

COMMONWEALTH



OF AUSTRALIA

Commonwealth Scientific and Industrial Research Organization

Division of Fisheries and Oceanography

REPORT 37

REPORT OF A SURVEY FOR TUNA IN
WESTERN AUSTRALIAN WATERS

By J. S. Hynd and D. Vaux

Marine Laboratory
Cronulla, Sydney
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FOREWORD

Tuna fisheries being among the most important of the world's fisheries today, many countries are seeking ways in which to develop their exploitation of these pelagic fish. Australia already has a small industry for the southern bluefin, its boats working out of southern ports in New South Wales and from Port Lincoln in South Australia, but the total production so far is only in the order of 5,000 tons per year, and there is a strong wish to develop this industry and to increase its catch. One of the areas in which it seemed that such development might be obtained, is that which lies off the south-western corner of Australia, in which tuna have been observed, and in which Australian tuna vessels could operate from Albany or Fremantle. Attention was drawn in 1960-61 to the reports of tuna occurrence in this area; this was a time when the fish cannery at Albany found itself short of raw material supplies drawn from the stocks of Australian salmon. A request was made for steps to establish, if possible, tuna fishing in this area to provide an alternative type of raw material. A decision was made, as a first step toward effecting that development, to charter a fishing vessel to carry out fishing operations to test the practicability of establishing there a commercial fishery. The present report is an account of the observations made from this vessel of tuna and tuna environment, together with an account of the tuna tagging operations carried out. The vessel "Estelle Star" was chartered, to carry out the survey reported on here, with funds made available from the Fishing Industry Development Trust Account by the Minister for Primary Industry, the Hon. C. F. Adermann.

G. L. KESTEVEN
Assistant Chief

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By J.S. Hynd and D. Vaux

Summary

This is a report of prospecting for tuna carried out in waters off the south-western corner of Australia, from July 31, 1961, to July 17, 1962; biological examination was made of almost all fish taken (chiefly Southern Bluefin, Thunnus maccoyii); 4,750 fish were tagged; hydrographical observations were made.

Although the survey plans provided for fishing on a commercial scale whenever fish were found, only one small catch was taken and landed; the rest of the catch, consisting entirely of small fish, was used for tagging and other biological purposes. The presence of three groups (= broods?) of fish was demonstrated.

I. INTRODUCTION

In 1960 a request was made to the Government of the Commonwealth of Australia for the conduct of a survey of tuna resources in waters off the south-western corner of Australia, with a view to establishment of a commercial fishery in that area if the survey should show that there were tuna stocks in that area of a size and composition to support such fishing. Tuna were known to be present in these waters for at least part of each year, but there was little information from which an estimate might be made of the magnitude of these stocks, or a guess made as to their size composition; moreover, no one could tell whether, supposing the stocks were sufficient to support commercial operations, the sea and weather conditions prevailing at the times at which the fish were present would permit successful operations of the kind currently employed in Australian tuna fishing. These matters had therefore to be tested. Since the local fishing industry had neither the skill nor the equipment to undertake this work, arrangements would have to be made with some fishing unit(s) from the Australian east coast where a fishery for tuna had begun ten years earlier. The arguments in favour of carrying out this survey were sufficiently strong, and an east coast tuna pole-and-bait boat was chartered for twelve months; prospecting operations were carried out for nearly the whole of the charter time. This report gives an account of those operations and presents the data obtained with regard to the tuna taken and the hydrographic observations and collections made. Conclusions that may validly be drawn from these results are suggested.

(a) Origin of Proposal for Survey

The original request resulting in this survey was made in June 1960 by Hunt's Canning Co. Pty Ltd, of Perth. This Company proposed to the Department of Primary Industry that a survey should be made of Western Australian waters to examine the possibility of establishing a tuna industry in Western Australia. The main species of fish taken until that time by the Company for canning had been Australian salmon but the catch of this species had fallen considerably in recent years, and in 1960 had fallen to a level at which, it was claimed, the cannery could no longer be operated economically. Consequently the Company was obliged to look for alternative raw material and was prepared to change to tuna if this species could be caught in sufficient quantity.

Hunt's proposal was supported by the Minister for Fisheries, Western Australia, whose Government wanted the Albany cannery kept in operation since its closure, the Government believed, would have disastrous effects on the fishing industry of Western Australia.

There was a parallel between the situation on the Western Australian coast in 1960 and that which had prevailed on the east coast before 1950. The presence of tuna in eastern Australian waters had been known for some years before 1950, but until the arrival of the U.S. tuna clipper Senibua in that year only sporadic catches had been taken and there was no sustained fishery. The Senibua was able to demonstrate that the bait-fishing technique could be used in these waters, that suitable bait fish were available, and that profitable commercial operations could be carried out using this technique. The crew of the Senibua trained Australian fishermen in the use of this technique, and the vessel herself was a demonstration of the structural features required in a vessel using this method. These demonstrations provided a stimulus which led immediately to local efforts out of which the local industry grew.

The view of the Western Australian Government in 1960 was that a reliable examination of the tuna resources of that State and demonstrations similar to those made in the east by the Senibua were needed. Obviously development of this industry would provide an opportunity for Western Australian fishermen to improve their income and it was further argued that such a development would prove important if diversion of boats from the crayfish industry should become necessary.

There was some question as to which sea area off the Western Australian coast should be examined first. The presence of southern bluefin tuna in southern Western Australian waters had been established by fishing operations and research observations (Serventy 1941); the few specimens caught were mainly large (heavier than 200 pounds), mature and spawning, but a few juveniles ($1\frac{1}{2}$ to 20 pounds) had been taken. Large fish had been caught on shark

lines and some by netting. This area also was convenient to the existing cannery equipment. Stocks of bluefin and yellowfin inhabit north-west Australian waters, and are exploited by the Japanese, but the sparse settlement and lack of canneries and other shore facilities north of Perth made this an area unsuitable for these initial operations; a further argument in favour of surveying the waters south of Perth first was the probability that experienced South Australian fishermen would move to this region, seasonally or permanently, if resources should be proved.

(b) Survey Plans

After discussions with tuna fishing operators, detailed proposals for a survey were drawn up by the Fisheries Division, Department of Primary Industry, and the Division of Fisheries and Oceanography, C.S.I.R.O.

The two Divisions proposed that a suitable fishing unit should spend twelve months in southern Western Australia to carry out fishing for tuna as widely and as intensively as possible, with the specific objectives of:

- (i) adding to knowledge of the occurrence and distribution of southern bluefin tuna in those waters;
- (ii) testing the suitability of various types of fishing gear;
- (iii) examining the availability of suitable bait fish and determining the most suitable method for their capture;
- (iv) demonstrating these methods to Western Australian fishermen.

Suggestions were made concerning the planning of operations. The two Divisions agreed that the operation should be carried out in closest possible collaboration with the Fisheries Division of the Department of Primary Industry (with respect to technological details) and C.S.I.R.O. Division of Fisheries and Oceanography (with respect to investigation of resources). Arrangements should be made to supplement and assist the work of the fishing unit by observations from other vessels and from aircraft. The fishing unit should aim to take as much catch as possible, but the fishing operations should be covered by a guarantee of income at a level indicated by the owners of the fishing unit.

The vessel to be used in the proposed survey should be of such size that it could operate over the whole survey area from Albany to Fremantle, and should be equipped to carry out various types of line fishing for tuna with and without bait. The unit should be capable of testing types of tuna lines, of using poles of various lengths, and of experimenting with different types of lures, trolling lines, longlines of various specifications, and water sprays.

For work on bait fishes, the unit should possess bait fishing nets and lights so that the availability and suitability of bait fish in the area could be examined and catching techniques formulated. The vessel should have a refrigerated brine tank capable of holding a pay load of fish and be equipped with echo sounder and radio telephone. Accommodation should be adequate for a full complement of crew plus one officer each from the Department of Primary Industry and C.S.I.R.O. The vessel should have a capable experienced skipper with a proven crew.

The area of survey was chosen to extend from a hundred miles east of Albany to a hundred miles north of Fremantle and to seaward for about a hundred miles from the coast; this is an area of about 60,000 square miles. In considering the duration of the proposed survey, establishment of a picture of the annual cycle of distribution and habits of tuna seemed most important. Large spawning fish have appeared as early as the end of September, but more frequently at the end of October; they have seldom been seen after March. This was the only indication as to seasonal occurrence of fish in these waters, but the presence of smaller fish at other times was highly probable. Consideration of these points led to the proposal for a survey of twelve months duration.

Since the primary objective of the fishing operations was to catch the greatest quantity of fish whenever and wherever possible, the overall determinant of day-to-day operations should be the decision of the skipper. He should, however, be required to act in close consultation with the Department of Primary Industry and C.S.I.R.O. in designing his plan of operations. The value of a charter as proposed would depend to a large extent upon the efforts of skipper and crew so that it seemed advisable to stipulate in the charter party that it should be subject to cancellation if there should be evidence of incompetence on the part of skipper or crew, or if the operations were not being prosecuted with appropriate vigour. Also, subject to weather conditions, the operations should continue for the full twelve months even if a catch of 800 tons were reached in a shorter period.

The proposal was approved by the Minister for Primary Industry and tenders were called. The most satisfactory tender in view of the requirements outlined above was received from Mr Owen Allan on behalf of Australian Tuna Fisheries. Mr Allan proposed that the Company's tuna vessel, Estelle Star, skippered by Mr Ken Tidswell, the foremost Australian tuna skipper, be used for the survey, and covered by a Commonwealth guarantee of £40,000, representing the value of 800 short tons of tuna at 6d per pound.

(c) The Charter Agreement

As a result of these proposals, F.V. Estelle Star was chartered for a year's survey with the declared aim of catching fish whenever and wherever

possible in the greatest possible quantity. The charter party drawn up by the Department of Primary Industry specified the operations to be carried out and, whilst it included a clause to the effect that the master and crew were to obey the reasonable orders of the charterer or its representative, the responsibility of fishing with maximum efficiency was to rest with the skipper. C.S.I.R.O. Division of Fisheries and Oceanography pointed out that it did not wish to exercise control over the skipper's plan, but merely to make careful and effective observations and records of all operations and their results so that it might be in a position to advise on the question of resources, also to take opportunity for tagging and water sampling. The charter provided for the continued presence of a representative of Primary Industry. C.S.I.R.O. arranged that officers of the Division of Fisheries and Oceanography should accompany the vessel at all times for the purpose of keeping records of catch, environmental information such as temperature and salinity of the surface waters, and relevant meteorological data, and to make such sub-surface observations as were possible without disturbing normal fishing operations. Assembly of these data was undertaken at Cronulla, and cruise summaries, showing area of operations and results covering cruises of two to three weeks, were promised.

II. SURVEY OPERATIONS

Estelle Star began her charter at Port Lincoln, South Australia, on July 31, 1961, and left for Western Australia on the following day with representatives of Department of Primary Industry and C.S.I.R.O. aboard. Fishing operations and hydrographical observations began at once and were continued thereafter until August 1962, interrupted, of course, by weather and the needs to put into port. Reflecting the decision that the operations were to be those of a fisherman, the vessel moved and worked as directed by the master of the vessel in accordance with his views on how to get a commercial catch, and subject to weather and logistic requirements. That is to say, the vessel did not operate a set of planned cruises, with station sites chosen before hand, or with any of the other planned features of formal research cruises. However, for C.S.I.R.O. purposes the records were assembled into units identified as cruises, reporting the operations in periods of two or three weeks, depending on how much sea-time had been possible, and how many stations had been occupied. These "cruises" are represented in Figures 1 to 21, and the operations are represented in Appendix 1.

Hydrographical work was limited to sampling the surface waters for temperature and salinity, with occasional lowerings of a bathythermograph to indicate the structure below the sea surface. Surface water temperature was recorded continuously by a thermograph, and meteorological observations made at three-hourly intervals throughout the vessel's sea time and at all stations. Specimen log sheets with entries are included in Appendix 2. The observations are listed in full in Appendix 3. The ship's fishing operations were recorded in

detail which included time spent in fishing (including baiting), length measurements on all fish used for tagging, and full morphometric measurements on fish unsuitable for tagging.

Early in the survey Mr Tidswell decided that the small numbers of tuna caught should be made available for tagging rather than kept for cannery processing. Opportunity was taken to test the behaviour of small tuna after marking by placing them in the vessel's bait tanks for observation. When the Estelle Star moored at Fremantle for the Christmas leave period, ten cruises of an exploratory nature had been completed without catching a paying quantity of tuna. About this time a decision was taken to install experimental longline equipment and to test, through its use, the presence of fish in deep strata. An hydraulic winch was therefore fitted to the vessel, during this leave period, and a set of longline equipment, as used regularly aboard F.R.V. Derwent Hunter, was supplied by C.S.I.R.O. Nansen water bottles and reversing thermometers were also issued so that subsurface water sampling could be undertaken whilst the vessel was standing by the longline. The line was shot for the first time early in January, and was used a few times thereafter, but since it resulted in the catching of only few fish (including three bigeye tuna), its use was abandoned. The deep-water sampling equipment was used only in conjunction with the longline.

One catch of $1\frac{1}{4}$ tons of fish of a size suitable for processing by the cannery was made 25 miles off Salisbury Island using poles and bait; the landing of this fish at Albany took two days. By April and May the catch rate of small (10-15 lb) tuna had increased, and since the possibility of making large sustained catches of tuna on a commercial scale became more remote, the decision was made to concentrate on a programme of tagging these small fish found within 10-20 miles off Albany. This programme reached a climax on cruise 8/62 (May 27 - June 20) and 9/62 (June 24 - July 5) when four thousand tuna were tagged. During May the tagging work provided an opportunity to test a new technique in age-determination and growth studies. Oxytetracycline hydrochloride (terramycin) was injected into slightly more than 11% of the fish tagged; this substance is incorporated in the bony structures of the fish and forms a layer which will fluoresce in ultraviolet light. The method therefore provides a time-identified datum mark in otoliths, scales, vertebra and fin rays from which subsequent growth can be measured and growth rates deduced.

Towards the end of the survey the Minister for Primary Industry approved of the use of funds from the Fisheries Development Trust account for the charter of a twin-engined aircraft for use in aerial spotting. Flight plans were drawn up by C.S.I.R.O. and Primary Industry to cover 18 hours of flight time spread over three days. The first series of flights was carried out between May 7 and 9, and before the tuna survey ended, three further series had been completed. Details of the flight plans and a list of sightings form Appendix 4; the tracks of these flight plans are shown in Figure 22. No tuna were positively identified during these flights, and on two occasions when the plane was

flying over the Estelle Star, the fish being poled from the vessel were not visible from the air. Schools of pilchards and unidentified small fish were seen and also fairly large numbers of whales, mainly sperm whales.

The area in which Estelle Star operated, for this project, has been marked off into four sub-areas as shown in Figure 23. The distribution of effort over these sub-areas is shown in the following two tables.

FISHING EFFORT OF ESTELLE STAR BY AREA AND MONTH

Area 1	Cruise 3/61, 4/61, 8/61, 10/61, 1/62, 5/62
Area 2	Cruise 2/61, 3/61, 4/61, 6/61, 8/61, 9/61, 10/61, 1/62, 5/62
Area 3	Cruise 1/61, 2/61, 3/61, 4/61, 5/61, 6/61, 7/61, 9/61, 2/62, 3/62, 4/62, 5/62, 6/62, 7/62, 8/62, 9/62
Area 4	Cruise 1/61, 4/61, 5/61, 2/62, 3/62, 4/62, 10/62?

BOAT TROLLING DAYS - 2, 3 OR 4 LINES (1 day = 12 hours)

Area	1961					1962							Total
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	
1		4 $\frac{1}{2}$	5 $\frac{3}{4}$	6 $\frac{1}{2}$	3 $\frac{3}{4}$	2 $\frac{1}{4}$		1 $\frac{1}{4}$	$\frac{1}{4}$				24 $\frac{1}{4}$
2	2	2	2 $\frac{3}{4}$	2	2	3 $\frac{1}{2}$		2	1 $\frac{3}{4}$				18
3	2 $\frac{1}{4}$	3 $\frac{1}{2}$	8 $\frac{1}{4}$	4 $\frac{3}{4}$				5 $\frac{1}{2}$	5 $\frac{1}{2}$	Tagging fish			29 $\frac{3}{4}$
4		2 $\frac{5}{4}$				3	9 $\frac{3}{4}$	6 $\frac{1}{4}$					21 $\frac{3}{4}$
Total	4 $\frac{1}{4}$	12 $\frac{3}{4}$	16 $\frac{3}{4}$	13 $\frac{1}{4}$	5 $\frac{3}{4}$	8 $\frac{3}{4}$	9 $\frac{3}{4}$	15	7 $\frac{1}{2}$				93 $\frac{3}{4}$

III. SURVEY RESULTS

(a) Commercial Fishing

With respect to its basic task the project produced only negative result: only one catch was considered to be of sufficient importance (in respect of its total weight and of the size of the fish of which it was composed) to warrant bringing it to the cannery, and even this was a very small catch, only $1\frac{1}{4}$ tons. The total weight of all fish caught was about 25 tons, all of which were small fish. The result is that the searching, by troll lines and by eye from ship and from aircraft, during a total of 202 days, spread over nearly twelve months, failed to discover surface occurring fish (schooled or otherwise) of a size, and in quantities suitable for cannery purposes.

(b) Hydrography and Weather

Although hydrographical measurements were made throughout Estelle Star's survey they were not made on a regular network of stations, but merely along the track of the vessel during searching; production of charts showing periodical distribution of water conditions is therefore not possible. It is of interest to note, however, that the large numbers of small fish caught off Albany during May and June were in water of temperature range 66° to 67° F, the same range as occupied by tuna comprising the bulk of the 1962 South Australian catch. Temperature measurements made by fishermen during their normal fishing operations have been discussed in S.P.P. Special Reports 1, 2 and 3. The third report summarizes conditions in South Australian waters in 1962 and draws attention to the range of temperatures at Rocky Island (66° - 67° F) and off the continental shelf south of Capes Wiles and Catastrophe (66° - 67° F, dropping below 65° F as the season closed). In the second report, referring to the New South Wales 1961 season, the temperature range in which fish were caught was 60° - 65° F at the beginning of the season (October) increasing to 65° - 70° F later (November-December). Conditions off Albany seem to have been similar to those of the South Australian fishery, an observation of interest when considering the movement of tuna between these areas.

Salinity measurements made on water samples collected on Estelle Star's two crossings of the Great Australian Bight showed an extensive area of high salinity water (salinity above 36‰) between the meridians of 126° E. and 134° E. We do not know how far south this high salinity water extends, but its distribution could affect the east-west movement of tuna and suggests a topic for further examination.

Quite apart from the absence of paying quantities of tuna of suitable size, the weather experienced in these waters is against the establishment of a small boat pole-and-bait fishery. Regular weather observations are listed in

Appendix 3 and summarized here. Of the 202 days Estelle Star was at sea, weather observations were made on 167 of them. Wind force was above 2 on all but 31 of these days; these days would represent good fishing weather for small boats. On a further 111 days, maximum wind force experienced was 3-5, representing days when a vessel of Estelle Star's construction would continue fishing but smaller vessels would probably cease operations. On the remaining 25 days, winds of force 6 and above were encountered. These figures refer to the days on which Estelle Star was at sea; on most of the remaining days of the charter the vessel was confined to port as a result of unfavourable conditions.

(c) Study of Tuna Stocks

A major result of the project has been the demonstration that the tuna occurrences in the area are of juvenile stocks on nursery grounds.

(i) Size and Other Characteristics of Captured Fish

The principal species of fish taken in the course of this work was southern bluefin tuna of which more than 6,000 were taken; these were all taken by trolling or poling. Of species other than southern bluefin only 18 specimens were taken. More than 6,000 southern bluefin were tagged and released, and in the course of this operation each fish was measured for length; length was measured on the fish that were not released, and other observations were made on them. The length measurement was between snout and caudal fork. The length frequency data are presented in the table of Appendix 5. The largest specimen measured 80 cm and since this was considerably less than that of the smallest fish in which mature gonads have been observed, we assume that all the fish taken in this project were immature.

(1) Fish Taken in the Vicinity of Albany.- Most specimens (some 5,000 odd) were taken between West Cape Howe and Bald Island in the months May, June and July 1962. (See map, Figure 23, for these and other localities). The length frequencies of the 2+ fish are represented in Figure 24, which shows the distribution of fish taken on Cruise 6 to have been unimodal, that of fish taken on Cruises 7 and 8 to have been bimodal, and that of fish taken on Cruise 9 to have been unimodal. The mode in Cruise 6 distribution has the same location as the right hand modes in the distributions of Cruises 7 and 8, while the mode in Cruise 9 corresponds to the left hand modes in Cruises 7 and 8. This set of correspondences suggests that two distinct groups of fish were present, one replacing the other over the period of the observations.

Of the fish taken in Cruise 9 nearly 1,300 were taken on the last two days (July 4 and 5, 1962). These fish were schooled in the vicinity of Vancouver Rock in an area of less than one square mile. Their length frequencies are plotted in Figure 25. Inspection shows a near symmetrical bell-shaped

distribution with mode of 65 cm. Mean and standard deviation were calculated as 64.91 cm and 3.34 cm respectively. A normal curve which was fitted is shown in Figure 25. The observed distribution was found to differ from the expected (normal) distribution at the 0.1% level. The major contribution to χ^2 derived from the fact that the observed distribution is leptokurtic with respect to the normal, the contribution from the high observed frequencies in the 73 and 74 cm class intervals being negligible. Therefore the distribution of L.C.F.s in the parent population is fundamentally symmetrical, leptokurtic with respect to the normal, and has estimated parameters of mean 64.91 cm, standard deviation 3.34 cm and 95% confidence range (1.96 times S.D.) \pm 6.56 cm about the mean.

When we apply these criteria of homogeneity to the histograms in Figure 24 we see that the distributions of L.C.F.s in the populations from which fish were taken in Cruises 6, 7 and 8 are widely different from that in the population fished on Cruise 9, on July 4 and 5, 1962.

To investigate this difference further, frequency histograms of catches taken on single days or groups of not more than three consecutive days separated by approximately weekly intervals, were constructed. These catches were taken from an area of approximately 30 square miles lying between Peak Head and Eclipse Island. The histograms are shown in Figure 26 (a) to (i). The distribution in Figure 26 (a) is practically identical with that in Figure 25 as might be expected. In Figure 26 (b) to (d) inclusive the distributions are, in general, right skewed with the same mode as in Figure 26 (a). Figure 26 (e) and (f) show approximately symmetrical flat-topped distributions with appreciably higher means than that of Figure 26 (a). In Figure 26 (h) and (i) the distributions are left skewed with modes at approximately 70 cm. This sequence of length frequency distribution is consistent with the hypothesis that at the beginning of the investigation period two distinct groups of fish were present in the area; that their modal sizes were 70 and 65 cm approximately; that the group with the greater modal size outnumbered the other by 3 or 4 to 1; and that over the period of the investigation the numbers of the larger size group decreased relative to those of the smaller size group until finally only the smaller size group was present.

Vessel movements were such that the whole of the area investigated was covered each day, effort being concentrated in places where schools were located. Investigation of the size composition of individual schools showed that, except at the end of the period of investigation, fish from both groups schooled together. Thus the observed sequence of length frequency distributions could not have arisen by fortuitous application of fishing effort to schools composed of fish segregated by size within the area.

Confirmation of this hypothesis of replacement of one group of fish by another comes from the results of the tagging programme carried out in connection with the survey. Of fish over 70 cm L.C.F. tagged and released during

Cruises 6 and 7 (almost certainly fish of the larger size group) nine were recovered by June 11, one more on June 25, but none subsequently.

Thus the evidence is conclusive that two distinct groups of 2+ fish were fished during the period May 3 to July 4 in the area between Peak Head and Eclipse Island. These groups differed in mean size, size distribution, and behaviour pattern. Parameters of the size distribution of the smaller size group are given above. Corresponding parameters cannot be estimated with the same accuracy from these data for the larger size group since this group was always mixed with the smaller size group whenever it was sampled. However, the modal value was approximately 75 cm and judging from the slope of the right hand side of the frequency distributions in Figure 26 (e), (f), (h) and (i), the standard deviation and therefore 95% confidence limits are of the same order of magnitude as those of the smaller size group. For identification purposes the group with the larger modal size is designated W.A. Group I and that with the smaller modal size W.A. Group II.

The length frequency distributions of the 1+ age group taken in the vicinity of Albany in the months May, June and July were also examined. Numbers involved were small but nevertheless two modes were detected in June.

Having determined that two different groups of fish were present during May, June and July, attention was now directed to the length frequency distributions of fish taken in the other nine months. Figure 27 (c) shows the modal sizes or mean lengths of the various groups month by month. The two groups distinguished above appear at top right, bottom right, and bottom left of the figure. The remaining points at right centre and top left represent a third group quite distinct from the other two. For identification purposes this is called W.A. Group III.

(2) Fish Taken Other Than in the Vicinity of Albany.- Figures 27 (a), (b) and (d) show the modal sizes or mean lengths of the various groups of fish taken in the areas Jurien Bay to Cape Naturaliste, C. Naturaliste to West Cape Howe, and Bald I. to Israelite B. respectively. The data are somewhat scanty but suggest that all three groups are present in all areas at one time or another during the year.

