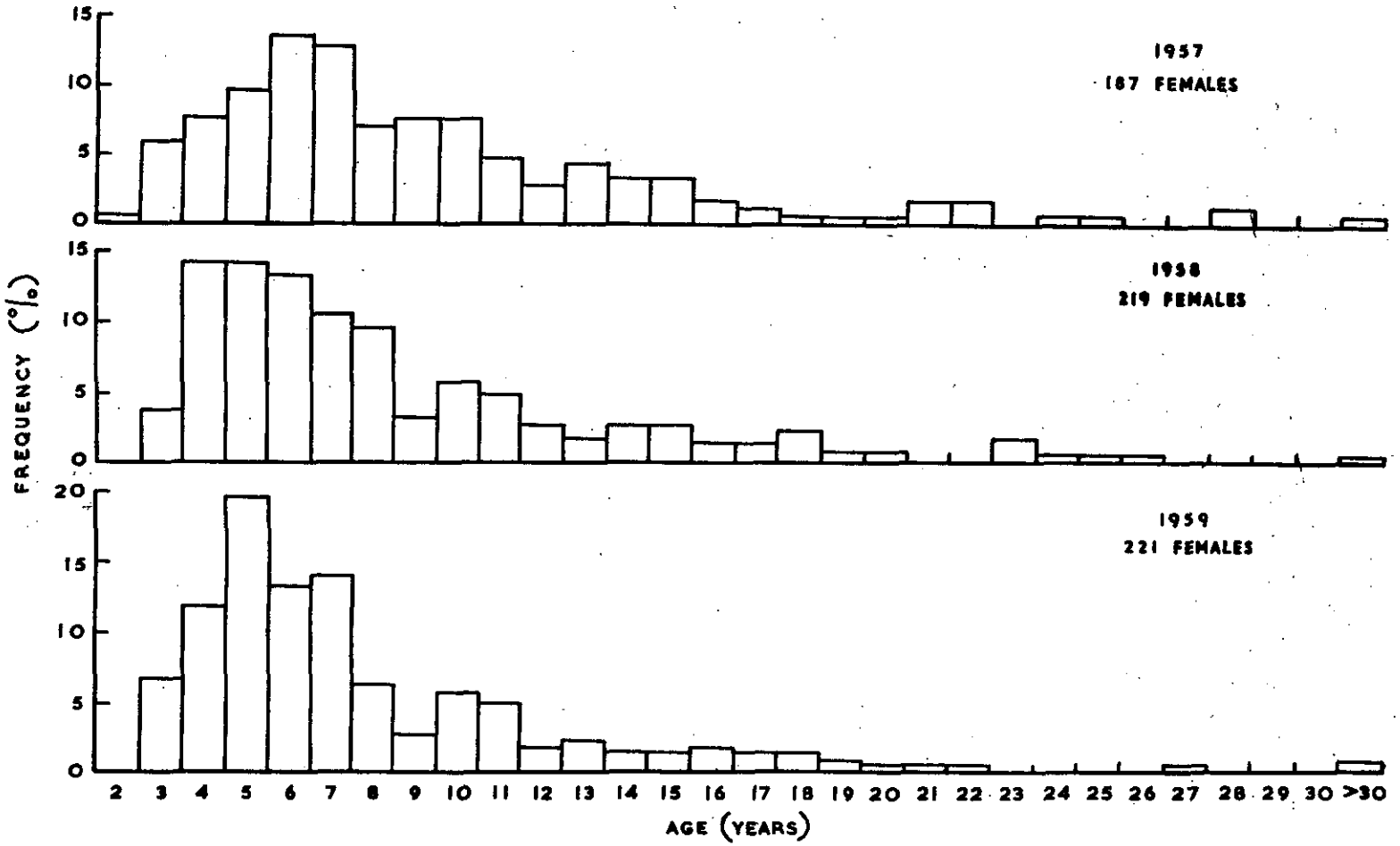

Fig. 16.- Age distribution within samples of female humpback whales taken on the west coast of Australia in 1957, 1958, and 1959.