(ii) Growth Rates

The relation between modal length and time of year for each group is shown in Figure 28. This figure was obtained by combining the data of Figure 27, omitting single measurements, and plotting 1+ fish twelve months to the left of 2+ fish. Parallel straight lines have been fitted by eye to each set of data and give reasonably good representation of the growth, consistent with estimates of growth rate obtained by other methods.

(iii) Tagging

This operation resulted in the tagging of 5,158 fish of which 588 were injected with oxytetracycline hydrochloride. The final outcome of this work will appear only in subsequent seasons when, as is expected, some of these fish are recaptured during commercial fishing. Already (at the time of assembly of this report) some fish have been taken in South Australian waters during the 1963 fishery, but their numbers are small, although including 2 of the fish injected with oxytetracycline.

The small recovery numbers could mean either

1. a very low rate of fishing on this stock in South Australian waters,
- or 2. that only part of this stock moved into South Australian waters in time for the 1963 season,
- or 3. that tags had fallen out,
- or 4. that the tagged fish had suffered heavy discriminate natural mortality.

There is evidence from the composition of the catches taken in the 1963 South Australian season that possibility (2) represents what happened. All recoveries made in Western Australian and South Australian waters show the tagging to have been technically successful (that is, the tags were securely embedded, with no sign of wound at the tagging site), thus heavily discounting possibility (3). Possibility (4) cannot yet be tested. The two injected fish recovered in the South Australian fishery were healthy and the mark in the vertebrae, resulting from the injection, lies at the position expected for it under our current views on the growth rate of this species.

IV. DISCUSSION

The Estelle Star is a typical Australian pole-and-bait fishing unit, except that under the management of its Captain, Mr K. Tidswell, this vessel is probably the most efficient tuna fishing vessel in Australia. Because of the record of Mr Tidswell and of this particular vessel we accept without reservation the conclusion to be drawn from these results, namely, that no fishing unit of this type could have taken from these waters in the period concerned, substantial quantities of fish of commercial size. The density of searching by the Estelle Star, supplemented by the aerial observations, are such as to indicate to us that the fish of commercial size were not present in that area and at the surface during those twelve months. Re-examination of previously

collected evidence, and review of this total in the light of subsequent experience in 1962/63, leads us also to the conclusion that it is unlikely that such a fishing unit would be able to make successful fishing in this area by the pole-and-bait method.

This conclusion, however, does not mean that we have concluded that there are no fish of commercial size in these waters at any time. We certainly think it unlikely that they appear on the surface, but they could be present in deeper strata, and if they were there a commercial fishery could be developed, if also they were present in large enough quantities and a suitable method of catching them could be devised. The results of the few attempts at using the longline on the Estelle Star gave no indication of where we stand with regard to this possibility. The Estelle Star was sent into the area as a pole-and-bait vessel to test the possibility of exploiting surface-schooling tuna. The addition of longline equipment to the vessel was an afterthought and the result of what was probably a wrong decision. The crew had not been given any training in the use of this equipment, and the project had not been planned in any way to give a proper test of this kind of fishing. The few attempts made cannot be taken to mean that the tuna were not present even on the occasions that the gear was used.

However, the operation was successful from the biological point of view. There has been a demonstration of the existence of a nursery ground for juvenile tuna, and this demonstration has been confirmed by a subsequent return of Estelle Star to these grounds. The discovery gave opportunity for an intensive marking operation which has since been repeated with even greater success. The data obtained from these operations have yielded interesting information on the composition of stocks in this area and subsequent tagging returns have shown that exchange takes place between the stocks around Albany and those on the Port Lincoln grounds. However, the recoveries in the 1963 South Australian season were only such as could be expected if there were movement of only part of the stock from the Albany grounds onto the Port Lincoln grounds. Moreover, the compositional picture on the Port Lincoln grounds in the season of 1963 shows the presence of certain groups which had not been seen as smaller fish on the Albany grounds some months earlier. This would suggest, then, that the recruits to the Port Lincoln grounds may be drawn also from nursery grounds other than those off Albany.

These, of course, are exceedingly tentative conclusions. They are drawn here only for the purpose of indicating the value of the results obtained by the Estelle Star operation. A fuller account of the distribution, behaviour and other characteristics of these stocks off the southern shores of Australia will, in due course, be prepared from the total store of material developed from all the research operations on these stocks.

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APPENDIX 1

SUMMARY OF WHOLE YEAR'S OPERATIONS

1961

F.V. ESTELLE STAR - COMPLETE SUMMARY OF YEAR'S OPERATION

APPENDIX 1

Cruise No.	1	2	3	4	5	6	7	8	9	10
Cruise Began	1/8	15/8	27/8	12/9	22/9	3/10	10/10	20/10	12/11	4/12
Cruise Ended	11/8	23/8	9/9	21/9	2/10	5/10	16/10	8/11	24/11	19/12
Days at Sea	10	7	9	8	6	3	5	14	11	7
No. of Stations	39	38	55	58	41	25	30	83	82	51
	1-39	40-77	78-132	133-190	191-231	232-256	257-286	287-369	370-451	452-502
Surface Temp. by Thermometer	39	38	55	58	41	25	30	80	66	48
Surface Temp. by Thermograph					-	-	Continuous Recordings	-		
No. of Surface Salinities	38	24	47	50	37	21	26	80	66	48
No. of Sub-surface Salinities	-	-	-	-	-	-	-	-	-	-
Bathythermograph Lowerings	-	1	4	4	5	5	1	2	7	-
Meteorological Observations				-	3-hourly and at all Stations	-				
Bluefin Caught - To Cannery (tons)	-	-	-	-	-	-	$\frac{1}{4}$	-	-	-
Bluefin Measured and Tagged	-	21	21	22(21)	19	13	55	21	1	14
Bluefin Measured Only	-	-	-	1	-	-	65	4	1	2
Longline Shots	-	-	-	-	-	-	-	-	-	-
CSIRO Personnel	Bradley	Bradley	Bradley	Bradley	Bradley	Bradley	Bradley	Bradley	Godfrey	Godfrey

1962 F.V. ESTELLE STAR - COMPLETE SUMMARY OF YEAR'S OPERATION Cont'd...

Cruise No.	1	2	3	4	5	6	7	8	9	10	Totals 1961-62
Cruise Began	3/1	23/1	12/2	1/3	27/3	27/4	10/5	27/5	24/6	7/7	
Cruise Ended	16/1	3/2	24/2	23/3	23/4	9/5	19/5	20/6	5/7	17/7	
Days at Sea	13	12	12	20	17	9	8	12	9	10	202
No. of Stations	86	55	57	100	109	64	10	27	14	38	
Surface Temp. by Thermometer	1-86	87-141	142-208	209-308	309-417	420-483	484-493	494-520	521-534	535-572	1072
Surface Temp. by Thermograph	80	55	60	'97	71	34	10	20	14	38	965
Surface Temp. by Thermograph				-	-	Continuous Recording	-				
No. of Surface Salinities	80	58	63	97	71	34	10	20	14	36	921
No. of Sub-surface Salinities	-	24	44	51	-	-	-	-	-	-	119
Bathythermograph Lowerings	5	1	-	-	-	-	-	-	-	-	35
Meteorological Observations				-	-	3-hourly and at all Stations	-				
Bluefin Caught - To Cannery (tons)	-	1 $\frac{1}{4}$	-	-	-	-	-	-	-	-	1 $\frac{1}{2}$ tons approx.
Bluefin Measured and Tagged	20	8	13	24	43	259	102	1993	1964	1	4570
						*247	*121	*20	*200		*588
						(506)	(223)	(2013)	(2164)		(5158)
Bluefin Measured Only	-	50	4	8	19	-	-	-	40	-	194
Longline Shqts	3	-	-	3	-	-	-	-	-	-	6
CSIRO Personnel	Godfrey Greig	Godfrey Greig	Greig	Godfrey Greig	Godfrey Greig	Hynd	Thomas	Thomas	Bradley	Bradley	

* Tagged and injected intramuscularly with oxytetracycline hydrochloride

APPENDIX 2
SPECIMEN LOG SHEETS

C.S.I.R.O. DIVISION OF FISHERIES AND OCEANOGRAPHY

STATION LOG BOOK

Vessel ESTELLE STAR Cruise 3 Stations 78 to 132 Year 19 61

Scientific Staff R. BRADLEY

Cruise began at 0400 hrs. on 27 AUGUST 19 61

Cruise ended at 0930 hrs. on 9 SEPTEMBER 19 61

Other documents containing original data Thermograms, track chart.

1.

Summary List of Stations and Gear used

Vessel ESTELLE STAR Cruise 3 Stations 78 to 92 Year 1961

Station No.	Gear used
78	Surface sample
79	"
80	Tuna tagged
81	Surface sample
82	"
83	"
84	"
85	"
86	"
87	Tuna tagged
88	Surface sample
89	"
90	"
91	"
92	"

C.S.I.R.O. DIVISION OF FISHERIES AND OCEANOGRAPHY

RMD/DKE
21/4/61
Ref. 440

DAILY LOG ABSTRACT

F.R.V. *ESTELLE STAR* CRUISE *3/61* DATE *27/8/61*

Hours	Log	Co.(T)	WIND		Wx.	SEA	SWELL	BAR.	REMARKS	
			D	F						
01										
02										
03										
0400			Proceeded to sea							
05										
06										
07										
08										
0900	15.5	276	21	03	10 18	21 2	23 4	23	Station 78	
1000	24.5								79	
1100	32.5								81	
1200	42.5		99	0	20 02		23 4	23	82	
13									83	
1400	60.0								84	
1500	68.9	270	27	1	20 02		24 4	22	85	
1600	79.0								86	
1700	87.3		05	2	20 02		24 4	22	88	
1800	96.3		05	2	20 02		24 4	22	89	
1900	105.9	296								
20										
2100	123.9	296	07	3-4	20 02	07 2	24 4	22	90	
22										
23										
2400			07	4	20 02	07 3	24 4	22	91	

DISTANCE NOON POSITION STEAMING TIME

Co.(T) to Noon: _____ TODAY _____ Lat. DR 35°08' S TODAY 20 hours

CURRENT Total _____ Long. DR 117°06' E Total _____

SET _____ LOG _____

DRIFT _____ TOTAL 123.9

MASTER K. Tidswell.

SURFACE SAMPLE LOG

Vessel ESTELLE STAR Cruise 3 Year 1961 Thermometer/ _____ Sheet No. 1

Station number	Month	Day	Time	Log	Grid reference	Latitude S	Longitude E	S % bottle number	Temp.	Corr. Temp.	S %	Remarks
78	8	27	0900			35 11	117 36	A499		16.7	—	S. bottle broken
79	8	27	1000			35 10	117 26	74 L		17.25	35.59	
81	8	27	1100			35 09	117 16	A152		17.4	35.59	
82	8	27	1200			35 08	117 06	427		17.4	—	S. bottle broken
83	8	27	1300			35 07	116 57	33P		17.4	35.59	
84	8	27	1400			35 07	116 46	548		17.4	35.61	
85	8	27	1500			35 05	116 35	833		17.5	35.61	
86	8	27	1600			35 05	116 23	4963		17.6	35.61	
88	8	27	1700									
89	8	27										
90	8											
91												

METEOROLOGICAL LOG

Vessel ESTELLE STAR Cruise 3 Year 19 61 Time Zone W.S.T.

Stn. No.	Month	Day	Time	Latitude S	Longitude E	Wind		Sea		Swell		Air temp		Cloud Type	Cloud Amt	Wthr.	Vis.	Bar.	Obsr.
						Dir.	Force	Dir.	Ht	Dir.	Code	Wet	Dry						
78	8	27	0900	35 11	117 36	21	03	21	2	23	4					18	7	23	RB.
79	8	27	1000	35 10	117 26	21	03	21	2	23	4					18	7	23	RB.
80	8	27	1025	35 10	117 21	21	03	21	2	23	4					18	7	23	RB.
81	8	27	1100	35 09	117 16	99	0	99	0	23	4					02	8	23	RB.
82	8	27	1200	35 08	117 06	99	0	99	0	23	4					02	8	23	RB.
83	8	27	1300																
84	8	27																	
85	8																		
86																			

C.S.I.R.O. Division of Fisheries and Oceanography

SALINITY ANALYSIS LOG SHEET

Vessel ESTELLE STAR Cruise 3 Year 1961

Analytical details:-

Chlorinity of sub-standard sea water 19.26

S.T. meter reading of sub-standard 19.25

Correction + 0.01

S.T. meter number 4

Stn.	Bottle no.	S.T. meter reading	Corr.	Corrected chlorinity	Salinity	Remarks
79	74 L	19.69	$\frac{+}{01}$	19.70	35.59	
81	A 152	19.69	$\frac{+}{01}$	19.70	35.59	
83	33 P	19.69	$\frac{+}{01}$	19.70	35.59	
84	548	19.70	$\frac{+}{01}$	19.71	35.61	
85	833	19.70	$\frac{+}{01}$	19.71	35.61	
86	4963	19.70	$\frac{+}{01}$	19.71	35.61	

Samples analysed by R. Bradley Date 29-8-61

INTERNATIONAL WEATHER CODE

Direction code	Wind force code	Knots	Weather - abbreviated list
00 Calm	0 Calm	0 - 1	No precipitation at time of observation
01 5° to 14°	1 Light air	1 - 3	Blue sky, clear or hazy atmosphere
02 15° to 24° NNE	2 Light breeze	4 - 6	Clouds generally dissolving
03 25° to 34°	3 Gentle breeze	7 - 10	State of sky on the whole unchanged
04 35° to 44°	4 Moderate breeze	11 - 16	Clouds generally forming
05 45° to 54° NE	5 Fresh breeze	17 - 21	Visibility reduced by smoke
06 55° to 64°	6 Strong breeze	22 - 27	Dry haze
07 65° to 74° ENE	7 Moderate gale	28 - 33	Light fog or mist
08 75° to 84°	8 Fresh gale	34 - 40	Lightning
09 85° to 94° E	9 Strong gale	41 - 47	Thunder
10 95° to 104°	10 Whole gale	48 - 55	Squalls
11 105° to 114° ESE			
12 115° to 124°			
13 125° to 134°			
14 135° to 144° SE			
15 145° to 154°			
16 155° to 164° SSE			
17 165° to 174°			
18 175° to 184° S			
19 185° to 194°			
20 195° to 204° SSW			
21 205° to 214°			
22 215° to 224°			
23 225° to 234° SW			
24 235° to 244°			
25 245° to 254° WSW			
26 255° to 264°			
27 265° to 274° W			
28 275° to 284°			
29 285° to 294° WNW			
30 295° to 304°			
31 305° to 314°			
32 315° to 324° NW			
33 325° to 334°			
34 335° to 344° NNW			
35 345° to 354°			
36 355° to 4° N			
99 Variable or unknown			

Sea code	Ht. in ft
0 Calm	0
1 Smooth	1
2 Slight	1 - 3
3 Moderate	3 - 5
4 Rough	5 - 8
5 Very rough	8 - 12
6 High	12 - 20

Swell code	Low	Mod.	High
0 No swell			
1 Short or Average) Low		
2 Long			
3 Short) Mod.		
4 Average			
5 Long) High		
6 Short			
7 Average			
8 Long			
9 Confused, or no observation			

Visibility	50 yards	200 yards	400 yards	1000 yards	1 mile	2 miles	5 miles	10 miles	30 miles
0 Dense fog									
1 Thick fog									
2 Fog									
3 Moderate fog									
4 Thin fog or mist									
5 Visibility poor									
6 Visibility moderate									
7 Visibility good									
8 Visibility very good									
9 Visibility excellent over									

APPENDIX 3
HYDROGRAPHICAL OBSERVATIONS

SHIP	CRUISE	STATION	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND	SEA	SWELL	PRESENT	VIS.	BAROMETRIC		
		NUMBER										DIR.	FORCE	DIR.	HT.	DIR.	AMT.	WEATHER	PRESSURE
17	1	1	61	8	1	2010	J	34 42 S	135 54 E	13.2	36.06	27	02	3	18	3	19	02	7
17	1	2	61	8	2	1505	J	34 53 S	135 21 E	15.9	36.06	18	04	3	18	2	19	02	7
17	1	3	61	8	2	1831	J	34 33 S	135 04 E	15.2	35.93	16	02	1	18	2	19	02	8
17	1	4	61	8	3	0705	J	33 33 S	134 28 E	15.2	35.95	13	01	1	12	2	18	02	7
17	1	5	61	8	3	1016	J	33 09 S	134 04 E	15.1	36.06	11	03	1	11	2	19	02	8
17	1	6	61	8	3	1334	J	32 48 S	133 39 E	15.4	36.22	10	04	1	11	2	19	02	8
17	1	7	61	8	4	0635	J	32 15 S	132 11 E	15.4	36.51	05	04	2	05	1	14	02	9
17	1	8	61	8	4	1004	J	32 15 S	131 35 E	16.0		04	05	3	04	3	17	02	8
17	1	9	61	8	4	1325	J	32 16 S	130 59 E	16.2	36.22	04	04	3	04	3	17	02	8
17	1	10	61	8	4	1638	J	32 17 S	130 24 E	16.0	36.15	04	03	3	05	3	17	02	8
17	1	11	61	8	4	2038	J	32 18 S	129 49 E	15.7	36.13	04	03	3	05	3	17	02	8
17	1	12	61	8	4	2355	J	32 18 S	129 13 E	15.6	36.17	00	04	2	00	2	17	02	8
17	1	13	61	8	5	0338	J	32 20 S	128 37 E	15.5	36.17	00	05	1	00	2	16	02	8
17	1	14	61	8	5	0646	J	32 21 S	128 02 E	14.9	36.20	00	05	2	00	2	16	02	8
17	1	15	61	8	5	0955	J	32 21 S	127 26 E	14.3	36.24	00	05	1	01	2	16	02	8
17	1	16	61	8	5	1322	H	32 22 S	126 51 E	14.5	36.18	00	06	2	00	2	16	02	8
17	1	17	61	8	5	1630	H	32 22 S	126 05 E	15.1	36.08	28	02	3	28	3	17	02	8
17	1	18	61	8	5	1955	H	32 40 S	125 36 E	15.3	36.00	18	05	4	18	4	18	02	8
17	1	19	61	8	5	2315	H	32 58 S	125 08 E	15.6	35.90	18	01	4	18	4	18	02	8
17	1	20	61	8	6	0220	H	33 15 S	124 39 E	15.5	35.81	06	04	2	06	2	18	01	8
17	1	21	61	8	6	0545	H	33 32 S	124 10 E	15.7	35.77	06	04	2	06	2	18	01	8
17	1	22	61	8	6	0906	H	33 46 S	123 51 E	15.7	35.77	06	04	3	18	1	18	01	8
17	1	23	61	8	6	1225	H	33 02 S	123 24 E	16.2	35.75	04	04	0	04	2	18	01	8
17	1	24	61	8	6	1550	H	34 06 S	122 48 E	16.3	35.73	99	01	0	00	0	00	02	8
17	1	25	61	8	7	1000	H	34 02 S	122 11 E	15.8	35.75	27	06	3	27	3	00	02	8
17	1	26	61	8	10	0944	H	34 08 S	121 32 E	15.8		00	03	0	00	0	00	03	8
17	1	27	61	8	10	1307	H	34 20 S	121 00 E	16.5	35.62	00	04	2	00	2	19	02	8
17	1	28	61	8	10	1633	H	34 31 S	120 26 E	17.2	35.73	01	02	2	01	2	19	02	8
17	1	29	61	8	10	1945	H	34 42 S	119 53 E	15.2	35.62	03	03	3	03	3	19	20	5
17	1	30	61	8	10	2100	H	34 47 S	119 41 E	15.6	35.66	03	04	2	03	3	19	20	5
17	1	31	61	8	10	2200	H	34 51 S	119 30 E	15.2	35.57	03	04	2	03	3	19	20	5
17	1	32	61	8	10	2300	H	34 54 S	119 21 E	15.8	35.50	03	02	3	03	3	19	20	5
17	1	33	61	8	11	0000	H	34 58 S	119 10 E	15.4	35.61	03	02	3	03	3	19	20	5
17	1	34	61	8	11	0100	H	35 02 S	119 00 E	15.7	35.62	03	02	3	03	3	19	20	5
17	1	35	61	8	11	0200	H	35 06 S	118 50 E	16.8	35.70	35	01	1	35	1	21	02	8
17	1	36	61	8	11	0300	H	35 10 S	118 40 E	17.2	35.71	35	01	1	35	1	21	02	8
17	1	37	61	8	11	0400	H	35 12 S	118 29 E	17.2	35.70	35	04	1	35	1	21	02	8
17	1	38	61	8	11	0500	H	35 09 S	118 19 E	17.0	35.66	35	04	1	35	1	21	02	8
17	1	39	61	8	11	0600	H	35 07 S	118 09 E	16.9	35.64	35	04	1	35	1	21	02	8
17	2	40	61	8	15	2108	H	35 03 S	117 54 E	12.4	33.08	99	00	0	00	0	00	03	7
17	2	41	61	8	18	0710	H	35 07 S	118 01 E	13.2		99	00	0	00	0	00	01	8
17	2	42	61	8	18	0725	H	35 09 S	117 58 E			30	02	4	30	3	22	01	8
17	2	43	61	8	18	0750	H	35 10 S	117 55 E	16.8	35.50	30	04	4	30	3	22	01	8
17	2	44	61	8	18	0825	H	35 07 S	118 02 E			30	04	4	30	3	22	01	8
17	2	45	61	8	18	0840	H	35 06 S	118 04 E			30	04	4	30	3	22	01	8
17	2	46	61	8	18	0848	H	35 06 S	118 05 E			30	04	4	30	3	22	01	8
17	2	47	61	8	18	0848	H	35 05 S	118 06 E			30	04	4	30	3	22	01	8
17	2	48	61	8	18	0853	H	35 05 S	118 06 E			30	04	4	30	3	22	01	8
17	2	49	61	8	18	0923	H	35 03 S	118 10 E			30	04	4	30	3	22	01	8
17	2	50	61	8	18	0935	H	35 02 S	118 13 E			30	04	4	30	3	22	01	8
17	2	51	61	8	18	1116	H	34 58 S	118 24 E			30	04	4	30	3	22	01	8
17	2	51	61	8	18	1122	H	34 58 S	118 25 E	16.4	35.50	30	04	4	30	3	22	01	8

SHIP	CRUISE	STATION	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND	SEA	SWELL	PRESENT	VIS.	BAROMETRIC			
		NUMBER										DIR.	HT.	DIR.	WEATHER		PRESSURE			
17	2	52	61	8	18	1122	H	34 58 S	118 25 E			30	04	30	3	22	4	01	8	15
17	2	53	61	8	20	0930	H	34 56 S	118 29 E	16.3	35.48	30	03	30	1	19	4	03	8	23
17	2	54	61	8	20	1030	H	35 04 S	118 31 E	17.0	35.59	30	03	30	1	19	4	01	8	23
17	2	55	61	8	20	1130	H	35 12 S	118 32 E	17.3	35.59	23	03	23	3	20	7	01	8	23
17	2	56	61	8	20	1230	H	35 16 S	118 29 E	17.1	35.68	23	03	23	3	20	7	01	8	23
17	2	57	61	8	20	1330	H	35 20 S	118 22 E	16.5	35.62	23	03	23	3	20	7	01	8	23
17	2	58	61	8	20	1430	H	35 24 S	118 15 E	15.2	35.52	27	03	27	3	20	7	03	8	22
17	2	59	61	8	20	1530	H	35 20 S	118 09 E	17.4	35.64	27	03	27	3	20	7	03	8	22
17	2	60	61	8	20	1600	H	35 12 S	118 05 E	17.2	35.64	27	03	27	3	20	7	03	8	22
17	2	61	61	8	21	0600	H	35 08 S	118 01 E	17.2	35.61	20	03	20	3	20	4	01	8	21
17	2	62	61	8	21	0700	H	35 14 S	118 01 E	17.4	35.61	20	03	20	3	20	4	01	8	21
17	2	63	61	8	21	0935	H	35 07 S	118 01 E			30	06	30	4	20	4	18	6	23
17	2	64	61	8	21	1000	H	35 07 S	118 01 E			30	06	30	4	20	4	18	6	23
17	2	65	61	8	21	1010	H	35 08 S	118 00 E	16.9	35.48	30	04	30	4	20	4	18	6	23
17	2	66	61	8	22	0900	H	35 17 S	118 00 E	17.5	35.59	11	03	11	2	20	4	03	8	27
17	2	67	61	8	22	0920	H	35 19 S	118 00 E			11	03	11	2	20	4	03	8	27
17	2	68	61	8	22	1000	H	35 25 S	118 00 E	16.5	35.62	11	03	11	2	20	4	03	8	27
17	2	69	61	8	22	1100	H	35 28 S	117 51 E	16.4	35.62	05	04	05	3	20	2	03	8	27
17	2	70	61	8	22	1200	H	35 30 S	117 42 E	16.9	35.64	05	04	05	3	20	2	03	8	27
17	2	71	61	8	22	1300	H	35 26 S	117 33 E	17.5	35.66	05	04	05	3	20	2	03	8	27
17	2	72	61	8	22	1400	H	35 24 S	117 23 E	17.7	35.66	05	01	05	3	20	4	01	8	26
17	2	73	61	8	22	1500	H	35 22 S	117 15 E	17.7	35.61	05	01	05	3	20	4	01	8	26
17	2	74	61	8	22	1600	H	35 19 S	117 28 E	17.8	35.64	05	01	05	3	20	4	01	8	26
17	2	75	61	8	22	1700	H	35 19 S	117 36 E	17.3	35.59	06	05	06	4	4	9	03	8	25
17	2	76	61	8	22	1710	H	35 18 S	117 38 E			06	05	06	4	4	9	03	8	25
17	2	77	61	8	22	1800	H	35 17 S	117 44 E	17.0	35.55	06	05	06	4	4	9	03	8	25
17	3	78	61	8	27	0900	H	35 11 S	117 36 E	16.7	35.59	21	03	21	2	23	4	18	7	23
17	3	79	61	8	27	1000	H	35 10 S	117 26 E	17.3	35.59	21	03	21	2	23	4	18	7	23
17	3	80	61	8	27	1025	H	35 10 S	117 21 E			21	03	21	2	23	4	18	7	23
17	3	81	61	8	27	1100	H	35 09 S	117 16 E	17.4	35.59	99	00	99	0	23	4	02	8	23
17	3	82	61	8	27	1200	H	35 08 S	117 06 E	17.4	35.59	99	00	99	0	23	4	02	8	23
17	3	83	61	8	27	1300	H	35 07 S	116 57 E	17.4	35.59	99	00	99	0	23	4	02	8	23
17	3	84	61	8	27	1400	H	35 07 S	116 46 E	17.4	35.59	99	00	99	0	23	4	02	8	23
17	3	85	61	8	27	1500	H	35 05 S	116 35 E	17.5	35.61	27	01	27	0	24	4	02	8	22
17	3	86	61	8	27	1600	H	35 05 S	116 23 E	17.6	35.61	27	01	27	0	24	4	02	8	22
17	3	87	61	8	27	1628	H	35 05 S	116 18 E			05	02	05	0	24	4	02	8	22
17	3	88	61	8	27	1700	H	35 05 S	116 13 E	17.6	35.57	05	02	05	0	24	4	02	8	22
17	3	89	61	8	27	1800	H	35 05 S	116 02 E	17.5	35.57	05	02	05	0	24	4	02	8	22
17	3	90	61	8	27	2100	H	34 07 S	115 31 E	17.8	35.64	07	03	07	2	24	4	02	8	22
17	3	91	61	8	27	2400	H	34 45 S	115 03 E	18.2	35.57	07	03	07	2	24	4	02	8	22
17	3	92	61	8	28	0300	H	34 28 S	114 56 E	18.1	35.57	07	04	07	3	24	4	02	8	20
17	3	93	61	8	28	0800	H	33 54 S	114 44 E	18.3	35.50	05	04	05	4	27	1	03	8	14
17	3	94	61	8	28	0900	H	33 47 S	114 48 E	17.7	35.50	03	06	03	4	27	1	03	8	14
17	3	95	61	8	28	1000	H	33 41 S	114 54 E	17.2	35.44	03	06	03	4	27	1	03	8	14
17	3	96	61	8	28	1010	H	33 40 S	114 54 E			03	06	03	4	27	1	03	8	14
17	3	97	61	8	28	1100	H	33 34 S	114 57 E	16.4	35.46	03	06	03	4	27	1	03	8	14
17	3	98	61	9	1	0001	H	32 39 S	115 29 E	17.0	35.48	33	02	33	2	24	4	01	8	20
17	3	99	61	9	1	0300	H	32 34 S	115 21 E	18.2	35.48	34	04	34	2	27	3	03	8	20
17	3	100	61	9	1	0600	H	32 06 S	115 24 E	18.8	35.44	34	04	34	2	27	3	03	8	20
17	3	101	61	9	5	2355	H	32 12 S	115 44 E	15.7	34.27	09	01	09	0	99	0	01	8	23
17	3	102	61	9	6	0730	H	31 56 S	115 38 E	16.8	35.35	99	00	99	0	99	0	01	8	22

SHIP	CRUISE	STATION	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND	SEA	SWELL	PRESENT	VIS.	BAROMETRIC	
		NUMBER										DIR.	FORCE	DIR.	AMT.	WEATHER	PRESSURE	
17	3	103	61	9	6	0830	H	31 56 S	115 25 E	18.4	35.39	99	00	99	0	01	8	22
17	3	104	61	9	6	0930	H	31 56 S	115 13 E	19.5	35.41	06	02	06	1	28	2	22
17	3	105	61	9	6	1030	H	31 56 S	115 02 E	19.6	35.46	06	02	06	1	28	2	22
17	3	106	61	9	6	1130	H	31 52 S	114 55 E	19.6	35.46	07	03	07	2	28	2	21
17	3	107	61	9	6	1230	H	31 43 S	114 55 E	19.7	35.44	07	03	07	2	28	2	21
17	3	108	61	9	6	1330	H	31 35 S	114 55 E	20.0	35.46	07	03	07	2	28	2	21
17	3	109	61	9	6	1430	H	31 28 S	114 55 E	19.9	35.50	99	00	99	1	28	2	22
17	3	110	61	9	6	1530	H	31 20 S	114 55 E	19.8	35.50	99	00	99	1	28	2	22
17	3	111	61	9	6	1600	H	31 15 S	114 54 E	19.8	35.46	99	00	99	1	28	2	22
17	3	112	61	9	6	1715	H	31 05 S	114 52 E	19.8	35.52	20	03	20	1	22	5	18
17	3	113	61	9	6	1800	H	31 00 S	114 51 E	19.6	35.50	20	03	20	1	22	5	18
17	3	114	61	9	7	0001	H	30 48 S	114 47 E	19.8	35.52	20	03	20	1	22	5	18
17	3	115	61	9	7	0600	H	30 37 S	114 43 E	19.8	35.44	27	03	26	1	21	2	19
17	3	116	61	9	7	0800	H	30 26 S	114 41 E	19.8	35.44	27	03	26	1	21	2	19
17	3	117	61	9	7	0900	H	30 19 S	114 36 E	19.7	35.41	27	03	26	1	21	2	18
17	3	118	61	9	7	1100	H	30 35 S	114 39 E	19.9	35.44	23	03	23	1	23	2	18
17	3	119	61	9	7	1200	H	30 44 S	114 40 E	19.7	35.48	23	03	23	1	23	2	18
17	3	120	61	9	7	1300	H	30 57 S	114 41 E	20.0	35.52	23	03	23	1	23	2	18
17	3	121	61	9	7	1500	H	31 10 S	114 43 E	19.6	35.48	19	03	21	2	23	2	19
17	3	122	61	9	7	1700	H	31 25 S	114 54 E	19.5	35.46	19	03	21	2	23	2	19
17	3	123	61	9	7	1800	H	31 32 S	115 00 E	19.6	35.43	25	02	23	2	23	2	20
17	3	124	61	9	7	2400	H	32 03 S	114 57 E	19.0	35.52	25	02	25	02	25	02	21
17	3	125	61	9	8	0001	H	32 03 S	114 57 E	18.8	35.52	25	02	25	02	25	02	21
17	3	126	61	9	8	0600	H	32 27 S	114 55 E	19.0	35.46	99	01	99	9	24	5	22
17	3	127	61	9	8	0830	H	32 29 S	114 56 E	19.4	35.44	04	02	04	1	24	5	24
17	3	128	61	9	8	0930	H	32 27 S	115 05 E	19.4	35.44	04	02	04	1	24	5	24
17	3	129	61	9	8	1030	H	32 20 S	115 11 E	19.3	35.43	04	02	04	1	24	5	24
17	3	130	61	9	8	1130	H	32 12 S	115 17 E	19.4	35.44	04	02	04	1	24	5	24
17	3	131	61	9	8	1400	H	31 58 S	115 31 E	16.4	34.76	04	02	04	1	24	5	24
17	3	132	61	9	8	1915	H	32 15 S	115 28 E	18.0	35.30	22	01	99	0	99	0	23
17	4	133	61	9	12	0900	H	32 07 S	115 26 E	18.0	35.30	16	03	16	3	22	4	24
17	4	134	61	9	12	1000	H	32 14 S	115 25 E	17.5	35.35	16	03	16	3	22	4	24
17	4	135	61	9	12	1100	H	32 21 S	115 25 E	18.4	35.39	16	03	16	2	22	4	24
17	4	136	61	9	12	1200	H	32 29 S	115 25 E	18.0	35.43	16	03	16	2	22	4	24
17	4	137	61	9	12	1305	H	32 35 S	115 25 E	18.8	35.43	16	03	16	2	22	4	24
17	4	138	61	9	12	1340	H	32 43 S	115 25 E	18.0	35.43	16	03	16	2	22	4	24
17	4	139	61	9	12	1400	H	32 46 S	115 25 E	18.2	35.43	14	03	14	2	22	4	23
17	4	140	61	9	12	1500	H	32 54 S	115 25 E	17.8	35.43	14	03	14	2	22	4	23
17	4	141	61	9	12	1600	H	33 03 S	115 25 E	17.3	35.44	14	03	14	2	22	4	23
17	4	142	61	9	12	1700	H	33 12 S	115 24 E	16.6	35.43	11	02	12	2	24	2	25
17	4	143	61	9	12	1800	H	33 21 S	115 24 E	16.5	35.26	11	02	12	2	24	2	25
17	4	144	61	9	13	0830	H	33 29 S	115 00 E	18.2	35.46	06	05	06	5	24	2	28
17	4	145	61	9	13	0930	H	33 32 S	114 50 E	18.6	35.46	06	05	06	5	24	2	28
17	4	146	61	9	13	1015	H	33 34 S	114 43 E	18.0	35.46	06	05	06	5	24	2	28
17	4	147	61	9	13	1030	H	33 35 S	114 40 E	18.5	35.48	06	05	06	3	24	2	27
17	4	148	61	9	13	1230	H	33 48 S	114 29 E	18.5	35.53	06	05	06	3	24	2	27
17	4	149	61	9	13	1345	H	33 57 S	114 29 E	17.2	35.59	99	01	99	3	24	2	26
17	4	150	61	9	13	1545	H	34 12 S	114 31 E	17.9	35.62	99	01	99	3	24	2	26
17	4	151	61	9	13	1800	H	34 29 S	114 40 E	17.7	35.57	16	03	16	2	24	2	26
17	4	152	61	9	14	0000	H	34 47 S	115 03 E	17.6	35.57	15	04	15	2	24	2	26
17	4	153	61	9	14	0300	H	34 53 S	115 18 E	17.7	35.61	15	04	15	2	24	2	26

SHIP CRUISE STATION YEAR MONTH DAY TIME ZONE LATITUDE LONGITUDE TEMP. SALINITY WIND DIR. FORCE DIR. HT. SEA DIR. SWELL DIR. AMT. WEATHER PRESENT VIS. BAROMETRIC PRESSURE

SHIP NUMBER	CRUISE NUMBER	STATION	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND DIR.	FORCE	SEA DIR.	HT.	SWELL DIR.	AMT.	WEATHER	PRESENT VIS.	BAROMETRIC PRESSURE
17	154	4	61	9	14	0600	H	35 00 S	115 38 E	17.8	35.57	09 06	06	09 09	4	16	2	01	8	28
17	155	4	61	9	14	0900	H	35 10 S	116 14 E	17.8	35.53	09 05	05	09 09	4	16	2	01	8	29
17	156	4	61	9	14	0915	H	35 10 S	116 17 E			09 05	05	09 09	4	16	2	01	8	29
17	157	4	61	9	14	0920	H	35 10 S	116 18 E			09 05	05	09 09	4	16	2	01	8	29
17	158	4	61	9	14	1020	H	35 10 S	116 31 E	17.8	35.53	09 05	05	09 09	4	16	2	01	8	29
17	159	4	61	9	14	1200	H	35 10 S	116 49 E	17.7	35.55	09 04	04	09 09	3	16	2	01	8	27
17	160	4	61	9	14	1500	H	35 09 S	117 16 E	17.0	35.46	09 06	06	09 09	4	16	2	01	8	26
17	161	4	61	9	14	1515	H	35 09 S	117 17 E			09 06	06	09 09	4	16	2	01	8	26
17	162	4	61	9	14	1800	H	35 10 S	117 45 E	16.5	35.39	09 05	05	09 09	3	16	2	02	8	27
17	163	4	61	9	19	0900	H	35 13 S	118 05 E	17.2	35.48	18 03	18	03 18	3	22	2	03	8	31
17	164	4	61	9	19	0910	H	35 14 S	118 05 E			18 03	18	03 18	3	22	2	03	8	31
17	165	4	61	9	19	0930	H	35 17 S	118 07 E			18 03	18	03 18	3	22	2	03	8	31
17	166	4	61	9	19	1000	H	35 21 S	118 09 E	17.1	35.62	18 03	18	03 18	3	22	2	03	8	31
17	167	4	61	9	19	1100	H	35 29 S	118 14 E	16.9	35.64	24 03	24	03 24	2	22	4	02	8	31
17	168	4	61	9	19	1200	H	35 23 S	118 21 E	16.5	35.61	24 03	24	03 24	2	22	4	02	8	31
17	169	4	61	9	19	1300	H	35 28 S	118 28 E	15.9	35.52	24 03	24	03 24	2	22	4	02	8	31
17	170	4	61	9	19	1400	H	35 28 S	118 37 E	16.2	35.53	24 02	24	02 24	1	22	4	02	8	31
17	171	4	61	9	19	1500	H	35 20 S	118 40 E	15.1	35.43	24 02	24	02 24	1	22	4	02	8	31
17	172	4	61	9	19	1600	H	35 13 S	118 42 E	16.1	35.52	24 02	24	02 24	1	22	4	02	8	31
17	173	4	61	9	19	1700	H	35 08 S	118 52 E	17.3	35.62	23 03	23	03 23	2	22	4	03	8	31
17	174	4	61	9	19	1800	H	35 05 S	119 00 E	17.1	35.62	23 03	23	03 23	2	22	4	03	8	31
17	175	4	61	9	19	2100	H	34 59 S	119 13 E	16.8	35.61	23 03	23	03 23	2	22	4	03	8	31
17	176	4	61	9	19	2300	H	34 55 S	119 22 E	17.0	35.61	23 03	23	03 23	2	22	4	03	8	31
17	177	4	61	9	20	0300	H	34 48 S	119 40 E	16.2	35.57	23 02	23	02 23	1	22	4	02	8	32
17	178	4	61	9	20	0500	H	34 45 S	119 47 E	16.9	35.61	23 02	23	02 23	1	22	4	02	8	32
17	179	4	61	9	20	0615	H	34 41 S	119 50 E	16.8	35.57	14 02	14	02 14	1	22	4	02	8	33
17	180	4	61	9	20	0800	H	34 27 S	119 38 E	16.3	35.50	99 01	99	01 99	1	20	2	02	8	33
17	181	4	61	9	20	1100	H	34 34 S	119 22 E	16.9	35.55	99 01	99	01 99	1	20	2	02	8	33
17	182	4	61	9	20	1300	H	34 50 S	119 17 E	17.4	35.53	99 01	99	01 99	1	21	4	03	8	33
17	183	4	61	9	20	1400	H	34 56 S	119 08 E	17.7	35.55	99 01	99	01 99	1	21	4	03	8	32
17	184	4	61	9	20	1500	H	35 02 S	118 53 E	17.0	35.53	99 01	99	01 99	1	20	2	03	8	32
17	185	4	61	9	20	1630	H	35 02 S	118 41 E	16.4	35.53	02 03	02	03 02	1	20	2	03	8	30
17	186	4	61	9	21	0800	H	34 58 S	118 33 E	17.2	35.52	02 03	02	03 02	1	20	2	03	8	30
17	187	4	61	9	21	0900	H	34 57 S	118 27 E	17.3	35.52	02 03	02	03 02	1	20	2	03	8	30
17	188	4	61	9	21	1000	H	34 57 S	118 27 E	17.3	35.52	02 03	02	03 02	1	20	2	03	8	30
17	189	4	61	9	21	1230	H	35 07 S	118 00 E			99 01	99	01 99	1	20	2	01	8	26
17	190	4	61	9	21	1300	H	35 11 S	117 54 E	17.7	35.48	99 01	99	01 99	1	20	2	01	8	26
17	191	5	61	9	22	1235	H	34 40 S	117 55 E			04 03	04	03 04	1	24	4	00	8	17
17	192	5	61	9	22	1330	H	35 09 S	118 12 E	18.2	35.61	04 03	04	03 04	1	24	4	00	8	17
17	193	5	61	9	22	1430	H	35 11 S	118 22 E	18.2	35.55	07 03	07	03 07	2	24	4	00	8	14
17	194	5	61	9	22	1530	H	35 13 S	118 32 E	18.1	35.59	07 03	07	03 07	2	24	4	00	8	14
17	195	5	61	9	22	1655	H	35 09 S	118 43 E	17.7	35.59	07 03	07	03 07	2	24	4	01	8	12
17	196	5	61	9	22	1800	H	35 05 S	118 53 E	16.6	35.53	07 03	07	03 07	2	24	4	01	8	12
17	197	5	61	9	22	2100	H	34 59 S	119 09 E	16.1	35.53	07 03	07	03 07	2	24	4	03	8	12
17	198	5	61	9	23	0001	H	34 54 S	119 23 E	16.8	35.55	99 01	99	01 99	1	22	4	02	8	12
17	199	5	61	9	23	0300	H	34 48 S	119 39 E	16.0	35.50	99 01	99	01 99	1	22	4	02	8	12
17	200	5	61	9	23	0600	H	34 41 S	119 58 E	17.0	35.55	29 04	29	04 29	3	22	2	02	8	12
17	201	5	61	9	25	0800	H	34 31 S	119 38 E	16.8	35.53	99 01	99	01 99	1	18	2	03	8	32
17	202	5	61	9	25	0900	H	34 39 S	119 41 E	16.8	35.70	99 01	99	01 99	1	18	2	03	8	32
17	203	5	61	9	25	1000	H	34 41 S	119 36 E	17.8	35.71	99 01	99	01 99	1	18	2	03	8	32
17	204	5	61	9	25	1200	H	34 48 S	119 25 E	15.9	35.61	09 02	09	02 09	1	18	2	03	8	32

SHIP	CRUISE	STATION	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND	SEA	SWELL	PRES.	VIS.	BAROMETRIC
NUMBER	NUMBER	NUMBER										DIR.	HT.	DIR.	WEATHER		PRESSURE
17	5	205	61	9	25	1300	H	34 51 S	119 20 E	16.7	35.66	09 02	09 1	18 2	03 8	8	32
17	5	206	61	9	25	1400	H	34 54 S	119 14 E	16.8	35.66	09 01	09 1	18 2	01 8	8	29
17	5	207	61	9	25	1500	H	34 58 S	119 07 E	16.0	35.61	09 01	09 1	18 2	01 8	8	29
17	5	208	61	9	25	1600	H	34 58 S	118 58 E	17.5	35.68	09 01	09 1	18 2	01 8	8	29
17	5	209	61	9	25	1700	H	35 05 S	118 52 E	16.6	35.66	09 01	09 1	18 2	01 8	8	29
17	5	210	61	9	25	1800	H	35 06 S	118 49 E	16.5	35.66	09 01	09 1	18 2	01 8	8	29
17	5	211	61	9	26	0001	H	35 10 S	118 33 E	17.2	35.68	09 01	09 1	18 2	01 8	8	27
17	5	212	61	9	26	0930	H	35 18 S	118 14 E	17.4	35.73	03 05	03 3	99 1	01 8	8	24
17	5	213	61	9	26	0930	H	35 17 S	118 08 E	17.4	35.73	04 05	04 3	20 2	02 8	8	24
17	5	214	61	9	26	1030	H	35 09 S	118 03 E	17.5	35.79	06 02	06 1	21 2	02 8	8	20
17	5	215	61	9	26	1100	H	35 09 S	118 00 E	17.4	35.57	06 02	06 1	21 2	02 8	8	20
17	5	216	61	10	1	0855	H	35 10 S	117 56 E	17.5	35.59	28 06	28 3	23 4	02 8	8	23
17	5	217	61	10	1	1000	H	35 13 S	117 49 E	17.5	35.59	28 06	28 3	23 4	02 8	8	23
17	5	218	61	10	1	1100	H	35 20 S	117 46 E	17.6	35.77	27 05	27 3	23 4	18 4	8	22
17	5	219	61	10	1	1200	H	35 28 S	117 44 E	17.3	35.77	27 05	27 3	23 4	18 4	8	22
17	5	220	61	10	1	1210	H	35 30 S	117 43 E	17.3	35.79	27 05	27 3	23 4	18 4	8	22
17	5	221	61	10	1	1500	H	35 30 S	117 43 E	17.3	35.79	27 04	27 3	23 4	18 4	8	21
17	5	222	61	10	1	1600	H	35 28 S	117 44 E	17.3	35.77	27 04	27 3	23 4	18 4	8	21
17	5	223	61	10	1	1745	H	35 14 S	118 02 E	17.6	35.71	28 05	28 3	23 4	18 4	8	21
17	5	224	61	10	2	0800	H	35 14 S	118 02 E	17.6	35.71	23 03	23 2	21 4	03 8	8	21
17	5	225	61	10	2	0818	H	35 16 S	118 03 E	17.5	35.77	23 03	23 2	21 4	03 8	8	21
17	5	226	61	10	2	0900	H	35 22 S	118 04 E	17.4	35.77	23 03	23 2	21 4	03 8	8	21
17	5	227	61	10	2	1000	H	35 26 S	117 58 E	17.4	35.79	23 03	23 2	21 4	03 8	8	21
17	5	228	61	10	2	1100	H	35 29 S	117 50 E	17.4	35.77	20 02	20 2	21 4	02 8	8	20
17	5	229	61	10	2	1200	H	35 27 S	117 43 E	17.4	35.77	20 02	20 2	21 4	02 8	8	20
17	5	230	61	10	2	1255	H	35 32 S	117 42 E	15.6	35.57	20 02	20 2	21 4	02 8	8	20
17	5	231	61	10	2	1400	H	35 30 S	117 43 E	17.5	35.77	21 04	21 2	21 4	03 8	8	20
17	6	232	61	10	3	0800	H	35 13 S	118 00 E	17.6	35.75	19 02	19 2	21 7	02 8	8	25
17	6	233	61	10	3	0900	H	35 21 S	117 59 E	17.6	35.79	19 02	19 2	21 7	02 8	8	25
17	6	234	61	10	3	1000	H	35 27 S	117 56 E	17.5	35.77	19 02	19 2	21 7	02 8	8	25
17	6	235	61	10	3	1200	H	35 31 S	117 51 E	15.4	35.57	22 03	22 2	21 7	03 8	8	25
17	6	236	61	10	3	1330	H	35 40 S	117 46 E	15.2	35.57	22 03	22 2	21 7	03 8	8	25
17	6	237	61	10	3	1400	H	35 44 S	117 43 E	15.3	35.57	19 03	19 2	21 7	02 8	8	26
17	6	238	61	10	3	1500	H	35 35 S	117 43 E	15.3	35.55	19 03	19 2	21 7	02 8	8	26
17	6	239	61	10	3	1700	H	35 26 S	117 43 E	17.7	35.77	99 01	99 2	21 7	03 8	8	26
17	6	240	61	10	3	1800	H	35 22 S	117 54 E	17.7	35.79	99 01	99 2	21 7	03 8	8	26
17	6	241	61	10	4	0800	H	35 14 S	117 57 E	17.6	35.73	99 01	99 1	21 4	03 8	8	30
17	6	242	61	10	4	0825	H	35 17 S	117 54 E	17.5	35.77	99 01	99 1	21 4	03 8	8	30
17	6	243	61	10	4	0900	H	35 20 S	117 50 E	17.7	35.77	99 01	99 1	21 4	03 8	8	30
17	6	244	61	10	4	1000	H	35 26 S	117 43 E	18.2	35.84	99 01	99 1	21 4	03 8	8	30
17	6	245	61	10	4	1100	H	35 31 S	117 39 E	18.2	35.81	99 01	99 1	21 4	02 8	8	28
17	6	246	61	10	4	1200	H	35 26 S	117 29 E	16.6	35.75	99 01	99 1	21 4	02 8	8	28
17	6	247	61	10	4	1300	H	35 25 S	117 20 E	17.7	35.79	99 01	99 1	21 4	02 8	8	28
17	6	248	61	10	4	1400	H	35 22 S	117 13 E	17.8	35.79	22 03	22 1	21 2	01 8	8	27
17	6	249	61	10	4	1500	H	35 26 S	117 04 E	17.5	35.81	22 03	22 1	21 2	01 8	8	27
17	6	250	61	10	4	1515	H	35 24 S	117 02 E	17.7	35.82	22 03	22 1	21 2	01 8	8	27
17	6	251	61	10	4	1600	H	35 21 S	116 55 E	18.2	35.77	22 03	22 1	21 2	01 8	8	27
17	6	252	61	10	4	1700	H	35 16 S	116 52 E	18.2	35.77	22 03	22 1	21 2	01 8	8	27
17	6	253	61	10	4	1800	H	35 18 S	116 48 E	18.1	35.75	22 03	22 1	21 2	01 8	8	27
17	6	254	61	10	5	0815	H	35 13 S	117 09 E	17.8	35.79	05 04	05 3	21 2	01 8	8	25
17	6	255	61	10	5	0900	H	35 13 S	117 17 E	17.8	35.81	05 04	05 3	21 2	01 8	8	25