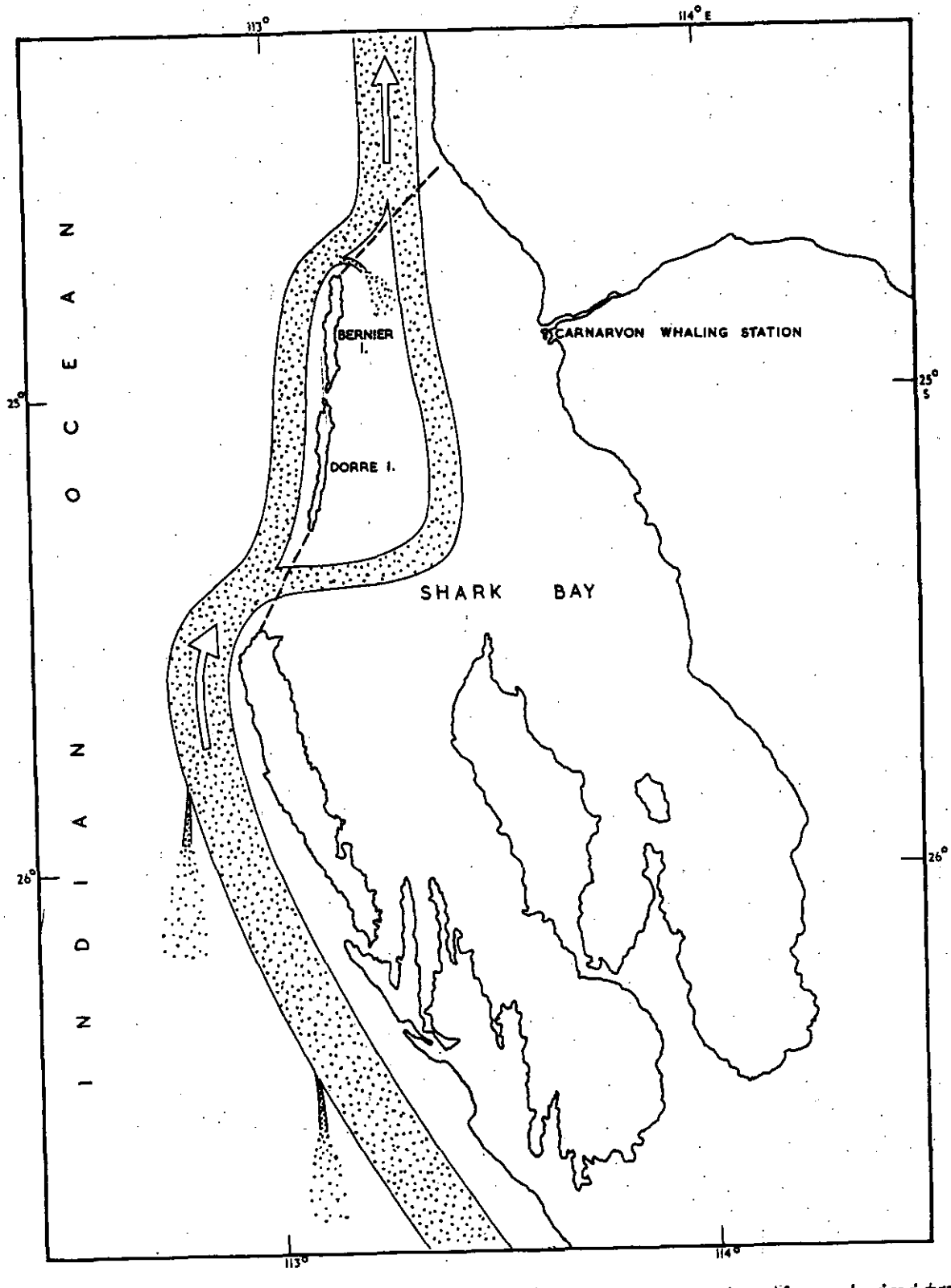

Fig. 17.- Migration path of humpback whales in the vicinity of Carnarvon Whaling Station.

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