SHIP	CRUISE	STATION	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND	SEA	SWELL	VIS.	BAROMETRIC	
		NUMBER										DIR.	HT.	DIR.	AMT.	WEATHER	PRESSURE
17	6	256	61	10	5	1200	H	35 11 S	117 42 E	17.4	35.66	07 05	07 4	21	2	03	23
17	7	257	61	10	10	0930	H	35 11 S	117 51 E	17.7	35.70	07 04	07 2	18	2	01	24
17	7	258	61	10	10	1100	H	35 22 S	117 47 E			07 04	07 3	18	2	02	21
17	7	259	61	10	10	1130	H	35 23 S	117 46 E			07 04	07 3	18	2	02	21
17	7	260	61	10	10	1200	H	35 25 S	117 48 E	17.3	35.75	07 04	07 3	18	2	02	21
17	7	261	61	10	10	1315	H	35 24 S	118 01 E	17.7	35.75	07 04	07 3	18	2	02	21
17	7	262	61	10	10	1500	H	35 10 S	118 15 E	17.7	35.77	07 04	07 3	18	2	01	18
17	7	263	61	10	10	1715	H	35 10 S	118 10 E	17.3	35.62	07 04	07 3	18	2	03	11
17	7	264	61	10	11	0715	H	35 10 S	118 00 E	17.6	35.73	08 04	08 3	18	2	05	11
17	7	265	61	10	11	0900	H	35 10 S	118 00 E			11 04	11 2	18	2	02	09
17	7	266	61	10	11	1110	H	35 10 S	118 00 E	17.6	35.64	11 04	11 2	18	2	02	09
17	7	267	61	10	11	1200	H	35 10 S	118 00 E	17.8	35.75	08 02	08 3	18	2	17	7
17	7	268	61	10	11	1450	H	35 10 S	118 00 E			08 02	08 3	18	2	17	7
17	7	269	61	10	11	1530	H	35 10 S	118 00 E			08 02	08 3	18	2	17	7
17	7	270	61	10	12	0720	H	35 10 S	118 00 E	17.2	35.61	32 02	25 1	20	2	01	8
17	7	271	61	10	15	0700	H	35 14 S	118 01 E	17.5	35.75	25 02	25 1	20	2	02	8
17	7	272	61	10	15	0800	H	35 21 S	118 01 E	17.6	35.77	01 02	09 1	20	2	03	8
17	7	273	61	10	15	0900	H	35 25 S	118 07 E	17.4	35.77	01 02	09 1	20	2	03	8
17	7	274	61	10	15	1010	H	35 30 S	118 14 E	17.0	35.79	01 02	09 1	20	2	03	8
17	7	275	61	10	15	1100	H	35 24 S	118 20 E	17.2	35.79	04 03	04 2	20	2	02	8
17	7	276	61	10	15	1200	H	35 18 S	118 25 E	17.4	35.79	04 03	04 2	20	2	02	8
17	7	277	61	10	15	1300	H	35 13 S	118 25 E	17.5	35.79	04 03	04 2	20	2	02	8
17	7	278	61	10	15	1400	H	35 05 S	118 32 E	17.8	35.79	09 03	09 2	20	2	01	8
17	7	279	61	10	15	1500	H	35 02 S	118 26 E	17.8	35.77	09 03	09 2	20	2	01	8
17	7	280	61	10	15	1600	H	35 04 S	118 14 E	17.6	35.70	09 03	09 2	20	2	01	8
17	7	281	61	10	16	0730	H	35 14 S	117 59 E	17.5	35.73	28 03	28 1	99	1	10	7
17	7	282	61	10	16	0830	H	35 20 S	117 54 E	17.8		25 05	25 3	99	1	02	8
17	7	283	61	10	16	0940	H	35 26 S	117 47 E	17.6	35.81	25 05	25 3	99	1	02	8
17	7	284	61	10	16	1100	H	35 33 S	118 38 E	15.6	35.61	27 05	27 3	99	1	02	8
17	7	285	61	10	16	1200	H	35 35 S	117 44 E	15.5	35.57	27 05	27 3	99	1	02	8
17	7	286	61	10	16	1400	H	35 23 S	118 00 E	17.6	35.77	28 06	28 4	99	1	03	8
17	8	287	61	10	20	0900	H	35 15 S	118 33 E	17.5	35.64	34 03	34 2	19	4	03	8
17	8	288	61	10	20	1010	H	35 18 S	117 23 E	17.5	35.73	34 03	34 2	19	4	03	8
17	8	289	61	10	20	1100	H	35 22 S	117 12 E	17.5	35.75	28 04	28 2	18	4	03	8
17	8	290	61	10	20	1120	H	35 22 S	117 10 E			28 04	28 2	18	4	03	8
17	8	291	61	10	20	1200	H	35 24 S	117 05 E	17.6	35.75	28 04	28 2	18	4	03	8
17	8	292	61	10	20	1350	H	35 29 S	116 48 E	17.3	35.75	28 03	28 2	18	4	03	8
17	8	293	61	10	20	1500	H	35 32 S	116 39 E	17.5	35.73	28 03	28 2	18	4	03	8
17	8	294	61	10	20	1700	H	35 25 S	116 23 E	17.6	35.77	29 04	29 2	18	4	02	8
17	8	295	61	10	20	1800	H	35 21 S	116 14 E	17.7	35.75	29 04	29 2	18	4	02	8
17	8	296	61	10	20	2100	H	35 13 S	115 54 E	17.8	35.73	30 04	30 3	18	4	02	8
17	8	297	61	10	21	0001	H	35 04 S	115 34 E	17.8	35.75	24 03	24 1	23	4	03	8
17	8	298	61	10	21	0600	H	34 43 S	114 47 E	16.8	35.75	24 03	24 1	23	4	03	8
17	8	299	61	10	21	0800	H	34 29 S	114 47 E	18.2	35.71	24 03	24 2	23	2	02	8
17	8	300	61	10	21	0850	H	34 29 S	114 40 E	18.3	35.71	24 03	24 2	23	2	02	8
17	8	301	61	10	21	1200	H	34 04 S	114 45 E	18.8	35.75	99 01	99 1	23	4	02	8
17	8	302	61	10	21	1400	H	33 46 S	114 30 E	19.2	35.75	23 02	23 4	4	01	8	27
17	8	303	61	10	21	1500	H	33 38 S	114 30 E	19.4	35.75	23 02	23 4	4	01	8	27
17	8	304	61	10	21	1600	H	33 32 S	114 30 E	19.1	35.71	23 02	23 4	4	01	8	27
17	8	305	61	10	21	1800	H	33 29 S	114 48 E	18.9	35.73	18 04	18 2	23	4	01	8
17	8	306	61	10	22	0700	H	33 08 S	114 39 E	18.8	35.71	11 04	11 3	21	7	02	26

SHIP CRUISE STATION YEAR MONTH DAY TIME ZONE LATITUDE LONGITUDE TEMP. SALINITY WIND DIR. FORCE DIR. SEA HT. SWELL DIR. AMT. PRESENT VIS. BAROMETRIC PRESSURE

Table with columns for Ship Cruise Station Number, Year, Month, Day, Time, Zone, Latitude, Longitude, Temp., Salinity, Wind Dir., Force, Sea Dir., Amt., Present Vis., and Barometric Pressure. The table contains multiple rows of data, some with missing values indicated by dashes.

SHIP CRUISE STATION YEAR MONTH DAY TIME ZONE LATITUDE LONGITUDE TEMP. SALINITY WIND DIR. FORCE SEA DIR. HT. SWELL DIR. AMT. PRESENT VIS. BAROMETRIC PRESSURE

SHIP	CRUISE	STATION	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND DIR.	FORCE	SEA DIR.	HT.	SWELL DIR.	AMT.	PRESENT VIS.	BAROMETRIC PRESSURE	
17	9	409	61	11	19	0900	H	35 15 S	117 50 E	17.8	35.75	33	01	34	1	23	1	02	7	10
17	9	410	61	11	19	1000	H	35 23 S	117 47 E	17.8	35.75									
17	9	411	61	11	19	1100	H	35 30 S	117 43 E	18.0	35.75									
17	9	412	61	11	19	1200	H	35 31 S	117 46 E	17.9	35.50									
17	9	413	61	11	19	1300	H	35 27 S	117 55 E	17.6	35.57									
17	9	414	61	11	19	1400	H	35 22 S	118 00 E	17.9	35.59									
17	9	415	61	11	19	1500	H	35 14 S	118 02 E	17.9	35.71									
17	9	416	61	11	19	1600	H	35 08 S	118 02 E	18.1	35.73									
17	9	417	61	11	21	0600	H	35 03 S	117 54 E											
17	9	418	61	11	21	0730	H	35 07 S	118 04 E	17.8	35.66									
17	9	419	61	11	21	0900	H	35 18 S	118 12 E	17.6	35.70									
17	9	420	61	11	21	1030	H	35 27 S	118 21 E	17.8	35.70									
17	9	421	61	11	21	1200	H	35 27 S	118 30 E	17.8	35.73									
17	9	422	61	11	21	1330	H	35 25 S	118 30 E	17.2	35.61									
17	9	423	61	11	21	1500	H	35 15 S	118 30 E	18.2	35.70									
17	9	424	61	11	21	1630	H	35 03 S	118 28 E	18.2	35.70									
17	9	425	61	11	21	1800	H	34 52 S	118 24 E	18.3	35.71									
17	9	426	61	11	22	0600	H	34 53 S	118 37 E	18.0	35.68									
17	9	427	61	11	22	0730	H	34 57 S	118 43 E	18.0	35.70									
17	9	428	61	11	22	0900	H	35 01 S	118 57 E	17.9	35.71									
17	9	429	61	11	22	1030	H	35 05 S	118 49 E	17.9	35.70									
17	9	430	61	11	22	1200	H	35 10 S	118 41 E	17.9	35.70									
17	9	431	61	11	22	1330	H	35 14 S	118 33 E	17.9	35.70									
17	9	432	61	11	22	1500	H	35 21 S	118 18 E	17.9	35.68									
17	9	433	61	11	22	1630	H	35 08 S	118 09 E	17.9	35.70									
17	9	434	61	11	23	0730	H	35 06 S	118 01 E											
17	9	435	61	11	23	0830	H	35 14 S	118 00 E	18.0	35.70									
17	9	436	61	11	23	0930	H	35 22 S	118 00 E	18.4	35.70									
17	9	437	61	11	23	1030	H	35 30 S	118 00 E	18.4	35.70									
17	9	438	61	11	23	1130	H	35 38 S	118 00 E	18.5	35.77									
17	9	439	61	11	23	1230	H	35 42 S	118 00 E	16.3	35.28									
17	9	440	61	11	23	1330	H	35 54 S	118 00 E	15.3	35.05									
17	9	441	61	11	23	1430	H	36 00 S	118 00 E	16.4	35.35									
17	9	442	61	11	23	1500	H	35 56 S	118 02 E											
17	9	443	61	11	23	1630	H	35 46 S	118 07 E	17.9	35.57									
17	9	444	61	11	23	1800	H	35 35 S	118 12 E	18.6	35.71									
17	9	445	61	11	23	1930	H	35 35 S	118 12 E											
17	9	446	61	11	24	0600	H	35 26 S	118 11 E	18.1	35.71									
17	9	447	61	11	24	0730	H	35 18 S	118 17 E	18.2	35.71									
17	9	448	61	11	24	0900	H	35 10 S	118 06 E	18.1	35.68									
17	9	449	61	11	24	0930	H	35 12 S	118 06 E	18.0										
17	9	450	61	11	24	1030	H	35 12 S	118 06 E											
17	9	451	61	11	24	1200	H	35 06 S	118 01 E											
17	10	452	61	12	4	0600	H	35 16 S	117 49 E	16.4	35.97									
17	10	453	61	12	4	0730	H	35 25 S	117 37 E	18.3	35.91									
17	10	454	61	12	4	0900	H	35 33 S	117 27 E	16.3	35.37									
17	10	455	61	12	4	0950	H	35 39 S	117 20 E	17.0										
17	10	456	61	12	4	1030	H	35 42 S	117 16 E	18.5	35.84									
17	10	457	61	12	4	1200	H	35 34 S	117 04 E	18.8										
17	10	458	61	12	4	1330	H	35 32 S	116 49 E	19.4	35.86									
17	10	459	61	12	4	1500	H	35 30 S	116 33 E	19.1	35.82									

SHIP CRUISE STATION YEAR MONTH DAY TIME ZONE LATITUDE LONGITUDE TEMP. SALINITY WIND DIR. FORCE DIR. HT. SEA SWELL DIR. AMT. PRESENT VIS. BAROMETRIC PRESSURE

17	10	460	61	12	4	1630	H	35 23 S	116 21 E	18.9	35.82	25	02	23	2	24	3	03	7	24
17	10	461	61	12	4	1800	H	35 20 S	116 05 E	19.0	35.90									
17	10	462	61	12	4	1930	H	35 17 S	115 54 E	19.0	35.84									
17	10	463	61	12	4	2100	H	35 15 S	115 45 E	17.6	35.81									
17	10	464	61	12	4	2400	H	35 11 S	115 27 E	17.2	35.75									
17	10	465	61	12	5	0300	H	35 02 S	115 12 E	18.8	35.86									
17	10	466	61	12	5	0600	H	34 44 S	114 52 E	18.8	35.82	14	04	14	2	14	5	02	7	26
17	10	467	61	12	5	0730	H	34 33 S	114 41 E	18.8	35.73									
17	10	468	61	12	5	0900	H	34 25 S	114 32 E	19.1	35.82	14	04	14	2	14	5	01	7	26
17	10	469	61	12	5	1030	H	34 12 S	114 32 E	18.8	35.91									
17	10	470	61	12	5	1200	H	33 59 S	114 31 E	18.8	35.88	14	05	14	3	14	5	02	8	26
17	10	471	61	12	5	1330	H	33 47 S	114 31 E	19.0	35.86									
17	10	472	61	12	5	1500	H	33 35 S	114 30 E	19.4	35.84	14	06	14	3	14	5	01	8	23
17	10	473	61	12	5	1630	H	33 24 S	114 38 E	18.7	35.90	14	05	14	3	14	5	00	7	21
17	10	474	61	12	5	1800	H	33 14 S	114 44 E	19.2	35.90									
17	10	475	61	12	5	1930	H	33 02 S	114 50 E	18.7	35.86									
17	10	476	61	12	5	2100	H	32 51 S	114 57 E	19.4	35.84	14	04	14	3	14	5	00	7	21
17	10	477	61	12	5	2400	H	32 27 S	115 10 E	19.2	35.82									
17	10	478	61	12	6	0300	H	32 06 S	115 25 E	19.0	36.17									
17	10	479	61	12	12	0600	H	31 59 S	115 35 E	20.0	35.32	08	01	00	0	17	1	01	7	15
17	10	480	61	12	12	0900	H	32 12 S	115 36 E	21.0	35.88	08	01	00	0	17	1	01	7	15
17	10	481	61	12	12	1200	H	32 09 S	115 26 E	20.9	36.06	27	03	27	1	17	1	00	7	15
17	10	482	61	12	17	2000	H	32 04 S	115 45 E	20.4	35.97	12	01	00	0	00	0	00	7	22
17	10	483	61	12	18	0600	H	31 57 S	115 39 E	20.9	35.95	12	02	11	1	11	1	00	7	22
17	10	484	61	12	18	0730	H	31 52 S	115 34 E	19.9	35.86	12	03	12	2	12	1	00	7	22
17	10	485	61	12	18	0815	H	31 47 S	115 30 E											
17	10	486	61	12	18	0830	H	31 44 S	115 28 E											
17	10	487	61	12	18	0900	H	31 43 S	115 47 E	20.1	35.79	12	03	12	2	12	1	00	8	22
17	10	488	61	12	18	1030	H	31 34 S	115 20 E	20.2	35.68	12	02	12	1	12	2	00	8	23
17	10	489	61	12	18	1200	H	31 31 S	115 09 E	20.6	35.62	14	02	14	1	16	2	00	8	22
17	10	490	61	12	18	1330	H	31 25 S	114 59 E	20.0	35.75	14	03	14	2	16	2	00	8	21
17	10	491	61	12	18	1500	H	31 13 S	114 58 E	20.6	35.81	16	03	16	2	18	2	00	8	20
17	10	492	61	12	18	1630	H	31 01 S	115 01 E	20.8	35.86	17	03	17	2	18	3	00	8	18
17	10	493	61	12	18	1800	H	30 47 S	114 56 E	21.2	35.91	17	04	17	2	18	3	00	8	18
17	10	494	61	12	18	2100	H	30 41 S	114 51 E	21.1	35.84									
17	10	495	61	12	18	2400	H	30 33 S	114 50 E	20.5	35.95									
17	10	496	61	12	19	0300	H	30 31 S	114 48 E	20.5	35.95									
17	10	497	61	12	19	0600	H	30 41 S	114 51 E	20.2	35.77									
17	10	498	61	12	19	0900	H	30 57 S	115 10 E	21.1	35.93	08	02	10	2	14	3	00	7	15
17	10	499	61	12	19	1100	H	31 11 S	115 11 E	22.1	35.90	07	02	07	2	09	3	01	8	16
17	10	500	61	12	19	1200	H	31 19 S	115 08 E	21.8	35.86	16	02	16	1	20	2	01	8	15
17	10	501	61	12	19	1500	H	31 36 S	115 18 E	21.2	35.86	16	02	16	1	20	1	01	8	14
17	10	502	61	12	19	1800	H	31 55 S	115 33 E	21.5	35.86	16	02	16	1	20	1	01	8	12

SHIP CRUISE STATION YEAR MONTH DAY TIME ZONE LATITUDE LONGITUDE TEMP. SALINITY WIND DIR. FORCE DIR. HT. SEA SWELL DIR. AMT. PRESENT VIS. BAROMETRIC PRESSURE

SHIP	CRUISE	STATION	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND DIR.	FORCE	SEA DIR.	HT.	SWELL DIR.	AMT.	PRESENT VIS.	BAROMETRIC PRESSURE
17	1	1	62	1	4	0230	H	32 11 S	115 43 E	22.8	36.31	05	01	05	1	00	0	01	8
17	1	2	62	1	4	1330	H	32 00 S	115 40 E	23.1	36.17	23	03	23	2	25	1	01	8
17	1	3	62	1	4	1500	H	31 57 S	115 27 E	22.8	35.95	20	03	20	2	23	2	01	8
17	1	4	62	1	4	1630	H	31 57 S	115 11 E	22.4	35.77	20	03	20	2	23	2	01	8
17	1	5	62	1	4	1800	H	31 57 S	114 51 E	22.3	35.77	20	03	20	2	23	2	01	8
17	1	6	62	1	4	1930	H	31 57 S	114 39 E	22.2	35.77	20	02	20	2	23	2	01	7
17	1	7	62	1	4	2100	H	31 57 S	114 24 E	22.0	35.81	20	02	20	2	23	2	01	7
17	1	8	62	1	4	2230	H	31 57 S	114 10 E	22.0	35.81	09	01	09	1	13	2	01	7
17	1	9	62	1	4	2400	H	31 57 S	113 56 E	21.5	35.84	09	02	09	1	13	2	01	8
17	1	10	62	1	5	0130	H	31 57 S	113 40 E	21.1	35.90	09	01	09	2	13	2	01	7
17	1	11	62	1	5	0330	H	31 57 S	113 24 E	21.5	35.84	11	02	11	2	16	2	01	8
17	1	12	62	1	5	0530	H	31 57 S	113 15 E	21.1	35.99	11	02	11	2	11	2	01	8
17	1	13	62	1	5	0900	H	31 57 S	113 15 E	21.1	35.99	11	02	11	2	16	2	01	8
17	1	14	62	1	5	1200	H	32 08 S	113 23 E	21.9	35.99	16	03	16	2	14	2	01	8
17	1	15	62	1	5	1330	H	32 18 S	113 27 E	21.8	35.86	16	01	16	1	16	1	01	8
17	1	16	62	1	5	1500	H	32 29 S	113 37 E	21.8	35.81	16	01	16	1	16	1	01	8
17	1	17	62	1	5	1630	H	32 39 S	113 45 E	22.0	35.95	16	01	16	1	16	1	01	8
17	1	18	62	1	5	1800	H	32 49 S	113 52 E	22.2	35.84	16	01	16	1	16	2	01	7
17	1	19	62	1	5	1930	H	33 00 S	114 00 E	22.1	35.84	16	01	16	1	16	2	01	7
17	1	20	62	1	5	2100	H	33 10 S	114 07 E	22.0	35.81	16	03	16	2	14	2	01	8
17	1	21	62	1	5	2400	H	33 32 S	114 23 E	21.9	35.81	16	01	16	1	16	1	01	8
17	1	22	62	1	6	0615	H	33 38 S	114 28 E	22.1	35.77	16	01	16	1	16	1	01	8
17	1	23	62	1	6	0700	H	33 38 S	114 28 E	22.1	35.77	16	01	16	1	16	1	01	8
17	1	24	62	1	6	1200	H	33 48 S	114 31 E	21.8	35.77	16	01	16	1	16	2	01	7
17	1	25	62	1	6	1330	H	33 56 S	114 49 E	21.2	35.77	16	03	16	2	16	2	01	8
17	1	26	62	1	6	1500	H	34 05 S	114 57 E	21.3	35.88	14	04	14	1	14	1	01	8
17	1	27	62	1	7	1800	H	34 12 S	115 00 E	21.3	36.11	14	03	14	2	17	2	01	8
17	1	28	62	1	8	0730	H	34 12 S	114 59 E	20.5	35.90	14	04	14	2	17	2	01	8
17	1	29	62	1	8	0900	H	34 11 S	114 56 E	20.7	35.93	14	04	14	2	17	3	01	8
17	1	30	62	1	8	1030	H	33 59 S	114 56 E	20.9	35.90	14	05	14	2	17	3	01	8
17	1	31	62	1	8	1135	H	33 52 S	114 57 E	21.7	36.04	18	04	18	2	17	3	01	8
17	1	32	62	1	8	1200	H	33 49 S	114 57 E	21.7	36.04	21	04	21	2	17	3	01	8
17	1	33	62	1	8	1300	H	33 42 S	114 57 E	21.7	35.99	22	03	22	1	20	3	01	8
17	1	34	62	1	8	1330	H	33 37 S	114 57 E	21.7	35.99	12	04	12	2	20	3	01	8
17	1	35	62	1	8	1430	H	33 29 S	114 58 E	20.2	36.06	14	04	14	2	17	2	01	8
17	1	36	62	1	8	1500	H	33 30 S	115 04 E	20.2	36.06	14	03	14	2	17	2	01	8
17	1	37	62	1	8	1900	H	33 28 S	115 03 E	21.7	35.91	14	04	14	2	17	2	01	8
17	1	38	62	1	9	0430	H	32 45 S	115 02 E	22.1	35.82	14	04	14	2	17	3	01	8
17	1	39	62	1	9	0600	H	32 36 S	115 06 E	22.0	35.73	18	04	18	2	17	3	01	8
17	1	40	62	1	9	0730	H	32 25 S	115 11 E	21.9	35.84	18	04	18	2	17	3	01	8
17	1	41	62	1	9	0900	H	32 16 S	115 25 E	22.3	35.88	18	03	18	2	18	2	01	8
17	1	42	62	1	9	0950	H	32 10 S	115 22 E	22.2	35.84	22	04	22	2	20	2	00	7
17	1	43	62	1	9	1030	H	32 05 S	115 20 E	22.2	35.84	22	04	22	2	20	2	00	7
17	1	44	62	1	10	0400	H	32 03 S	115 42 E	23.8	36.18	22	04	22	2	20	2	00	7
17	1	45	62	1	12	1200	H	32 02 S	115 34 E	22.8	36.18	22	04	22	2	20	2	00	7
17	1	46	62	1	12	1330	H	32 13 S	115 32 E	23.0	36.08	22	04	22	2	20	2	00	7
17	1	47	62	1	12	1500	H	32 22 S	115 29 E	22.9	36.06	22	04	22	2	20	2	00	7
17	1	48	62	1	12	1630	H	32 35 S	115 27 E	22.9	36.00	22	04	22	2	20	2	00	7
17	1	49	62	1	12	1800	H	32 45 S	115 25 E	22.3	35.93	22	04	22	3	20	3	00	7
17	1	50	62	1	12	1930	H	32 54 S	115 24 E	22.0	35.93	22	02	22	2	20	2	01	7
17	1	51	62	1	12	2100	H	33 08 S	115 24 E	22.3	35.90	22	02	22	2	20	2	01	7

SHIP CRUISE STATION YEAR MONTH DAY TIME ZONE LATITUDE LONGITUDE TEMP. SALINITY WIND DIR. SEA DIR. SWELL DIR. AMT. WEATHER PRESENT VIS. BAROMETRIC PRESSURE

SHIP NUMBER	CRUISE NUMBER	STATION NUMBER	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND DIR.	SEA DIR.	SWELL DIR.	AMT.	WEATHER	PRESENT VIS.	BAROMETRIC PRESSURE			
17	1	52	62	1	12	2400	H	33 29 S	115 22 E	22.2	36.15	16	04	16	1	18	1	01	7	14	
17	1	53	62	1	13	0730	H	33 37 S	115 20 E	23.4	36.44	24	02	24	1	00	0	00	8	15	
17	1	54	62	1	13	1200	H	33 36 S	115 18 E	23.9	36.27	20	03	20	1	00	0	01	8	13	
17	1	55	62	1	13	1500	H	33 35 S	115 12 E	23.5	36.45	17	02	17	1	17	1	01	7	14	
17	1	56	62	1	14	0400	H	33 33 S	115 04 E	21.8	36.15	23	02	23	2	18	1	01	8	14	
17	1	57	62	1	14	0900	H	33 31 S	114 50 E	21.0	35.97	23	02	23	2	18	1	01	8	14	
17	1	58	62	1	14	1030	H	33 34 S	114 36 E	21.4	35.82	23	02	23	2	18	2	01	8	14	
17	1	59	62	1	14	1200	H	33 44 S	114 29 E	21.9	35.77	19	03	19	1	18	2	01	8	14	
17	1	60	62	1	14	1330	H	33 56 S	114 25 E	22.2	35.77	19	03	19	1	18	2	01	8	14	
17	1	61	62	1	14	1430	H	34 04 S	114 24 E	22.6											
17	1	62	62	1	14	1500	H	34 07 S	114 23 E	22.8	35.71	19	03	19	1	18	2	01	8	14	
17	1	63	62	1	14	1630	H	34 19 S	114 20 E	22.8	35.79	20	03	20	1	18	2	01	8	12	
17	1	64	62	1	14	1800	H	34 25 S	114 22 E	21.8	36.06	20	02	20	1	18	2	01	8	12	
17	1	65	62	1	14	1930	H	34 37 S	114 19 E	21.8	36.06	20	01	20	1	18	2	01	7	12	
17	1	66	62	1	14	2100	H	34 49 S	114 16 E	21.5	35.95										
17	1	67	62	1	14	2230	H	35 02 S	114 13 E	21.9	35.88										
17	1	68	62	1	14	2400	H	35 14 S	114 10 E	21.0	35.88										
17	1	69	62	1	15	0130	H	35 27 S	114 06 E	20.3	35.90										
17	1	70	62	1	15	0300	H	35 40 S	114 02 E	21.3	35.88										
17	1	71	62	1	15	0400	H	35 48 S	114 00 E	20.1	35.71	27	02	27	2	24	2	02	7	08	
17	1	72	62	1	15	1030	H	35 47 S	114 10 E	21.0	35.90	27	05	27	3	24	3	80	6	09	
17	1	73	62	1	15	1200	H	35 45 S	114 25 E	21.1	35.93	27	04	27	2	24	3	18	3	09	
17	1	74	62	1	15	1330	H	35 43 S	114 37 E	21.1	35.91	27	04	27	2	24	4	51	6	09	
17	1	75	62	1	15	1500	H	35 41 S	114 52 E	21.6	35.82	27	04	27	2	23	4	02	6	09	
17	1	76	62	1	15	1630	H	35 39 S	115 08 E	21.4	35.90	27	04	27	2	24	5	01	7	09	
17	1	77	62	1	15	1800	H	35 26 S	115 24 E	20.9	35.93	27	04	27	2	24	6	01	7	09	
17	1	78	62	1	15	1930	H	35 35 S	115 38 E	21.0	36.00										
17	1	79	62	1	15	2100	H	35 33 S	115 48 E	19.8	35.91										
17	1	80	62	1	15	2400	H	35 30 S	116 09 E	21.2	35.88										
17	1	81	62	1	16	0300	H	35 27 S	116 29 E	19.8	35.88										
17	1	82	62	1	16	0600	H	35 26 S	116 48 E	20.9	35.86	25	05	23	3	23	6	02	7	10	
17	1	83	62	1	16	0730	H	35 20 S	117 06 E	19.7	35.91	24	05	23	3	23	7	02	6	11	
17	1	84	62	1	16	0900	H	35 16 S	117 23 E	19.7	35.86	23	06	23	3	23	7	02	6	12	
17	1	85	62	1	16	1030	H	35 12 S	117 41 E	19.7	35.88	23	06	23	3	23	7	02	6	12	
17	1	86	62	1	16	1200	H	35 08 S	117 59 E	19.5	35.86	23	07	23	3	23	7	02	6	13	
17	1	87	62	1	16	1400	H	35 07 S	118 01 E	20.0	35.97	14	02	14	2	18	2	03	8	17	
17	2	88	62	1	24	0530	H	35 10 S	118 16 E	20.4	35.88										
17	2	89	62	1	24	0700	H	35 14 S	118 31 E	20.2	35.88	18	02	18	2	18	2	01	8	18	
17	2	90	62	1	24	0830	H	35 09 S	118 44 E	20.2	35.86										
17	2	91	62	1	24	1000	H	35 03 S	118 57 E	20.4	35.88	18	04	18	3	18	2	01	8	19	
17	2	92	62	1	24	1130	H	34 58 S	119 10 E	20.1	35.82										
17	2	93	62	1	24	1300	H	34 54 S	119 22 E	20.3	35.82	18	04	18	3	18	2	01	8	19	
17	2	94	62	1	24	1430	H	34 42 S	119 26 E	20.4	35.88										
17	2	95	62	1	24	1600	H	34 31 S	119 31 E	20.4	35.90	14	03	14	3	18	2	03	8	19	
17	2	96	62	1	25	0530	H	34 21 S	119 40 E	20.0	35.90	14	03	14	3	18	2	02	8	19	
17	2	97	62	1	25	0700	H	34 18 S	119 54 E	19.9	35.95	14	04	14	3	18	2	01	8	21	
17	2	98	62	1	25	0830	H	34 16 S	120 08 E	19.9	35.86										
17	2	99	62	1	25	1000	H	34 14 S	120 22 E	19.8	35.84	14	05	14	3	18	2	02	8	21	
17	2	100	62	1	25	1130	H	34 12 S	120 35 E	19.5	35.81										
17	2	101	62	1	25	1300	H	34 10 S	120 50 E	19.5	35.81	10	05	10	3	18	2	01	8	21	
17	2	102	62	1	25	1430	H	34 07 S	121 04 E	19.7	35.81										

SHIP CRUISE STATION YEAR MONTH DAY TIME ZONE LATITUDE LONGITUDE TEMP. SALINITY WIND DIR. SEA HT. SWELL DIR. AMT. PRESENT VIS. BAROMETRIC PRESSURE

SHIP NUMBER	CRUISE NUMBER	STATION NUMBER	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND DIR.	SEA HT.	SWELL DIR.	SWELL AMT.	PRESENT VIS.	BAROMETRIC PRESSURE
17	2	103	62	1	25	1600	H	34 05 S	121 17 E	19.5	35.84	10 06	10 3	18 2	02	8	19
17	2	104	62	1	25	1730	H	34 02 S	121 30 E	19.2	35.81	09 04	09 2	14 2	03	8	18
17	2	105	62	1	28	0700	H	34 02 S	121 40 E	19.3	35.79	09 04	09 3	14 2	02	8	18
17	2	106	62	1	28	0830	H	34 02 S	121 56 E	19.3	35.79	09 04	09 3	14 2	02	8	18
17	2	107	62	1	28	1000	H	34 02 S	122 11 E	19.3	35.79	09 04	09 3	14 2	02	8	18
17	2	108	62	1	28	1130	H	33 59 S	122 24 E	19.2	35.79	09 06	09 3	14 2	01	8	16
17	2	109	62	1	28	1300	H	33 59 S	122 39 E	19.0	35.77	09 06	09 3	14 2	01	8	15
17	2	110	62	1	28	1430	H	33 59 S	122 52 E	19.2	35.82	09 06	09 3	14 2	01	8	20
17	2	111	62	1	28	1600	H	34 00 S	123 06 E	18.9	35.81	04 02	04 1	18 3	02		
17	2	112	62	2	1	0500	H	34 07 S	123 15 E			04 02	04 1	18 3	02		
17	2	113	62	2	1	0700	H	34 11 S	123 18 E			04 02	04 1	18 3	02		
17	2	114	62	2	1	0930	H	34 18 S	123 16 E			04 02	04 1	18 3	02		
17	2	115	62	2	1	0930	H	34 38 S	123 39 E			04 02	04 1	18 3	02		
17	2	116	62	2	1	1130	H	34 38 S	123 47 E			04 01	04 1	18 3	02		
17	2	117	62	2	1	1130	H	34 38 S	123 38 E	20.2	35.82	04 01	04 1	18 3	02		
17	2	118	62	2	1	1345	H	34 31 S	124 03 E	20.8	35.88	04 02	04 1	18 3	02		
17	2	119	62	2	1	1600	H	34 36 S	123 45 E	20.0	35.84	14 02	14 1	18 3	02		
17	2	120	62	2	1	1800	H	34 40 S	123 34 E	19.8	35.81	14 03	14 1	18 3	02		
17	2	121	62	2	1	2400	H	34 52 S	123 21 E	18.9	35.62	05 03	05 2	18 3	03		
17	2	122	62	2	2	0600	H	34 57 S	123 02 E	19.5	35.79	05 03	05 2	18 3	03		
17	2	123	62	2	2	0800	H	34 51 S	122 45 E	19.5	35.84	05 03	05 2	18 3	03		
17	2	124	62	2	2	0900	H	34 49 S	122 35 E	19.6	35.90	05 03	05 2	18 3	03		
17	2	125	62	2	2	1030	H	34 45 S	122 23 E	19.8	35.88	05 04	05 2	18 3	02		
17	2	126	62	2	2	1200	H	34 39 S	122 12 E	19.5	35.86	05 04	05 2	18 3	02		
17	2	127	62	2	2	1330	H	34 37 S	121 58 E	19.9	35.88	09 05	09 3	18 2	01		
17	2	128	62	2	2	1500	H	34 34 S	121 44 E	19.9	35.88	09 05	09 3	18 2	01		
17	2	129	62	2	2	1630	H	34 35 S	121 26 E	19.9	35.86	09 06	09 3	18 2	01		
17	2	130	62	2	2	1800	H	34 36 S	121 14 E	19.7	35.84	09 06	09 3	18 2	01		
17	2	131	62	2	2	2100	H	34 37 S	120 46 E	20.0	35.88						
17	2	132	62	2	2	2400	H	34 39 S	120 17 E	19.9	35.84						
17	2	133	62	2	3	0300	H	34 47 S	119 50 E	19.4	35.71						
17	2	134	62	2	3	0600	H	34 55 S	119 22 E	19.5	35.71						
17	2	135	62	2	3	0730	H	34 58 S	119 07 E	20.4	35.81						
17	2	136	62	2	3	0900	H	35 03 S	118 51 E	20.4	35.88	04 02	04 3	18 2	03		
17	2	137	62	2	3	1030	H	35 11 S	118 37 E	20.3	35.82	04 02	04 3	18 2	03		
17	2	138	62	2	3	1100	H	35 14 S	118 33 E			04 02	04 3	18 2	03		
17	2	139	62	2	3	1300	H	35 12 S	118 18 E			04 02	04 3	18 2	03		
17	2	140	62	2	3	1445	H	35 09 S	118 04 E			04 02	04 1	18 2	03		
17	2	141	62	2	3	1500	H	35 07 S	118 03 E			04 02	04 1	18 2	03		
17	3	142	62	2	12	1330	H	35 02 S	118 12 E	20.4	35.75	27 05	27 2	18 2	01		
17	3	143	62	2	12	1500	H	34 58 S	118 28 E	21.0	35.70	27 05	27 2	18 2	01		
17	3	144	62	2	12	1700	H	34 54 S	118 48 E	21.4	35.70	27 06	27 3	18 3	01		
17	3	145	62	2	12	1800	H	34 52 S	118 58 E	21.0	35.68	23 07	23 4	18 3	02		
17	3	146	62	2	13	0600	H	34 21 S	121 12 E	20.0	35.68	18 05	18 3	18 3	02		
17	3	147	62	2	13	0730	H	34 13 S	121 26 E	20.0	35.66	18 05	18 3	18 3	02		
17	3	148	62	2	13	0900	H	34 08 S	121 39 E	19.8	35.64	18 04	18 3	18 3	02		
17	3	149	62	2	13	1030	H	34 02 S	121 53 E	19.6	35.57	18 04	18 3	18 3	02		
17	3	150	62	2	13	1200	H	34 02 S	122 09 E	20.0	35.62	18 03	18 2	18 2	01		
17	3	151	62	2	13	1330	H	34 00 S	122 26 E	19.9	35.62	16 03	16 2	18 2	01		
17	3	152	62	2	13	1500	H	33 59 S	122 41 E	19.9	35.62	14 02	14 1	18 2	01		
17	3	153	62	2	13	1630	H	34 00 S	122 58 E	19.8	35.64	13 02	13 1	18 2	01		

SHIP CRUISE STATION YEAR MONTH DAY TIME ZONE LATITUDE LONGITUDE TEMP. SALINITY WIND DIR. WIND DIR. SEA DIR. SWELL DIR. AMT. PRESENT VIS. BAROMETRIC PRESSURE

SHIP	CRUISE	STATION	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND DIR.	WIND DIR.	SEA DIR.	SWELL DIR.	AMT.	PRESENT VIS.	BAROMETRIC PRESSURE	
17	3	154	62	2	14	0525	H	34 08 S	123 16 E	19.6		04 05	04 05	04 18	2	01	7	18	
17	3	155	62	2	14	0600	H	34 11 S	123 19 E			04 05	04 05	04 18	2	01	7	18	
17	3	156	62	2	15	0730	H	34 12 S	123 18 E	19.5	35.86	04 02	04 02	04 14	2	01	7	15	
17	3	157	62	2	15	0900	H	34 17 S	123 25 E	20.1	35.95	09 02	09 02	09 09	2	01	6	15	
17	3	158	62	2	15	1030	H	34 29 S	123 33 E	20.4	35.81	09 02	09 02	09 09	2	01	6	15	
17	3	159	62	2	15	1200	H	34 34 S	123 43 E	20.4	35.81	09 03	09 03	09 09	2	01	6	14	
17	3	160	62	2	15	1330	H	34 32 S	123 54 E	20.2	35.82	09 03	09 03	09 09	2	01	6	13	
17	3	161	62	2	15	1500	H	34 24 S	124 04 E	20.4	35.82	09 04	09 04	09 09	2	01	7	12	
17	3	162	62	2	15	1535	H	34 23 S	124 04 E			09 04	09 04	09 09	2	01	7	12	
17	3	163	62	2	15	1630	H	34 19 S	124 10 E	20.3	35.82	09 04	09 04	09 09	2	01	7	12	
17	3	164	62	2	15	1700	H	34 17 S	124 10 E			09 05	09 05	09 09	2	01	7	11	
17	3	165	62	2	15	1800	H	34 12 S	124 12 E	20.3	35.82	09 05	09 05	09 09	2	01	7	11	
17	3	166	62	2	16	0600	H	34 18 S	124 25 E	20.1	35.84	04 05	04 05	04 09	3	03	7	10	
17	3	167	62	2	16	0730	H	34 23 S	124 10 E	20.0	35.82	04 04	04 04	04 09	3	03	7	09	
17	3	168	62	2	16	0840	H	34 27 S	124 00 E			04 03	04 03	04 09	3	03	7	08	
17	3	169	62	2	16	0900	H	34 30 S	124 01 E	20.2	35.88	04 03	04 03	04 09	3	03	7	08	
17	3	170	62	2	16	0925	H	34 32 S	124 02 E			04 03	04 03	04 09	3	03	7	08	
17	3	171	62	2	16	1030	H	34 36 S	123 56 E	20.3	35.84	04 03	04 03	04 09	3	03	7	06	
17	3	172	62	2	16	1200	H	34 35 S	123 36 E			32 03	32 03	32 09	3	80	07	07	
17	3	173	62	2	16	1330	H	34 25 S	123 29 E	20.3	35.90	25 05	25 05	25 09	2	80	07	07	
17	3	174	62	2	16	1420	H	34 18 S	123 24 E			25 05	25 05	25 09	2	80	08	08	
17	3	175	62	2	16	1500	H	34 13 S	123 20 E	19.8	35.84	25 05	25 05	25 09	2	80	08	08	
17	3	176	62	2	16	1535	H	34 10 S	123 17 E	20.4	35.84	25 05	25 05	25 09	2	80	08	08	
17	3	177	62	2	16	1200	H	34 35 S	123 36 E			00 00	00 00	00 18	3		28	28	
17	3	178	62	2	21	0600	H	34 11 S	123 19 E			18 01	18 01	18 18	3	03	7	29	
17	3	179	62	2	21	0800	H	34 24 S	123 22 E			18 02	18 02	18 18	3	03	7	29	
17	3	180	62	2	21	1015	H	34 37 S	123 39 E			18 01	18 01	18 18	3	02	7	29	
17	3	181	62	2	21	1230	H	34 49 S	123 39 E	20.5	35.84	18 01	18 01	18 18	3	02	7	29	
17	3	182	62	2	21	1400	H	35 00 S	123 39 E			18 01	18 01	18 18	3	02	7	28	
17	3	183	62	2	21	1630	H	35 12 S	123 39 E	19.9	35.88	18 01	18 01	18 18	3	02	7	28	
17	3	184	62	2	21	1800	H	35 24 S	123 39 E			18 01	18 01	18 18	3	02	7	28	
17	3	185	62	2	22	0600	H	35 42 S	123 39 E	18.8	35.62	09 01	09 01	09 18	2	02	7	28	
17	3	186	62	2	22	0730	H	35 52 S	123 39 E	19.0	35.64	00 00	00 00	00 18	2	02	7	28	
17	3	187	62	2	22	0800	H					00 00	00 00	00 18	2	02	7	28	
17	3	188	62	2	22	1000	H	35 55 S	123 23 E	19.6	35.81	00 00	00 00	00 18	2	02	7	29	
17	3	189	62	2	22	1130	H	35 54 S	123 08 E	19.8	35.73	36 01	36 01	36 18	2	02	7	29	
17	3	190	62	2	22	1300	H	35 53 S	122 52 E	19.8	35.73	36 01	36 01	36 18	2	02	7	28	
17	3	191	62	2	22	1430	H	35 52 S	122 57 E	19.3	35.57	09 02	09 02	09 18	2	02	7	27	
17	3	192	62	2	22	1600	H	35 51 S	122 22 E	18.9	35.57	09 02	09 02	09 18	2	02	7	27	
17	3	193	62	2	22	1730	H	35 50 S	122 05 E	19.5	35.77	09 03	09 03	09 18	2	01	7	26	
17	3	194	62	2	22	1800	H	35 50 S	122 00 E			09 03	09 03	09 18	2	01	7	26	
17	3	195	62	2	22	2400	H	35 48 S	121 42 E	18.5	35.52								
17	3	196	62	2	23	0600	H	35 44 S	121 17 E	18.7	35.62	04 04	04 04	04 18	2	03	7	22	
17	3	197	62	2	23	0730	H	35 36 S	121 03 E	18.7	35.61	04 05	04 05	04 18	2	02	7	22	
17	3	198	62	2	23	0900	H	35 32 S	120 47 E	18.7	35.73	04 05	04 05	04 18	2	01	7	21	
17	3	199	62	2	23	1030	H	35 28 S	120 32 E	18.8	35.73	04 05	04 05	04 18	2	01	7	20	
17	3	200	62	2	23	1200	H	35 24 S	120 16 E	19.0	35.70	04 04	04 04	04 18	2	01	7	19	
17	3	201	62	2	23	1330	H	35 18 S	120 01 E	19.3	35.73	04 04	04 04	04 18	2	01	7	18	
17	3	202	62	2	23	1500	H	35 13 S	119 49 E	19.8	35.77	04 03	04 03	04 18	2	01	7	18	
17	3	203	62	2	23	1630	H	35 11 S	119 40 E	20.6	35.86	04 02	04 02	04 18	2	01	7	17	
17	3	204	62	2	23	1800	H	35 09 S	119 33 E	20.5	35.86	04 01	04 01	04 18	2	01	7	17	

SHIP CRUISE STATION YEAR MONTH DAY TIME ZONE LATITUDE LONGITUDE TEMP. SALINITY WIND DIR. FORCE DIR. HT. SEA SWELL DIR. AMT. PRESENT VIS. BAROMETRIC PRESSURE

SHIP	CRUISE	STATION	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND DIR.	FORCE	SEA DIR.	HT.	SEA SWELL DIR.	AMT.	PRESENT VIS.	BAROMETRIC PRESSURE
17	17	3	205	62	23	1930	H	35 06 S	119 14 E	20.8	35.82	27	02	27	1	18	2		17
17	17	3	206	62	23	2100	H	35 03 S	118 52 E	20.9	35.93	27	02	27	1	18	2		17
17	17	3	207	62	23	2330	H	35 03 S	118 24 E	20.6	35.91								
17	17	3	208	62	24	0130	H	35 04 S	118 04 E	20.6	35.93								
17	17	4	209	62	2	0730	H	35 06 S	118 01 E	20.4	35.75								
17	17	4	210	62	3	0800	H	35 10 S	118 01 E	20.4	35.75	18	01						
17	17	4	211	62	3	2090	H	35 16 S	118 01 E	20.4	35.86	18	03	18	2	18	3	01	7
17	17	4	212	62	3	2095	H	35 22 S	118 01 E	19.5	35.64	18	03						
17	17	4	213	62	3	2103	H	35 26 S	118 01 E	19.7	35.71								
17	17	4	214	62	3	2140	H	35 30 S	118 01 E	19.2	35.64	20	03						
17	17	4	215	62	3	2120	H	35 34 S	118 01 E	19.5	35.68	21	04	21	2	18	3	01	7
17	17	4	216	62	3	2130	H	35 35 S	118 00 E	19.5	35.64								
17	17	4	217	62	3	2150	H	35 24 S	117 56 E	19.8	35.68	21	03	21	1	18	2	01	7
17	17	4	218	62	3	21630	H	35 13 S	117 52 E	20.7	35.75								
17	17	4	219	62	3	0630	H	35 07 S	118 04 E	20.4	35.75	21	01	21	1	20	2	01	7
17	17	4	220	62	3	0730	H	35 14 S	118 17 E	20.2	35.68								
17	17	4	221	62	3	0900	H	35 32 S	118 25 E	19.8	35.73	20	02	20	1	20	2	01	7
17	17	4	222	62	3	1050	H	35 34 S	118 27 E	19.8	35.68	20	02						
17	17	4	223	62	3	1200	H	35 42 S	118 27 E	20.1	35.71	22	02	22	1	20	2	02	7
17	17	4	224	62	3	1330	H	35 50 S	118 28 E	20.0	35.71	22	02	22	1	20	2	02	7
17	17	4	225	62	3	1800	H	36 00 S	118 29 E	19.5	35.71	22	03	22	1	20	2	02	7
17	17	4	226	62	3	0600	H	36 08 S	118 27 E	18.9	35.73	24	03	24	1	19	3	01	7
17	17	4	227	62	3	0730	H	36 19 S	118 26 E	18.7	35.66								
17	17	4	228	62	3	0900	H	36 24 S	118 26 E			25	03	25	2	18	2	02	7
17	17	4	229	62	3	1200	H	36 24 S	118 26 E			25	03	25	2	23	3	02	8
17	17	4	230	62	3	1530	H	36 08 S	118 03 E	19.1	35.64	25	02	25	1	13	2	01	7
17	17	4	231	62	3	1630	H	35 56 S	118 03 E	19.1	35.64								
17	17	4	232	62	3	1800	H	35 45 S	117 58 E	19.1	35.68	25	02	25	1	23	1	01	8
17	17	4	233	62	3	1930	H	35 37 S	117 55 E	19.2	35.68								
17	17	4	234	62	3	0730	H	35 35 S	118 00 E	19.4	35.68	29	02	29	1	23	1	01	8
17	17	4	235	62	3	0900	H	35 31 S	117 47 E	20.2	35.81	29	02	29	1	23	1	02	8
17	17	4	236	62	3	1030	H	35 20 S	117 42 E	20.7	35.81								
17	17	4	237	62	3	1200	H	35 09 S	117 55 E	20.9	35.79	29	01	29	1	23	1	01	7
17	17	4	238	62	3	1330	H	35 09 S	117 55 E	21.0	35.79								
17	17	4	239	62	3	0600	H	35 02 S	118 02 E	20.5	36.02	11	04	11	2	14	3	02	6
17	17	4	240	62	3	0730	H	34 56 S	118 24 E	20.4	35.90	11	04	11	2	14	3	02	6
17	17	4	241	62	3	0800	H	35 03 S	118 15 E	20.6	36.04	10	03	10	1	09	1	01	8
17	17	4	242	62	3	1800	H	34 58 S	118 25 E	20.5	36.00	10	03	10	1	12	2	01	8
17	17	4	243	62	3	2000	H	34 54 S	118 45 E	20.2	35.86								
17	17	4	244	62	3	2200	H	34 50 S	119 05 E	20.1	35.77								
17	17	4	245	62	3	2400	H	34 45 S	119 24 E	19.8	35.77	10	03	10	1	12	2	01	8
17	17	4	246	62	3	0200	H	34 41 S	119 44 E	18.9	35.61								
17	17	4	247	62	3	0400	H	34 37 S	120 04 E	19.2	35.61	09	02	09	1	12	2	02	7
17	17	4	248	62	3	100600	H	34 32 S	120 24 E	18.8	35.59	08	02	08	2	23	2	02	7
17	17	4	249	62	3	100800	H	34 27 S	120 42 E	19.0	35.53	08	02	08	2	23	2	02	7
17	17	4	250	62	3	101000	H	34 17 S	121 02 E	19.9	35.84	08	03	08	2	23	2	02	7
17	17	4	251	62	3	101200	H	34 21 S	121 17 E	19.9	35.86	08	02	08	2	23	2	02	7
17	17	4	252	62	3	101400	H	34 11 S	121 38 E	20.0	35.84	09	03	09	2	10	2	01	8
17	17	4	253	62	3	101600	H	34 00 S	121 51 E	19.8	35.77	09	05	09	3	10	3	01	8
17	17	4	254	62	3	110800	H	33 54 S	121 57 E	19.8	35.82	11	01	00	0	00	0	02	5
17	17	4	255	62	3	130700	H	33 55 S	121 59 E	19.8	35.79	07	03	07	1	09	1	02	5

SHIP	CRUISE	STATION	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND	SEA	SWELL	PRESENT	VIS.	BAROMETRIC
		NUMBER										DIR.	HT.	DIR.	AMT.	WEATHER	PRESSURE
17	4	256	62	3	13	0900	H	34 01 S	122 16 E	19.8	35.82	07 04	07 2	08 2	02 6	6	22
17	4	257	62	3	13	1100	H	33 59 S	122 45 E	19.8	35.95	09 03	09 2	09 2	02 6	6	21
17	4	258	62	3	13	1300	H	33 59 S	122 54 E	19.8	35.95	09 05	09 2	09 2	02 6	6	20
17	4	259	62	3	13	1500	H	34 04 S	123 11 E	19.7	36.49	08 06	08 2	09 2	01 7	7	19
17	4	260	62	3	16	0900	H	34 11 S	123 20 E	19.7	35.95	17 03	17 1	19 2	01 7	7	17
17	4	261	62	3	16	1100	H	34 24 S	123 30 E	19.8	36.04	23 03	23 1	23 2	01 7	7	17
17	4	262	62	3	16	1200	H	34 32 S	123 34 E	20.0	36.06	23 03	23 1	23 2	01 7	7	17
17	4	263	62	3	16	1300	H	34 39 S	123 38 E	20.1	35.97	23 03	23 1	19 2	01 7	7	17
17	4	264	62	3	16	1500	H	34 34 S	123 56 E	20.1	35.97	21 03	21 1	19 2	01 7	8	17
17	4	265	62	3	16	1700	H	34 23 S	124 08 E	19.9	35.95	21 03	21 1	19 2	01 7	7	18
17	4	266	62	3	16	1800	H	34 15 S	124 11 E	20.1	35.93	21 02	21 1	19 2	01 7	7	18
17	4	267	62	3	17	0700	H	34 06 S	124 32 E	19.8	36.02	24 03	24 1	25 2	01 7	7	20
17	4	268	62	3	17	0830	H	34 09 S	124 43 E								
17	4	269	62	3	17	0900	H	34 11 S	124 47 E	19.9	36.00	23 03	23 2	21 2	01 7	7	21
17	4	270	62	3	17	1000	H	34 06 S	124 51 E	19.9	36.00	23 03	23 2	21 2	01 7	7	21
17	4	271	62	3	17	1100	H	34 06 S	124 55 E	19.9	36.00	23 02	23 1	21 2	02 7	7	21
17	4	272	62	3	17	1300	H	33 57 S	125 08 E	20.2	36.00	23 02	23 1	21 2	01 8	21	21
17	4	273	62	3	17	1500	H	33 58 S	125 21 E	19.9	35.79	23 03	23 1	21 2	01 8	21	21
17	4	274	62	3	17	1700	H	34 06 S	125 06 E	20.2	36.00	20 02	20 1	20 2	01 8	21	21
17	4	275	62	3	17	1800	H	34 07 S	124 56 E			20 02	20 1	20 2	01 7	7	21
17	4	276	62	3	17	1900	H	34 07 S	124 54 E	20.2	36.08	17 01	17 1	18 2	01 7	7	21
17	4	277	62	3	18	0700	H	34 05 S	125 02 E	20.1	36.04	05 02	05 1	02 2	01 7	7	22
17	4	278	62	3	18	0900	H	34 09 S	124 47 E	20.0	36.00	05 02	05 1	02 2	01 7	7	22
17	4	279	62	3	18	1025	H	34 11 S	124 34 E			05 02	05 1	02 2	01 7	7	23
17	4	280	62	3	18	1100	H	34 12 S	124 29 E	19.9	36.00	06 02	06 2	04 2	01 8	8	23
17	4	281	62	3	18	1300	H	34 15 S	124 10 E	20.1	36.00	06 04	06 2	04 3	01 8	8	22
17	4	282	62	3	18	1430	H	34 16 S	123 54 E								
17	4	283	62	3	18	1500	H	34 16 S	123 50 E	19.9	36.04	07 04	07 2	04 3	01 6	6	22
17	4	284	62	3	18	1700	H	34 13 S	123 30 E	19.8	35.97	07 04	07 2	06 3	01 7	7	21
17	4	285	62	3	18	1900	H	34 04 S	123 13 E	19.9	36.02	08 04	08 3	08 3	01 7	7	21
17	4	286	62	3	19	0800	H	34 00 S	123 06 E	20.0	36.06	08 05	08 2	08 3	02 7	7	20
17	4	287	62	3	19	1000	H	33 56 S	122 49 E	20.1	36.02	08 03	08 2	08 1	03 6	20	20
17	4	288	62	3	19	1200	H	33 59 S	122 34 E	19.9	36.00	27 04	27 2	25 2	61 5	20	20
17	4	289	62	3	19	1400	H	34 01 S	122 14 E	19.9	36.00	27 01	27 1	25 1	02 6	20	20
17	4	290	62	3	19	1600	H	33 55 S	122 01 E	19.9	35.91	05 01	05 1	07 1	61 5	19	19
17	4	291	62	3	21	1500	H	33 55 S	121 43 E	20.2	35.91	16 04	16 2	14 3	01 7	7	23
17	4	292	62	3	22	0300	H	34 10 S	121 25 E	20.0	36.04	06 02	06 1	23 2	01 7	7	24
17	4	293	62	3	22	0500	H	34 24 S	121 15 E	19.9	36.02	07 03	07 1	23 2	01 7	7	25
17	4	294	62	3	22	0600	H	34 31 S	121 10 E	19.8	35.99	07 02	07 1	23 2	01 7	7	25
17	4	295	62	3	22	0800	H	34 45 S	121 00 E	19.5	35.79	07 02	07 1	23 2	01 8	26	26
17	4	296	62	3	22	1000	H	34 55 S	120 52 E	19.5	35.79	07 02	07 1	23 2	01 8	26	26
17	4	297	62	3	22	1100	H	34 58 S	120 49 E			07 02	07 1	23 2	01 8	26	26
17	4	298	62	3	22	1500	H	34 58 S	120 47 E	19.8	35.79	07 02	07 1	23 2	01 8	26	26
17	4	299	62	3	22	1700	H	34 58 S	120 28 E	19.8	35.86	07 02	07 1	23 2	01 8	26	26
17	4	300	62	3	22	1900	H	34 58 S	120 13 E	20.0	35.86	07 02	07 1	23 2	01 7	7	25
17	4	301	62	3	22	2100	H	34 58 S	119 57 E	19.4	35.82	07 01	07 1	23 2	01 7	7	25
17	4	302	62	3	23	0100	H	34 58 S	119 41 E	19.3	35.82	07 01	07 1	23 2	01 7	7	24
17	4	303	62	3	23	0300	H	34 58 S	119 31 E	19.3	35.82	05 02	05 1	23 1	01 7	7	24
17	4	304	62	3	23	0500	H	34 58 S	119 25 E	19.3	35.79	05 02	05 1	23 1	01 7	7	23
17	4	305	62	3	23	0700	H	34 58 S	119 10 E	19.5	35.82	06 03	06 2	23 2	01 4	8	23
17	4	306	62	3	23	0900	H	34 58 S	118 50 E	20.7	35.95	07 04	07 2	23 3	00 8	23	23

SHIP CRUISE STATION YEAR MONTH DAY TIME ZONE LATITUDE LONGITUDE TEMP. SALINITY WIND DIR. FORCE DIR. HT. SEA SWELL DIR. AMT. WEATHER PRESENT VIS. BAROMETRIC PRESSURE

SHIP	CRUISE	STATION	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND DIR.	FORCE	DIR.	HT.	SEA SWELL DIR.	AMT.	WEATHER	PRESENT VIS.	BAROMETRIC PRESSURE		
17	4	307	62	3	23	1100	H	34 58 S	118 33 E	20.2	36.02	07	02		07	1	23	3	01	7	23	
17	4	308	62	3	23	1300	H	35 00 S	118 17 E	20.3	36.02	07	03		07	1	23	3	01	7	23	
17	5	309	62	3	27	0700	H	35 12 S	118 01 E	20.2	36.04	20	03		20	2	18	3	01	7	20	
17	5	310	62	3	27	0725	H	35 12 S	118 01 E													
17	5	311	62	3	28	1000	H	35 13 S	117 59 E	20.3	36.00	25	01		25	1	18	3	01	7	24	
17	5	312	62	3	28	1200	H	35 28 S	117 54 E	20.3	36.02	25	02		25	1	18	3	01	7	23	
17	5	313	62	3	28	1400	H	35 27 S	117 34 E	20.5	35.99	25	02		25	1	18	3	01	7	22	
17	5	314	62	3	28	1600	H	35 25 S	117 15 E	20.1	35.99	25	04		25	2	18	3	01	7	22	
17	5	315	62	3	28	1800	H	35 24 S	116 58 E	20.1	35.93	25	02		25	1	18	3	01	7	21	
17	5	316	62	3	28	2100	H	35 23 S	116 37 E	20.3	35.93	25	02		25	1	18	3	01	7	21	
17	5	317	62	3	28	2400	H	35 21 S	116 15 E	20.3	35.93	25	02		25	1	18	3	01	7	21	
17	5	318	62	3	29	0300	H	35 15 S	115 55 E	20.5	36.00	25	02		25	2	23	3	01	7	20	
17	5	319	62	3	29	0600	H	35 10 S	115 39 E	20.4	36.00	25	03		25	1	23	3	01	7	20	
17	5	320	62	3	29	0800	H	35 05 S	115 24 E	20.4	36.00	25	03		25	2	23	3	01	7	20	
17	5	321	62	3	29	1000	H	35 00 S	115 08 E	20.7	35.93	25	03		25	2	23	3	01	7	20	
17	5	322	62	3	29	1200	H	34 46 S	115 05 E	20.7	35.91	25	04		25	3	23	3	01	7	20	
17	5	323	62	3	29	1400	H	34 32 S	115 01 E	20.7	35.91	24	04		24	3	23	4	01	7	19	
17	5	324	62	3	29	1600	H	34 19 S	114 58 E	20.8	35.95	23	03		23	2	23	4	01	7	20	
17	5	325	62	3	29	1800	H	34 12 S	114 51 E	20.5	36.02	26	02		26	1	23	2	01	7	20	
17	5	326	62	3	30	0800	H	34 03 S	114 58 E	20.6	35.91	99	01		99	1	23	2	01	7	20	
17	5	327	62	3	30	0925	H	33 53 S	114 57 E													
17	5	328	62	3	30	1000	H	33 49 S	114 56 E	20.4	36.00	29	01		29	1	26	2	01	7	20	
17	5	329	62	3	30	1200	H	33 32 S	115 00 E	20.4	36.00	35	02		35	1	26	2	01	7	20	
17	5	330	62	3	30	1400	H	33 31 S	114 59 E	20.7	35.95	34	02		34	1	26	2	01	7	19	
17	5	331	62	3	30	1500	H	33 22 S	115 01 E	20.9	35.99	32	02		32	1	26	2	01	7	19	
17	5	332	62	3	30	1600	H	33 11 S	115 02 E	20.6	36.04	25	02		25	1	26	2	01	7	19	
17	5	333	62	3	30	1800	H	33 04 S	115 03 E	20.5	36.06	23	03		23	2	25	2	01	7	19	
17	5	334	62	3	31	0600	H	32 52 S	115 03 E	20.5	36.00	20	02		20	1	24	2	01	7	19	
17	5	335	62	3	31	0800	H	32 35 S	115 03 E	22.9	35.79	20	02		20	2	24	2	01	7	18	
17	5	336	62	3	31	1000	H	32 19 S	115 09 E	23.0	35.77	19	04		19	3	24	3	01	8	18	
17	5	337	62	3	31	1200	H	32 06 S	115 21 E	22.1	35.84	19	03		19	2	24	3	01	6	18	
17	5	338	62	3	31	1400	H	31 56 S	115 35 E	22.2	35.81	19	04		19	3	24	3	01	7	18	
17	5	339	62	3	31	1500	H	32 00 S	115 40 E	20.5	36.47	19	03		19	2	24	2	01	7	19	
17	5	340	62	4	8	2100	H	31 56 S	115 35 E	20.5	35.97	10	02		10	1	23	1	01	7	20	
17	5	341	62	4	8	2400	H	32 18 S	115 25 E	20.1	36.00	10	01		10	1	23	1	01	7	20	
17	5	342	62	4	9	0300	H	32 45 S	115 21 E	20.4	36.00	10	02		10	1	24	1	01	7	21	
17	5	343	62	4	9	0600	H	33 11 S	115 17 E	20.4	36.00	10	02		10	1	25	1	01	7	22	
17	5	344	62	4	9	0800	H	33 23 S	115 04 E	20.5	36.09	10	02		10	1	25	1	01	7	22	
17	5	345	62	4	9	1000	H	33 39 S	114 56 E	20.4	36.04	09	03		09	1	25	1	01	7	23	
17	5	346	62	4	9	1030	H	33 43 S	114 56 E			08	04		08	3	24	3	01	7	23	
17	5	347	62	4	9	1200	H	33 55 S	114 55 E	21.8	36.17	08	03		08	2	24	2	01	8	23	
17	5	348	62	4	9	1400	H	34 07 S	114 42 E	22.3	35.93	14	04		14	3	21	3	01	8	22	
17	5	349	62	4	9	1600	H	34 11 S	115 00 E	20.3	36.22	14	05		14	3	16	3	01	8	22	
17	5	350	62	4	10	0900	H	34 19 S	114 57 E	20.5	36.04	10	05		10	3	12	3	01	7	22	
17	5	351	62	4	10	1000	H	34 22 S	115 04 E	21.2	35.91	12	05		12	2	14	2	01	7	23	
17	5	352	62	4	10	1200	H	34 24 S	115 06 E	21.2	35.99	12	03		12	2	14	2	01	7	22	
17	5	353	62	4	10	1500	H	34 36 S	115 25 E	21.6	35.99	14	02		14	1	11	2	01	7	21	
17	5	354	62	4	10	1600	H	34 41 S	115 31 E	21.4	36.00	14	02		14	1	11	2	05	7	21	
17	5	355	62	4	10	1800	H	34 46 S	115 41 E	20.2	36.11	14	03		14	2	14	2	05	6	21	
17	5	356	62	4	10	2100	H	35 05 S	116 03 E	20.3	36.02	12	03		12	2	12	2	01	6	21	
17	5	357	62	4	10	2400	H	35 11 S	116 24 E	20.6	36.04	12	04		12	2	12	2	01	6	22	

SHIP CRUISE STATION YEAR MONTH DAY TIME ZONE LATITUDE LONGITUDE TEMP. SALINITY WIND DIR. SEA SWELL PRESENT VIS. BAROMETRIC PRESSURE

SHIP CRUISE NUMBER	STATION	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND DIR.	SEA HT.	SWELL DIR.	SWELL AMT.	PRESENT WEATHER	VIS.	BAROMETRIC PRESSURE		
17	5	408	62	4	19	1600	H	35 07 S	117 59 E		14	05	14	3	16	3	02	7	19
17	5	409	62	4	23	0630	H	35 02 S	117 53 E		36	01	00	0	00	0	01	6	20
17	5	410	62	4	23	0730	H	35 07 S	118 01 E	20.1	36	02	36	1	18	2	01	6	20
17	5	411	62	4	23	0800	H	35 07 S	118 01 E										
17	5	412	62	4	23	0900	H	35 03 S	118 04 E										
17	5	413	62	4	23	1000	H	35 03 S	118 10 E	20.4									21
17	5	414	62	4	23	1200	H	35 09 S	117 52 E										21
17	5	415	62	4	23	1400	H	35 08 S	118 17 E										21
17	5	416	62	4	23	1500	H	35 07 S	117 48 E										21
17	5	417	62	4	23	1600	H	35 08 S	117 59 E										21
17	5	418																	
17	6	419																	
17	6	420	62	4	28	0900	H	35 08 S	117 57 E	20.4	32	02	32	1	23	4	00	8	29
17	6	421	62	4	28	1030	H	35 06 S	118 11 E	20.3	36	02	36	1	23	4	00	8	28
17	6	422	62	4	28	1200	H	35 04 S	118 24 E	20.4	05	02	05	1	23	4	00	8	28
17	6	423	62	4	28	1330	H	34 59 S	118 34 E	20.4	09	02	09	1	23	4	00	8	27
17	6	424	62	4	28	1500	H	35 11 S	118 35 E	21.0	09	02	09	1	23	1	00	8	26
17	6	425	62	4	28	1630	H	35 14 S	118 24 E	20.9	09	02	09	1	23	1	00	8	26
17	6	426	62	4	28	1800	H	35 09 S	118 11 E	20.6	09	02	09	1	23	1	00	8	26
17	6	427	62	4	29	0730	H	35 04 S	117 58 E	20.0	36	01	00	0	00	0	00	8	26
17	6	428	62	4	29	0820	H	35 08 S	117 58 E	20.8	23	01	23	1	23	1	03	8	27
17	6	429	62	4	29	0845	H	35 08 S	117 57 E	20.6	23	01	23	1	23	1	03	8	27
17	6	430	62	4	29	1030	H	35 08 S	117 50 E	20.8	23	04	23	1	23	1	50	6	26
17	6	431	62	4	29	1200	H	35 08 S	117 57 E	20.6	23	04	23	3	23	1	50	6	26
17	6	432	62	4	29	1345	H	35 05 S	118 08 E	20.6	23	04	23	3	23	1	50	6	26
17	6	433	62	4	29	1445	H	35 05 S	118 08 E		23	04	23	3	23	1	50	6	26
17	6	434	62	4	30	1540	H	35 03 S	118 03 E	20.2	23	04	23	3	23	1	50	6	26
17	6	435	62	4	30	0800	H	35 03 S	118 00 E	19.6	11	04	11	2	11	1	02	8	29
17	6	436	62	4	30	0900	H	35 04 S	118 07 E	20.5	11	04	11	2	18	4	02	8	29
17	6	437	62	4	30	1005	H	35 08 S	118 00 E		11	04	11	2	18	4	02	8	29
17	6	438	62	4	30	1035	H	35 08 S	117 57 E		11	04	11	2	18	4	02	8	29
17	6	439	62	4	30	1200	H	35 10 S	117 42 E	20.5	11	04	11	2	18	4	02	8	29
17	6	440	62	4	30	1420	H	35 06 S	117 47 E		09	05	09	3	16	4	02	8	27
17	6	441	62	4	30	1445	H				09	05	09	3	16	4	02	8	27
17	6	442	62	4	30	1500	H	35 07 S	117 52 E	20.3	09	05	09	3	16	4	02	8	27
17	6	443	62	4	30	1530	H	35 07 S	117 56 E		09	05	09	3	16	4	01	8	27
17	6	444	62	4	30	1630	H	35 08 S	118 00 E		09	05	09	3	16	4	01	8	27
17	6	445	62	4	30	1800	H	35 03 S	118 03 E	20.0	09	05	09	3	16	4	01	8	27
17	6	446	62	5	1	0820	H	35 03 S	118 01 E		04	04	09	1	18	1	03	8	25
17	6	447	62	5	1	0900	H	35 08 S	118 00 E	19.9	04	04	09	1	18	4	03	8	25
17	6	448	62	5	1	0900	H	35 08 S	118 00 E		04	04	09	1	18	4	02	8	25
17	6	449	62	5	1	0930	H	35 08 S	117 57 E		04	04	09	1	18	4	02	8	25
17	6	450	62	5	1	1000	H	35 08 S	117 56 E		04	04	09	1	18	4	02	8	25
17	6	451	62	5	1	1100	H	35 07 S	117 53 E		04	04	09	1	09	1	02	8	25
17	6	452	62	5	1	1200	H	35 11 S	117 53 E	20.0	04	04	09	1	09	1	02	8	25
17	6	453	62	5	1	1340	H	35 03 S	118 03 E		09	03	09	1	00	0	02	8	25
17	6	454	62	5	1	1515	H	35 08 S	117 57 E	20.2	09	03	09	3	00	0	01	8	25
17	6	455	62	5	3	0800	H	35 08 S	118 01 E		04	01	04	1	00	0	02	8	21
17	6	456	62	5	3	1000	H	35 08 S	117 57 E		04	01	04	1	00	0	02	8	21
17	6	457	62	5	3	1200	H	35 11 S	117 53 E	20.3	04	01	04	1	00	0	02	8	21
17	6	458	62	5	3	1330	H	35 08 S	118 01 E		04	01	04	1	00	0	02	8	21

SHIP	CRUISE	STATION	YEAR	MONTH	DAY	TIME	ZONE	LATITUDE	LONGITUDE	TEMP.	SALINITY	WIND	SEA	SWELL	PRESNT	VIS.	BAROMETRIC			
		NUMBER										DIR.	FORCE	DIR.	HT.	DIR.	AMT.	WEATHER	WEATHER	PRESSURE
17/	10	561	62	7	12	0530	I	32 08 S	131 56 E	16.8	36.55	07	04	07	1	99	1	03	7	16
17	10	562	62	7	12	0830	I	32 12 S	132 23 E	15.7	36.42	07	04	07	1	99	1	03	7	18
17	10	563	62	7	12	1130	I	32 13 S	132 47 E	16.1	36.31	08	01	08	1	99	1	03	8	17
17	10	564	62	7	12	1430	I	32 15 S	133 16 E	14.9		08	01	08	1	23	2	01	8	23
17	10	565	62	7	13	1130	I	32 38 S	133 44 E			23	01	23	1	23	2	01	8	22
17	10	566	62	7	13	1430	I	32 59 S	134 01 E			16	01	16	1	23	2	01	8	22
17	10	567	62	7	13	1730	I	33 20 S	134 20 E			17	01	17	1	23	2	01	8	24
17	10	568	62	7	13	2030	I	33 40 S	134 37 E	15.3										
17	10	569	62	7	13	2329	I	34 03 S	134 45 E	15.4										
17	10	570	62	7	14	0230	I	34 27 S	134 53 E	16.4										
17	10	571	62	7	14	0530	I	34 50 S	135 10 E	16.4										
17	10	572	62	7	14	0830	I	34 58 S	135 39 E	16.6										
												99	01	99	1	20	1	45	8	27

APPENDIX 4

AERIAL SPOTTING RESULTS

SUMMARY OF FLIGHTS

Flight Plan	Series 1	Series 2	Series 3	Series 4
1	7/5/62 0910-1238	17/5/62 0852-1200	16/6/62 0855-1155	
2	7/5/62 1358-1710	17/5/62 1321-1634	14/6/62 1250-1600	2/7/62 0850-1155
3	9/5/62 0930-1126	18/5/62 0940-1258		3/7/62 0845-0930 1425-1645
4	8/5/62 1328-1631	18/5/62 1344-1705	15/6/62 0835-1210	3/7/62 1035-1345
5	8/5/62 0926-1223	19/5/62 0908-1206		2/7/62 1250-1555
6	9/5/62 1232-1605	19/5/62 1259-1622	15/6/62 1300-1625	4/7/62 0830-1200

FLIGHT TRACK - SERIES 1, PLAN 1

PERTH-JURIEN BAY-PERTH

Time	Position		Course • true	Distance nautical miles
	Lat. oS.	Long. oE.		
0910	Perth Aerodrome		270	70
0947	31 56	114 37	338	103
1040	30 20	113 52	090	55
1103	30 20	114 55	160	6
1122	30 26	114 58	270	14
1133	30 26	114 42	160	27
1151	31 28	114 51	090	18
1205	31 28	115 12	160	20
1238	Perth Aerodrome			

Date 7.5.62
 Airborne 0910 hours
 Landed 1238 hours
 Observer P. Lorimer (P.I.)

Position	Sightings	General Remarks
Lat. oS.	Long. oE.	
32 04	114 31	
31 24	114 14	Weather - calm to light breezes at sea surface, low S.W. swell. Some haze and fog patches during first hour of flight. Cumulus cloud, sky 1/10 covered. Good spotting conditions throughout flight.
31 33	114 51	Current line running north-south. Bird life west of this line. Large school of porpoise feeding. Small school of porpoise. Six small schools of small unidentified fish. Birds in the area.
31 51	115 23	

FLIGHT TRACK - SERIES 1, PLAN 2

PERTH-ALBANY

Time	Position		Course ° true	Distance nautical miles
	Lat. °S.	Long. °E.		
1358	Perth Aerodrome		236	98
1447	32 50	114 22	180	108
1535	34 38	114 22	112	90
1630	35 11	116 02	090	90
1710	Eclipse I. Albany Aerodrome		348	14

Date 7.5.62
 Airborne 1358 hours
 Landed 1710 hours
 Observer P. Lorimer (P.I.)

Position	Sightings	General Remarks
Lat. Long. °S. °E. 34 17 114 13	Small school of small fish.	Weather - calm to light breezes at sea surface, low S.W. swell. Spotting conditions good until 1630 when sun was too low for effective work.

FLIGHT DETAILS - SERIES 1, PLAN 3

ALBANY - ALBANY

Time	Observations	Course of true
0930	Airborne Albany. Altitude 1000 ft.	223
0945	Current line SE-NW, 26 miles S. of Wilson's Head.	
1005	Wind NE 25 knots. Sea rough. Overcast, hazy. Altitude 1000-1300 ft. Flying conditions rough. Spotting conditions poor.	082
1035	Course for Bald I. Weather unsuitable for spotting.	
1100	10 miles SW Bald I. Wind increasing. Set course Albany.	
1112	Circled Bald Head.	
1126	Landed Albany.	

Date 9.5.62
 Airborne 0930 hours
 Landed 1126 hours
 Observer P. Lorimer (P.I.)

A strong NE wind, low cloud and rough conditions made effective spotting impossible.

FLIGHT DETAILS - SERIES 1, PLAN 4

ALBANY-ALBANY

Time	Observations	Course ° true
1328	Airborne Albany.	088
1348	Bald Island.	090
1408	Cloud 7/10, Fr. Cu. Base 1000-900 ft. Heavy haze. Wind ESE 20 knots. Low SW swell.	068
1423	34°42'; 119°52'. Four sperm whales (bulls) heading west.	
1439	Conditions clear, no cloud, still hazy.	089
1505	34°03'; 121°07'. Number of albatross.	
1512		263
1530	More low Fr. Cu. cloud.	246
1536		260
1631	Landed Albany	

Date 8.5.62
 Airborne 1328 hours
 Landed 1631 hours
 Observer P. Lorimer (P.I.)

Spotting conditions were very difficult. Low cloud and haze made it necessary to fly at a maximum altitude of 1000 ft and at times as low as 600 ft.

FLIGHT DETAILS - SERIES 1, PLAN 5

ALBANY-ALBANY

Time	Observations	Course ° true
0926	Airborne Albany.	
0933	Albany township. Flying height 1000 ft.	134
0942	Wind east, 10 knots, few white caps on sea surface. Very hazy. Low SW swell. Fracto-cumulus cloud, sky 9/10 covered, cloud base 1000 ft and lower. Spotting height 1000-700 ft.	167
0953	Low Fr. Cu. cloud. Base 600 ft. Very hazy.	066
1042		347
1045	Altitude 900 ft.	247
1100		167
1116		
1122	Circled for 3 minutes. Numerous birds on a line running E-W, all sitting on water. No sign of fish.	
1126		247
1143		147
1150		247
1157	Set course for Albany.	
1223	Landed at Albany.	

Date 8.5.62
 Airborne 0926
 Landed 1223
 Observer P. Lorimer (P.I.)

Conditions were very difficult for spotting, and the flight was carried out at a maximum height of 1000 ft. Low cloud at times necessitated a descent to 600 ft.

FLIGHT TRACK - SERIES 1, PLAN 6

ALBANY-PERTH

Time	Position		Course ° true	Distance nautical miles
	Lat. °S.	Long. °E.		
	Albany Aerodrome			
1232	35 32	117 48	180	35
1243	35 32	116 28	270	65
1309	35 03	114 52	290	84
1400	33 33	114 52	000	90
1450	Rottneest Island.		030	98
1550	Perth Aerodrome.		080	23
1605				

Date 9.5.62
 Airborne 1232 hours
 Landed 1605 hours
 Observer P. Lorimer (P.I.)

Time	Position		Observations
	Lat. ° S.	Long. ° E.	
1243			Wind NE 15 knots. Overcast. Sea moderate. Low SW swell. Altitude 1000 ft. Poor spotting conditions.
1322			Heavy smoke haze. Wind 10-15 knots.
1348			Current line running to SW. No bird life.
1400			Spotting conditions improved to moderate.
1450			Wind NNE. 10 knots. Overcast. Smoke haze. Slight sea.
1526			Several small schools of small fish. Circled two schools.
1537			Further small schools of small fish, widely scattered over wide area.

FLIGHT TRACK - SERIES 2, PLAN 1

PERTH-JURIEN BAY-PERTH

Time	Position Lat. °S.	Long. °E.	Course ° true	Distance nautical miles
0855	Perth Aerodrome		270	70
0925	31 56	114 37	338	103
1010	30 20	113 52	090	55
1034	30 20	114 55	160	6
1037	30 26	114 58	270	14
1043	30 26	114 42	160	27
1057	30 51	114 53	270	15
1104	30 51	114 36	160	39
1124	31 28	114 51	090	18
1134	31 28	115 12	160	20
1143	31 47	115 20	090	15
1149	31 47	115 37	117	20
1200	Perth Aerodrome			

Date 17.5.62
 Airborne 0854 hours
 Landed 1200 hours
 Observer P. Lorimer (P.I.)

Time	Observations	Spotting conditions	Cloud cover	Wind		Sea	Swell
				force	dir.		
0900	Overcast	moderate	1	3	14	2	4
0945				5	09		
1010							
1024	Indefinite current line running E-W, 3 miles.						
1102	Current line running N-S. No life.						
1113	Current line running N-S. No life.						
1134	Overcast			3	09		

FLIGHT TRACK - SERIES 2, PLAN 2

PERTH-ALBANY

Time	Position		Course ° true	Distance nautical miles
	Lat. °S.	Long. °E.		
1322	Perth Aerodrome		236	98
1409	32 50	114 22	180	108
1505	34 38	114 22	112	90
1545	35 11	116 02	090	90
1624	Eclipse I.		348	14
1634	Albany Aerodrome			

Date 17.5.62
 Airborne 1321 hours
 Landed 1634 hours
 Observer P. Lorimer (P.I.)

Time	Position		Observations	Spotting conditions	Wthr	Cloud cover	Wind		Sea, Swell
	Lat. °S.	Long. °E.					force	dir.	
1333			Current line north-south. No life. Current line east/west. No life. Bird life on water. East-west current line. Some birds. Circled for 2 mins. Numerous Molly Hawks. Indefinite current line, east-west. Few Molly Hawks.	clear good moderate poor		6	1	99	4
1407							4	23	
1501	34 29	114 22							
1507	34 39	114 27							
1511	34 44	114 38							
1515	34 51	115 01							
1520									
1525			52	7	5	23	3	4	

FLIGHT TRACK - SERIES 2, PLAN 3. (amended)

ALBANY - ALBANY

Time	Position		Course ° true	Distance nautical miles
	Lat. °S.	Long. °E.		
0940	Albany Aerodrome		133	15
0947	35 07	118 02	207	25
1001	35 29	117 48	270	63
1034	35 29	116 30	290	90
1125	34 58	114 47	000	6
1128	34 52	114 47	110	95
1210	35 24	116 35	090	60
1258	35 24	117 49	000	26
	Albany Aerodrome			

Date 18.5.62
 Airborne 0940 hours
 Landed 1258 hours
 Observer P.Lorimer (P.I.)

Time	Position		Spotting conditions	Wthr	Cloud cover	Wind		Sea Swell
	Lat. °S.	Long. °E.				force	dir.	
1000								
1014								
1035	35 27	116 30	moderate	52	7	5	23	4
1102	35 11	115 29	good	clear	5	5	23	
1210			moderate	52	8	5	23	
1226			poor	64		5	23	

Observations
 Current line E-W. No birds.
 Circled for 5 mins. 3 pods
 of sperm whales, total 40.
 Large numbers of Molly Hawks.
 Visibility poor

The flight plan was altered for this series only.

FLIGHT TRACK - SERIES 2, PLAN 4

ALBANY - ALBANY

Time	Position		Course ° true	Distance nautical miles
	Lat. °S.	Long. °E.		
1344	Albany Aerodrome		088	32
1402	Bald Island		090	50
1427	34 54	119 29	072	100
1517	34 22	121 22	342	20
1526	34 03	121 15	252	88
1608	34 31	119 34	240	65
1704	35 03	118 25	282	30
	Albany Aerodrome			

Date 18.5.62
 Airborne 1344 hours
 Landed 1705 hours
 Observer P. Lorimer (P.I.)

Time	Position		Observations	Spotting conditions	Wthr	Cloud cover	Wind		Sea Swell
	Lat. °S.	Long. °E.					force	dir.	
1402	Off Bald Island		Many schools of pilchards. Visibility good.	good		6	3	14	
1420	34 55	119 17	8 sperm whales (cows and calfs) heading west.						
1430	34 50	119 38	16 sperm whales (mixed) heading west.						
1435	34 44	119 58	2 sperm whales (bulls?) heading west.						
1457	34 55	120 33	Large school of killer whales.	good					
1616			Large numbers of birds.						
1620			2 schools of pilchards.						
1632	Cape Knob - Bald I.		Pilchard schools over extend- ed area.						

FLIGHT TRACK - SERIES 2, PLAN 5

ALBANY-ALBANY

Time	Position		Course ° true	Distance nautical miles
	Lat. °S.	Long. °E.		
0908	Albany Aerodrome		119	14
0914	Breaksea Island		166	45
0930	35 47	118 16	064	100
1019	35 02	120 06	346	45
1037	34 20	119 50	244	15
1045	34 26	119 34	164	15
1051	34 41	119 38	244	15
1059	34 47	119 22	164	15
1107	35 02	119 26	244	30
1123	35 14	118 54	346	15
1131	35 00	118 49	244	25
1144	35 11	118 21	297	30
1206	Albany Aerodrome			

Date 19.5.62
 Airborne 0908 hours
 Landed 1206 hours
 Observer P.Lorimer (P.I.)

Time	Position		Spotting conditions	Wind		Sea	Swell
	Lat. °S.	Long. °E.		force	dir.		
0914			good	4	32	0	1
0920			poor	6	32		
0923	35 26	118 07					
0953	35 21	119 00					
1015			moderate	4	34		
1100			moderate	5	32		
1105	35 00	119 21	-poor				

Observations
 Weather clear.
 6 sperm whales, large, heading NW.
 10 sperm whales, (harem-1 bull) heading N.
 Current line running east-west.
 7 sperm whales (cows and calves) heading NE

FLIGHT TRACK - SERIES 2, PLAN 6

ALBANY-PERTH

Time	Position		Course ° true	Distance nautical miles
	Lat. °S.	Long. °E.		
1300	Albany Aerodrome		180	35
1314	35 32	117 48	270	65
1353	35 32	116 28	290	84
	35 03	114 52	000	90
1521	33 33	114 52	020	98
1612	Rottnest Island		080	23
1617	Perth Aerodrome			

Date 19.5.62
 Airborne 1259 hours
 Landed 1622 hours
 Observer P.Lorimer (P.I.)

Time	Observations	Spotting conditions	Cloud cover	Wind		Sea	Swell
				force	dir.		
1305	No sightings	mod.-good		5	32	3	1
1353	No sightings	very poor		6	32		
1500	No sightings	mod.	3	5	32		
1530	No sightings			4	32		
1545	No sightings	good		3	32		

FLIGHT TRACK - SERIES 3, PLAN 1

PERTH-JURIEN BAY-PERTH

Time	Position		Course ° true	Distance nautical miles	Remarks
	Lat. °S.	Long. °E.			
0855	Perth Aerodrome		270	70	
0928	31 56	114 37	338	103	
1013	30 20	113 52	090	55	
1036	30 20	114 55	160	6	Jurien Bay
1039	30 26	114 58	270	14	
1046	30 26	114 42	160	27	
1058	30 51	114 53	270	15	
1116	30 51	114 36	160	39	
1123	31 28	115 51	090	18	
1131	31 28	115 12	160	20	
1140	31 28	115 51	090	15	
1147	31 28	115 12	117	20	
1155	Perth Aerodrome				

Date 16.6.62
 Airborne 0855 hours
 Landed 1155 hours
 Observer K. Godfrey
 (C.S.I.R.O.)

Time	Observations	Spotting conditions	Wthr	Cloud		Wind		Sea	Swell	Vis.
				cover	height (ft)	force	dir.			
0902	Crossed coast	fair				03	05	1		
0930	No sightings	moderate	62	8	2000	04	05	2	1	7
1000	No sightings	fair	63	8	2000	03	05	1	1	6
1100	No sightings	good		5	2000	02	05	1	1	7
1130	No sightings	mod.-good	62	6	2000	04	05	2	1	6
1145	No sightings	fair	63	8	1500	04	05	2	1	5

Remarks: Entire flight at 1000 feet.

FLIGHT TRACK - SERIES 3, PLAN 2

PERTH-ALBANY

Time	Position		Course ° true	Distance nautical miles
	Lat. °S.	Long. °E.		
1250	Perth Aerodrome		236	98
1336	32 50	114 22	180	108
1428	34 38	114 22	112	90
1505	35 11	116 02	090	90
1600	Eclipse Island Albany Aerodrome		348	14

Date 14.6.62
 Airborne 1250 hours
 Landed 1600 hours
 Observer K. Godfrey
 (C.S.I.R.O.)

Time	Observations	Spotting conditions	Wthr	Cloud		Wind		Sea	Swell	Vis.
				cover	height (ft)	force	dir.			
1300	No sightings	fair				04	36	2	4	6
1336	No sightings	fair	63		1000	04	36	3	4	5
1400	No sightings	fair	18			05	36	3	4	5
1428	No sightings	fair-mod.		5	3500	05	32	3	4	6
1505	No sightings	fair-mod.		5	3500	06	32	3	4	6
1530	No sightings	fair			high	06	29	3-4	4	6
1542	No sightings	fair-poor			high	06	29	3-4	4	6

Remarks: Conditions generally on this flight not suitable for good spotting. Very squally and cloudy north of Cape Leeuwin, seas rough south of Cape Leeuwin. Entire flight at 1000 feet.

FLIGHT TRACK - SERIES 3, PLAN 4

ALBANY-ALBANY VIA
FIGURE-OF-EIGHT I.

Time	Position		Course ° true	Distance nautical miles	Remarks
	Lat. °S.	Long. °E.			
0835	Albany Aerodrome		088	32	
0850	Bald Island		090	50	
0911	34 55	119 29	072	100	
1000	34 22		342	20	
1010	34 03		252	88	Figure-of-Eight I.
1107	34 31		240	65	Doubtful I.
1150	35 03		282	30	
1210	Albany Aerodrome				

Date 15.6.62
 Airborne 0835 hours
 Landed 1210 hours
 Observer K. Godfrey
 (C.S.I.R.O.)

Time	Observations	Spotting conditions	Wthr	Cloud (ft)		Wind		Sea	Swell	Vis.
				cover	height	force	dir.			
0845	Crossed coast		62	8		05	32			6
0850	No sightings	mod.	62	8		05	32	2	1	6
0911	No sightings	fair		8	2000	06	32	2-3	1	6
1000	No sightings	fair-mod.		5	5000	05	32	2	1	6
1030	No sightings	fair-mod.		6	5000	05	32	2	1	6
1107	No sightings	fair-mod.		6	6000	06	27	2	1	6
1150	No sightings	fair		7	5000	05	32	2-3	1	6
1158	Crossed coast									

Remarks: Conditions generally not good for spotting, particularly over shelf. Flight confined to coast. Entire flight at 1000 feet.

FLIGHT TRACK - SERIES 3, PLAN 6

ALBANY-PERTH

Time	Position		Course	Distance nautical miles	Remarks
	Lat. °S.	Long. °E.			
1300	Albany Aerodrome		180	15	
1310	35 13	117 48	270	92	
1415	35 11	115 57	315	76	C.D'Entrecasteaux abeam
1450	34 17	114 52	000	42	C. Leeuwin
1523	33 33	114 52	020	98	C. Naturaliste
1612	Rottneest Island		080	23	
1625					

Date 15.6.62
 Airborne 1300 hours
 Landed 1625 hours
 Observer K. Godfrey
 (C.S.I.R.O.)

Time	Observations	Spotting conditions	Wthr	Cloud		Wind		Sea	Swell	Vis.
				cover	height (ft)	force	dir.			
1305	Crossed coast	fair		5	5000	07	32	2-3	1	6
1355	No sightings	fair		5	5000	08	27	3	4	6
1415	No sightings	poor		5	5000	08	27	3-4	4	5
1430	No sightings	poor		6	1500	08	27	3-4	4	5
1515	No sightings	fair		7	1800	06	32	3	1	6
1523	No sightings	fair		8	2000	06	32	3	1	6
1612	No sightings	fair-mod.		7	1500	03	32	2	1	6

Remarks: Spotting conditions generally only fair on this flight, entire flight at 1000 feet.

FLIGHT TRACK - SERIES 4, PLAN 2

PERTH-ALBANY

Time	Position		Course ° true	Distance nautical miles
	Lat. °S.	Long. °E.		
0850	Perth Aerodrome		236	98
0929	32 50	114 22	180	108
1016	34 38	114 22	112	90
1056	35 11	116 02	090	90
1146	Eclipse Island		348	14
1155	Albany Aerodrome			

Date 2.7.62
 Airborne 0850 hours
 Landed 1155 hours
 Observer K. Godfrey
 (C.S.I.R.O.)

Time	Observations	Spotting conditions	Wthr	Cloud		Wind		Sea	Swell	Vis.
				cover	height (ft)	force	dir.			
0850	Left Perth Aerodrome	good		0		01	05	1	1	7
0855	Crossed coast. No sightings.	good				02	05			
0929	No sightings, except numerous scattered terns.	good				02	05	1	1	7
1000	No sightings	good		1		02	05	1	1	7
1015	Current line east-west.	good				02	05	1	1	7
1045	Current line east-west.	good		5	2000	02-03	05	1	1	7
1100	No sightings	poor		6	2500	02	05	1	1	7
1145	No sightings		60			01	05	1	1	5
1148	Crossed coast									

Remarks: Entire flight at 1000 feet.

FLIGHT TRACK - SERIES 4, PLAN 3 (first attempt) ALBANY - ALBANY

Time	Position		Course ° true	Distance nautical miles
	Lat. °S.	Long. °E.		
0845	Albany	Aerodrome	219	40
0905	35 28	117 18	040	40
0930	Albany	Aerodrome		

Date 3.7.62
 Airborne 0845 hours
 Landed 0930 hours
 Observer K. Godfrey
 (C.S.I.R.O.)

Time	Observations	Spotting conditions	Wthr	Cloud		Sea	Swell	Vis.
				cover	height (ft)			
0845	Left aerodrome, foggy on coast.			6	2000	1	1	5
0850	Crossed coast.							
0900				7	50			5
0920	Two humpback whales, cow and calf, in Torbay, close to Cape West Howe. Whales circling.							
0930	Still foggy				low	1	1	5

Remarks: Spotting conditions generally poor. Very foggy, with low cloud offshore. Decided to return to airport and await improved conditions. Height throughout flight - 1000 feet

FLIGHT TRACK - SERIES 4, PLAN 3 (second attempt)

ALBANY-ALBANY

Time	Position		Course ° true	Distance nautical miles	Remarks
	Lat. °S.	Long. °E.			
1425	Albany Aerodrome		219	90	
1505	36 06	116 39	080	110	
1602	35 45	118 51	313	70	Circling
1645	Albany Aerodrome				

Date 3.7.62
 Airborne 1425 hours
 Landed 1645 hours
 Observer K. Godfrey
 (C.S.I.R.O.)

Time	Observations	Spotting conditions	Wthr	Cloud		Wind		Sea	Swell	Vis.
				cover	height	force	dir.			
1425	Left Aerodrome Crossed coast. Slight haze. No sightings. Hazy. No sightings. No sightings. Many schools of pilchards on surface, birds over. One large humpback whale travell- ing west.	good		2	2000	01	32	1	1	7
1431		moderate		2	2000	02	32	1	1	
1500		moderate		5	500	02	32	1	1	6
1530				2	2000	02	32	1	1	
1600				2	2000	02	32	1	1	
1624				2	2000	02	32	1	1	
1626										

Remarks: Conditions good, but patchy, throughout flight. Flight at 1000 feet.

FLIGHT TRACK - SERIES 4, PLAN 4

ALBANY-ALBANY

Time	Position		Course ° true	Distance nautical miles	Remarks
	Lat. °S.	Long. °E.			
1035	Albany Aerodrome		088	32	
1050	Bald Island		090	50	
1111.	34 54	119 29	072	100	
1201	34 22	121 22	342	20	
1210	34 03	121 15	252	88	
1250	34 31	119 34	240	65	
1322	35 03	118 25	282	30	
1345	Albany Aerodrome				Circling harbour

Date 3.7.62
 Airborne 1035 hours
 Landed 1345 hours
 Observer K. Godfrey
 (C.S.I.R.O.)

Time	Observations	Spotting conditions	Wthr	Cloud		Wind		Swell	Vis.
				cover	height (ft)	force	dir.		
1035	Weather improving to the east.			6	2000	02	05		6
1045				6	2000	02	05	1	6
1110	No sightings.	good		4	3000	02	05	1	6-7
1130	Current lines east to west.			4	2500	02	05	1	7
1200	No sightings.			0	-	02	05	1	7
1230	No sightings.			0	-	02	05	0	9
1300	No sightings.			0	-	02	05	0	7
1330	No sightings.			3	2500	02-03	36	1	7

Remarks: Entire flight at 1000 feet.

FLIGHT TRACK - SERIES 4, PLAN 5

ALBANY-ALBANY

Time	Position		Course • true	Distance nautical miles	Remarks
	Lat. • S.	Long. • E.			
1250	Albany Aerodrome		119	14	
1259	Breaksea Island		166	45	
1318	35 47	118 16	064	100	
1404	35 02	120 06	346	45	Flew round heavy low cloud
1425	34 20	119 50	244	15	
1434	34 26	119 34	164	15	3 miles off Hood Point
1441	34 41	119 38	244	15	
1448	34 47	119 22	164	15	
1455	35 02	119 26	244	30	
1510	35 14	118 54	346	15	
1518	35 00		244	25	
1530	35 11		297	30	
1555	Albany Aerodrome				Circling

Date 2.7.62
 Airborne 1250 hours
 Landed 1555 hours
 Observer K. Godfrey
 (C.S.I.R.O.)

Time	Observations	Spotting conditions	Wthr	Cloud		Wind		Sea	Swell	Vis.
				cover	height (ft)	force	dir.			
1300		good	03	6	2000	02	05	1	1	6-7
1307-10	Several schools of pilchards on surface.					02	05	1	1	
1318-30	Numerous current lines running east to west.			8	2000	02	05	1	1	6
1400		mod-good		5	50-2000	02-03	32	1	1	6
1430	One blue whale travelling west.	improved		5	2000	02	23	1	1	7
1455	Size about 65 ft.					02	23	1	1	7
1510	Weather patchy, mainly good.	good	62			03	23	1	1	6
1530	Numerous schools of pilchards, birds over schools.	good		6	2000	02	23	1	1	6

Remarks: Height throughout flight 1000 feet.

FLIGHT TRACK - SERIES 4, PLAN 6

ALBANY-PERTH

Time	Position		Distance nautical miles	Remarks
	Lat. oS.	Long. oE.		
0830	Albany Aerodrome		35	
0845	35 32	117 43	65	Contacted Estelle Star at sea
0913	35 32	116 28	84	
1008	35 03	114 52	90	
1054	33 33	114 52	98	
1145	Rottneast Island		23	
1200	Perth Aerodrome			

Date 4.7.62
 Airborne 0830 hours
 Landed 1200 hours
 Observer K. Godfrey
 (C.S.I.R.O.)

Time	Observations	Spotting conditions	Wthr	Cloud		Wind		Sea	Swell	Vis.
				cover	height (ft)	force	dir.			
0830	Left Aerodrome. Weather fine.		00	0	-	02	05	2	1	7
0845	Flew over Estelle Star.			0	-	04	32	2	1	9
0900	No sightings.	moderate		0	-	04	32	2	4	7
0930	No sightings.	hazy		0	-	04	32	2	4	7
1000	No sightings.	hazy		2	2000	04	02	2	1	6
1015	No sightings.	hazy		2	2000	04	02	2	1	6
1030	No sightings.	hazy		1	3000	04-05	02	2-3	1	6
1100	No sightings.	hazy								
1103	Passed over Naturaliste Reef.	hazy		0	-	04-05	02	2-3	1	6
1130	No sightings.	hazy		0	-	04-05	02	2-3	1	6
1145	No sightings.	hazy								

Remarks: Conditions generally good except for haze. Flight height 1000 feet.

APPENDIX 5

TUNA MEASUREMENTS, LENGTH FREQUENCY

LENGTH FREQUENCIES OF CATCH
ESTELLE STAR CRUISES 6-9

APPENDIX 5

(L.C.F.) Length in cm	6	7	8	9	Totals
37		1	1		2
38	3				3
39	4		2		6
40	4		8		12
41			8	3	11
42		3	6	3	12
43		1	15	2	18
44	1		6	3	10
45			5	2	7
46			4	2	6
47			2	4	6
48			5	4	9
49			2	3	5
50				1	1
51			1	3	4
52			2	1	3
53			2		2
54	1		3	3	7
55			5	7	12
56	2	1	5	8	16
57	2	1	25	8	36
58	4	3	32	26	65
59	3	4	57	32	96
60	5	7	75	55	142
61	8	12	118	116	254
62	17	12	155	168	352
63	21	9	172	251	453
64	26	11	169	314	520
65	33	9	183	304	529
66	34	12	148	237	431
67	41	24	124	189	378
68	47	23	123	101	294
69	48	17	122	80	267
70	39	17	124	63	243
71	44	21	92	45	202
72	37	19	77	37	170
73	30	11	62	33	136
74	29	4	40	18	91
75	14	8	21	7	50
76	5	2	3	7	17
77	2	1	2	2	7
78	3		3		6
79	2		3	3	8
80		1	1		2
Totals	509	234	2013	2145	4901

APPENDIX 6
TAGGING RESULTS

TAGGING RESULTS

APPENDIX 6

(a) Summary

AREA 1. JURIEN BAY - CAPE NATURALISTE, 30°14'S., 33°32'E.

Date of Release	Tag Identifying Numbers	Number Released
27.8.61 - 8.9.61	579	1
13.9.61 - 21.9.61	580	1
20.10.61 - 8.11.61	(1217-1221)	5
4.12.61 - 19.12.61	(1226-1237)	12
4. 1.62 - 12. 1.62	(1239-1259) Excepting (1241-1253)	8
27.3.62 - 27. 4.62	1313	<u>1</u>
Total - Area 1		<u>28</u>

AREA 2. CAPE NATURALISTE - WEST CAPE HOWE, 33°32'S., 117°37'E.

18.8.61 - 22.8.61	(572-573)	2
27.8.61 - 8.9.61	(576-578)	3
13.9.61 - 21.9.61	(581-586) Excepting 585	5
4.10.61 - 5.10.61	(1116-1124)	9
20.10.61- 8.11.61	(1201-1216)	16
4.12.61 - 19.12.61	1255	1
4. 1.62 - 12. 1.62	(1242-1253)	12
27.3.62 - 27. 4.62	(1309-1314) Excepting 1313	<u>5</u>
Total - Area 2		<u>53</u>

AREA 3. WEST CAPE HOWE - BALD I., 117°37'S., 118°38'E.

18.8.61 - 22.8.61	(545-575) Excepting 549, 550, (561-570), 572, 573	17
13.9.61 - 21.9.61	(585-600) + 1131 Excepting (586-587)	15
22.9.61 - 2.10.61	(1111-1150) Excepting (1112-1132)	19
4.10.61 - 5.10.61	(1112-1115)	4

AREA 3. Cont'd...

Date of Release	Tag Identifying Numbers	Number Released
10.10.61 - 12.10.61	(1126-1200)	55
24.11.61	1222	1
4.12.61 - 19.12.61	1224	1
1. 2.62 - 3. 2.62	1267	1
2. 3.62 - 18. 3.62	(1281-1290) Excepting (1288-1289)	8
27. 3.62 - 27. 4.62	(1307-1349) Excepting two records (1309-1314), (1319-1320)	35
28. 4.62 - 8. 5.62	(1350-2414) + 2252. Excepting 1355, 1401, 1402, 1521, 1543, 1621, 1630, 1684, 1691, 1695, (1701-2000), 2008, 2077, 2149, 2209, 2318, (2379-2400)	729
28. 5.62 - 20. 6.62	(2381-4745) Excepting 2434, 2539, 2568, 2575, (2401-2414), (2601-2900), 2905, 2966, 3055, 3190, 3247, 3249, 3286, 3316, 3443, 3475, 3491, 3514, 3548, 3557, 3613, 3615, 3643, 3654, 3679, 3722, 3769, 3776, 3779, 3790, 3879, 3891, 3942, 3970, 4054, 4201, 4288, 4426, 4440, 4660	2,013
24. 6.62 - 5. 7.62	(701-6624) + 2 extra Nos 4891 and 5000 (duplications). Excepting 963, 1000, 1085, (1101-4049), 4881, 4905, 4981, 5116, 5228, (5601-5700), 5840, (5851-5856), 6078, 6110, 6119, 6129, 6136, 6155, 6167, 6171, 6612	<u>2,163</u>
Total - Area 3		<u>5,061</u>

AREA 4. BALD I. - ISRAELITE BAY, 118°28'S., 125°31'E.

18. 8.61 - 22. 8.61	(549-550)	2
1. 2.62 - 3. 2.62	(1260-1266)	7
14. 2.62 - 21. 2.62	(1268-1280)	13
2. 3.62 - 18. 3.62	(1288-1306) Excepting (1290-1291) 1301	16
27. 3.62 - 23. 4.62	(1319-1320)	2
7. 7.62	6625	<u>1</u>
Total - Area 4		<u>41</u>

Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm
855	63	856	63	857	66	858	69	859	66	860	66	861	66	862	66
860	66	861	63	862	65	863	65	864	65	865	64	866	64	867	64
865	72	866	63	867	64	868	64	869	64	870	64	871	64	872	64
870	67	871	63	872	71	873	67	874	67	875	67	876	67	877	67
875	73	876	65	877	61	878	63	879	63	880	63	881	63	882	63
880	65	881	69	882	62	883	62	884	62	885	62	886	62	887	62
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900	62	901	65	902	70	903	70	904	65	905	62	906	65	907	65
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910	63	911	74	912	59	913	59	914	62	915	67	916	66	917	66
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920	62	921	55	922	64	923	64	924	64	925	64	926	64	927	64
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930	63	931	63	932	67	933	67	934	72	935	64	936	61	937	61
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940	66	941	63	942	64	943	64	944	66	945	66	946	64	947	64
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980	71	981	70	982	64	983	67	984	62	985	67	986	62	987	62
985	67	986	62	987	68	988	64	989	67	990	64	991	69	992	64
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995	63	996	66	997	68	998	66	999	65	1000	63	1001	72	1002	65
1000	63	1001	72	1002	65	1003	71	1004	67	1005	66	1006	70	1007	65
1005	66	1006	70	1007	65	1008	65	1009	66	1010	70	1011	64	1012	64
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1015	65	1016	67	1017	63	1018	64	1019	63	1020	65	1021	67	1022	69
1020	65	1021	67	1022	69	1023	63	1024	65	1025	67	1026	65	1027	65
1025	67	1026	67	1027	65	1028	66	1029	65	1030	61	1031	61	1032	67
1030	58	1031	61	1032	67	1033	68	1034	64	1035	66	1036	65	1037	65
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1040	73	1041	62	1042	67	1043	62	1044	63	1045	62	1046	66	1047	63
1045	62	1046	66	1047	63	1048	62	1049	63	1050	54	1051	65	1052	65
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Tag No.	Length cm	mm	Tag No.	Length cm	mm	Tag No.	Length cm	mm	Tag No.	Length cm	mm
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1065	67	0	1067	61	0	1068	65	0	1069	65	0
1070	69	5	1072	60	0	1073	67	0	1074	64	0
1075	66	5	1077	65	0	1078	65	0	1079	61	5
1080	66	0	1082	72	5	1083	65	0	1084	63	0
1085	66	0	1087	66	5	1088	68	5	1089	66	5
1090	66	0	1092	64	0	1093	63	0	1094	63	0
1095	66	0	1097	67	0	1098	58	0	1099	61	5
1100	61	5	1112	46	5	1113	47	3	1114	46	5
1115	43	8	1117	46	5	1118	47	5	1119	47	3
1120	46	0	1122	49	5	1123	49	8	1124	43	1
1126	53	7	1128	61	5	1129	49	3	1130	52	0
1131	57	1	1134	62	0	1135	46	0	1136	48	0
1137	49	5	1139	45	5	1140	50	0	1141	64	5
1142	62	0	1144	59	1	1145	61	0	1146	60	5
1147	65	0	1149	50	5	1150	46	0	1151	45	0
1152	47	0	1154	61	9	1155	60	0	1156	56	0
1157	51	3	1159	41	7	1160	50	5	1161	53	0
1162	57	8	1164	64	0	1165	43	5	1166	45	3
1167	55	5	1169	45	0	1171	52	8	1170	52	0
1172	55	5	1174	53	0	1175	51	5	1176	50	0
1178	46	5	1180	47	8	1181	62	8	1182	48	0
1183	47	0	1185	53	8	1186	50	5	1187	48	0
1188	46	3	1190	47	8	1191	47	5	1192	48	3
1193	48	3	1195	51	0	1196	50	0	1197	62	0
1198	64	5	1201	52	0	1202	47	6	1203	44	7
1204	47	5	1206	47	6	1207	49	1	1208	63	8
1209	46	9	1211	44	8	1212	45	8	1213	46	4
1214	43	4	1216	42	5	1217	52	3	1218	54	0
1219	51	5	1221	44	0	1222	44	0	1224	53	0
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1230	50	4	1232	41	8	1233	43	2	1234	56	6
1235	41	0	1237	42	4	1239	47	0	1240	41	5
1242	47	0	1244	46	0	1245	66	0	1246	62	0
1247	56	0	1249	49	0	1250	45	2	1251	44	2
1252	50	3	1254	44	4	1255	45	0	1256	44	0
1257	45	0	1259	45	0	1260	71	5	1261	66	0
1262	66	5	1264	69	8	1265	66	5	1266	67	0
1267	66	0	1269	70	0	1270	68	0	1271	68	5

Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm																																																																																																																																																																																																																																																																																																																																																																																																																														
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Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm																																																																																																																																																																																																																																																																																																																																																																																																																																										
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Tag No.	Length cm	Length mm	Tag No.	Length cm	Length mm	Tag No.	Length cm	Length mm	Tag No.	Length cm	Length mm
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1692	63	5	1693	74	0	1694	68	0	1695	69	5
1698	67	0	1699	73	0	1700	64	0	2001	66	5
2003	71	0	2004	63	0	2005	63	0	2006	67	0
2009	69	5	2010	66	0	2011	66	5	2012	71	0
2014	59	5	2015	67	0	2016	59	5	2017	64	5
2019	75	0	2020	68	0	2021	59	0	2022	39	5
2024	63	0	2025	66	0	2026	64	0	2027	67	0
2029	64	5	2030	74	0	2031	71	0	2032	65	5
2034	66	5	2035	70	0	2036	71	0	2037	71	0
2039	68	5	2040	69	5	2041	65	0	2042	64	5
2044	59	0	2045	58	0	2046	69	5	2047	64	5
2049	56	5	2050	70	5	2051	65	0	2052	63	5
2054	68	5	2055	65	0	2056	69	5	2057	72	5
2059	66	5	2060	70	5	2061	72	5	2062	67	0
2064	67	5	2065	72	0	2066	68	5	2067	68	0
2069	61	0	2070	64	5	2071	68	0	2072	69	0
2074	62	0	2075	68	0	2076	59	5	2077	68	5
2079	74	5	2080	75	0	2081	75	0	2082	71	5
2084	72	0	2085	70	5	2086	69	0	2087	72	0
2089	65	0	2090	70	5	2091	74	5	2092	69	5
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2099	65	0	2100	71	5	2101	69	5	2102	69	5
2104	71	5	2105	68	5	2106	72	0	2107	64	5
2109	71	5	2110	74	0	2111	71	0	2112	70	0
2114	69	5	2115	64	5	2116	66	0	2117	72	5
2119	74	0	2120	70	0	2121	68	5	2122	67	5
2124	67	0	2125	73	0	2126	72	5	2127	63	0
2129	64	0	2130	65	5	2131	68	0	2132	70	5
2139	73	5	2140	68	0	2141	76	5	2142	71	0
2144	62	0	2145	68	0	2146	62	5	2147	72	0
2150	66	5	2151	69	5	2152	66	5	2153	66	5
2155	40	0	2156	38	5	2157	38	0	2158	67	5
2160	65	0	2161	72	0	2162	71	0	2163	72	0
2165	38	0	2166	72	0	2167	70	0	2168	78	5
2170	65	0	2171	70	0	2172	66	0	2173	75	5
2175	60	0	2176	72	5	2177	72	5	2178	69	5
2179	62	0	2180	69	5	2181	61	5	2182	70	5
2184	69	5	2185	63	5	2186	62	5	2187	70	5
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2194	66	5	2195	66	5	2196	67	5	2197	69	5
2199	65	0	2200	65	0	2201	65	0	2202	65	0
2204	65	0	2205	65	0	2206	65	0	2207	65	0
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2215	65	0	2216	65	0	2217	65	0	2218	65	0
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2233	65	0	2234	65	0	2235	65	0	2236	65	0
2239	65	0	2240	65	0	2241	65	0	2242	65	0
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2253	65	0	2254	65	0	2255	65	0	2256	65	0
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2555	65	0	2556	65	0	2557	65	0	2558	65	0
2560	65	0	2561	65	0	2562	65	0	2563	65	0
2565	65	0	2566	65	0	2567	65	0	2568	65	0
2570	65	0	2571	65	0	2572	65	0	2573	65	0
2574	65	0	2575	65	0	2576	65	0	2577	65	0
2579	65	0	2580	65	0	2581	65	0	2582	65	0
2586	65	0	2587	65	0	2588	65	0	2589	65	0
2593	65	0	2594	65	0	2595	65	0	2596	65	0
2599	65	0	2600	65	0	2601	65	0	2602	65	0
2606	65	0	2607	65	0	2608	65	0	2609	65	0
2614	65	0	2615	65	0	2616	65	0	2617	65	0
2619	65	0	2620	65	0	2621	65	0	2622	65	0
2624	65	0	2625	65	0	2626	65	0	2627	65	0
2629	65	0	2630	65	0	2631	65	0	2632	65	0

Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm
2184	73	2185	74	2186	75	2187	74	2188	44
2189	68	2190	71	2191	72	2192	65	2193	73
2194	78	2195	66	2196	73	2197	69	2198	74
2199	67	2200	38	2201	67	2202	68	2203	74
2204	75	2205	61	2206	68	2207	69	2208	74
2210	72	2211	68	2212	64	2213	66	2214	74
2215	72	2216	78	2217	70	2218	61	2219	64
2220	61	2221	70	2222	63	2223	71	2224	72
2225	71	2226	75	2227	75	2228	67	2229	64
2230	73	2231	73	2232	65	2233	67	2234	69
2235	75	2236	69	2237	70	2238	72	2239	67
2240	71	2241	72	2242	72	2243	70	2244	73
2245	76	2246	68	2247	67	2248	67	2249	69
2250	74	2251	68	2252	70	2253	72	2254	62
2254	67	2255	60	2256	69	2257	71	2258	67
2259	75	2260	65	2261	68	2262	71	2263	42
2264	42	2265	64	2266	70	2267	59	2268	65
2269	66	2270	67	2271	73	2272	61	2273	62
2274	61	2275	60	2276	73	2277	71	2278	69
2279	75	2280	67	2281	73	2282	69	2283	71
2284	68	2285	62	2286	67	2287	73	2288	68
2289	61	2290	64	2291	67	2292	64	2293	65
2294	64	2295	66	2296	70	2297	69	2298	75
2299	71	2300	69	2301	70	2302	63	2303	70
2304	65	2305	71	2306	62	2307	70	2308	68
2309	66	2310	71	2311	70	2312	68	2313	71
2314	69	2315	62	2316	73	2317	72	2318	74
2320	69	2321	68	2322	75	2323	68	2324	63
2325	72	2326	66	2327	71	2328	68	2329	62
2330	69	2331	67	2332	59	2333	62	2334	67
2335	67	2336	63	2337	65	2338	68	2339	67
2340	61	2341	64	2342	67	2343	68	2344	70
2345	65	2346	73	2347	63	2348	68	2349	70
2350	69	2351	62	2352	64	2353	65	2354	72
2355	64	2356	59	2357	65	2358	61	2359	67
2360	61	2361	69	2362	71	2363	70	2364	67
2365	73	2366	68	2367	75	2368	73	2369	67
2370	61	2371	68	2372	71	2373	60	2374	69
2375	64	2376	70	2377	61	2378	72	2379	65
2382	61	2383	61	2384	61	2385	62	2386	70

Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm
2591	62	2592	64	2593	64	2594	59	2595	59	2596	62	2597	71	2598	62
2596	71	2597	69	2598	69	2599	59	2600	59	2601	62	2602	71	2603	62
2601	66	2602	69	2603	69	2604	63	2605	63	2606	65	2607	65	2608	64
2607	67	2608	68	2609	62	2610	65	2611	72	2612	64	2613	64	2614	64
2611	69	2612	72	2613	64	2614	65	2615	65	2616	64	2617	66	2618	66
2622	69	2623	66	2624	68	2625	69	2626	69	2627	61	2628	61	2629	61
2627	68	2628	70	2629	70	2630	73	2631	73	2632	73	2633	74	2634	74
2632	64	2633	68	2634	68	2635	63	2636	63	2637	74	2638	74	2639	74
2637	70	2638	62	2639	57	2640	57	2641	57	2642	68	2643	68	2644	68

2942	70	2943	67	2944	60	2945	75	2946	67	2947	67	2948	73	2949	67
2947	69	2948	73	2949	63	2950	65	2951	73	2952	71	2953	68	2954	71
2952	71	2953	68	2954	74	2955	61	2956	71	2957	65	2958	65	2959	65
2957	65	2958	66	2959	63	2960	43	2961	60	2962	60	2963	67	2964	60
2962	67	2963	66	2964	62	2965	61	2966	60	2967	60	2968	64	2969	64
2968	64	2969	62	2970	61	2971	43	2972	67	2973	63	2974	63	2975	63
2973	63	2974	62	2975	40	2976	66	2977	45	2978	63	2979	63	2980	61
2978	63	2979	43	2980	42	2981	71	2982	66	2983	61	2984	61	2985	61
2983	61	2984	69	2985	67	2986	69	2987	62	2988	62	2989	62	2990	62
2988	62	2989	56	2990	63	2991	70	2992	62	2993	62	2994	62	2995	62

2993	67	2994	72	2995	73	2996	37	2997	71	2998	71	2999	63	3000	63
2998	62	2999	62	3000	70	3001	66	3002	63	3003	63	3004	63	3005	63
3003	63	3004	62	3005	65	3006	66	3007	63	3008	69	3009	69	3010	69
3008	67	3009	61	3010	69	3011	64	3012	69	3013	69	3014	69	3015	69
3013	68	3014	63	3015	72	3016	61	3017	70	3018	70	3019	70	3020	70
3018	66	3019	63	3020	62	3021	64	3022	66	3023	66	3024	66	3025	66
3023	70	3024	73	3025	62	3026	64	3027	61	3028	61	3029	61	3030	61
3028	70	3029	69	3030	63	3031	63	3032	62	3033	62	3034	62	3035	62
3033	71	3034	65	3035	63	3036	59	3037	66	3038	66	3039	66	3040	66
3038	61	3039	64	3040	61	3041	68	3042	62	3043	62	3044	62	3045	62

3043	67	3044	62	3045	65	3046	70	3047	71	3048	71	3049	62	3050	62
3048	60	3049	62	3050	63	3051	61	3052	62	3053	62	3054	62	3055	62
3053	62	3054	65	3055	70	3056	61	3057	60	3058	60	3059	63	3060	63
3059	68	3060	63	3061	65	3062	60	3063	63	3064	63	3065	63	3066	63
3064	65	3065	66	3066	57	3067	62	3068	65	3069	65	3070	65	3071	65
3069	61	3070	69	3071	62	3072	66	3073	62	3074	62	3075	62	3076	62
3074	63	3075	63	3076	71	3077	66	3078	64	3079	64	3080	64	3081	64
3079	73	3080	65	3081	66	3082	62	3083	63	3084	63	3085	63	3086	63
3084	57	3085	67	3086	66	3087	58	3088	67	3089	67	3090	67	3091	67
3089	71	3090	64	3091	61	3092	63	3093	64	3094	64	3095	64	3096	64

Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm
3094	61	3095	67	3096	63	3097	61	3098	45						
3099	5	3100	71	3101	61	3102	66	3103	59						
3104	70	3105	59	3106	66	3107	62	3108	69						
3109	72	3110	69	3111	70	3112	69	3113	66						
3114	71	3115	71	3116	63	3117	60	3118	57						
3119	0	3120	59	3121	59	3122	60	3123	75						
3124	66	3125	51	3126	68	3127	72	3128	0						
3129	64	3130	64	3131	66	3132	69	3133	69						
3134	67	3135	59	3136	61	3137	73	3138	55						
3139	71	3140	68	3141	70	3142	70	3143	62						
3144	65	3145	59	3146	54	3147	61	3148	73						
3149	55	3150	67	3151	68	3152	75	3153	68						
3154	60	3155	55	3156	62	3157	66	3158	68						
3159	61	3160	68	3161	62	3162	70	3163	61						
3164	70	3165	70	3166	65	3167	70	3168	65						
3169	63	3170	63	3171	65	3172	69	3173	61						
3174	41	3175	42	3176	58	3177	69	3178	61						
3179	60	3180	69	3181	67	3182	64	3183	68						
3184	72	3185	63	3186	67	3187	60	3188	67						
3189	77	3191	65	3192	63	3193	63	3194	65						
3195	57	3196	58	3197	40	3198	42	3199	41						
3200	67	3201	62	3202	60	3203	66	3204	55						
3205	61	3206	64	3207	64	3208	61	3209	57						
3210	71	3211	66	3212	63	3213	64	3214	69						
3215	61	3216	67	3217	74	3218	58	3219	67						
3220	69	3221	69	3222	57	3223	65	3224	72						
3225	63	3226	70	3227	69	3228	67	3229	69						
3230	70	3231	69	3232	52	3233	48	3234	62						
3235	69	3236	71	3237	71	3238	64	3239	59						
3240	71	3241	59	3242	57	3243	70	3244	70						
3245	67	3246	68	3248	65	3250	70	3251	68						
3252	63	3253	63	3254	72	3255	62	3256	64						
3258	64	3259	73	3258	68	3259	67	3260	68						
3261	73	3262	63	3263	69	3264	63	3265	53						
3266	64	3267	65	3268	71	3269	62	3270	71						
3271	65	3272	67	3273	71	3274	61	3275	65						
3276	66	3277	72	3278	67	3279	67	3280	61						
3281	69	3282	64	3283	57	3284	71	3285	65						
3287	64	3288	73	3289	57	3290	71	3291	65						
3292	68	3293	67	3295	68	3296	62	3297	72						

Tag No.	Length cm	Tag No.	Length mm	Tag No.	Length cm	Tag No.	Length mm	Tag No.	Length cm	Tag No.	Length mm	Tag No.	Length cm	Tag No.	Length mm
3298	6.8	3299	6.9	3300	6.9	3301	6.9	3302	6.9	3303	6.9	3304	6.9	3305	6.9
3303	6.5	3304	7.3	3305	6.4	3306	6.4	3307	5.9	3308	5.9	3309	5.9	3310	5.9
3313	7.5	3314	6.8	3315	6.4	3316	6.4	3317	5.6	3318	5.6	3319	5.6	3320	5.6
3324	6.7	3325	5.9	3326	6.4	3327	6.4	3328	6.2	3329	6.2	3330	6.2	3331	6.2
3329	4.9	3330	6.4	3331	6.4	3332	6.4	3333	6.5	3334	6.5	3335	6.5	3336	6.5
3334	7.1	3335	6.3	3336	6.5	3337	6.5	3338	7.4	3339	7.4	3340	7.4	3341	7.4
3339	6.2	3340	7.0	3341	6.5	3342	6.5	3343	6.4	3344	6.4	3345	6.4	3346	6.4
3344	7.2	3345	7.1	3346	6.1	3347	6.1	3348	5.7	3349	5.7	3350	5.7	3351	5.7
3349	6.9	3350	7.0	3351	7.1	3352	7.1	3353	6.3	3354	6.3	3355	6.3	3356	6.3
3354	6.9	3355	6.0	3356	6.6	3357	6.6	3358	6.2	3359	6.2	3360	6.2	3361	6.2
3359	6.3	3360	6.1	3361	6.6	3362	6.6	3363	6.8	3364	6.8	3365	6.8	3366	6.8
3364	6.6	3365	5.9	3366	6.0	3367	6.0	3368	6.5	3369	6.5	3370	6.5	3371	6.5
3369	6.4	3370	6.7	3371	7.2	3372	7.2	3373	6.6	3374	6.6	3375	6.6	3376	6.6
3374	6.8	3375	6.8	3376	6.6	3377	6.6	3378	6.6	3379	6.6	3380	6.6	3381	6.6
3379	6.3	3380	6.6	3381	7.1	3382	7.1	3383	5.7	3384	5.7	3385	5.7	3386	5.7
3384	7.2	3385	7.1	3386	6.5	3387	6.5	3388	6.0	3389	6.0	3390	6.0	3391	6.0
3389	6.0	3390	5.8	3391	6.9	3392	6.9	3393	7.0	3394	7.0	3395	7.0	3396	7.0
3394	4.6	3395	6.6	3396	6.3	3397	6.3	3398	7.3	3399	7.3	3400	7.3	3401	7.3
3399	7.0	3400	7.1	3401	6.0	3402	6.0	3403	6.6	3404	6.6	3405	6.6	3406	6.6
3404	6.3	3405	5.9	3406	6.4	3407	6.4	3408	5.9	3409	5.9	3410	5.9	3411	5.9
3409	6.7	3410	6.8	3411	6.9	3412	6.9	3413	7.1	3414	7.1	3415	7.1	3416	7.1
3414	7.0	3415	6.7	3416	7.0	3417	7.0	3418	7.0	3419	7.0	3420	7.0	3421	7.0
3419	6.1	3420	6.0	3421	5.8	3422	5.8	3423	7.1	3424	7.1	3425	7.1	3426	7.1
3424	6.2	3425	6.2	3426	6.2	3427	6.2	3428	4.1	3429	4.1	3430	4.1	3431	4.1
3429	6.0	3430	7.4	3431	6.4	3432	6.4	3433	6.5	3434	6.5	3435	6.5	3436	6.5
3434	6.5	3435	6.6	3436	7.1	3437	7.1	3438	6.1	3439	6.1	3440	6.1	3441	6.1
3439	6.5	3440	6.6	3441	7.2	3442	7.2	3443	6.4	3444	6.4	3445	6.4	3446	6.4
3445	7.2	3446	5.9	3447	6.5	3448	6.5	3449	6.5	3450	6.5	3451	6.5	3452	6.5
3450	6.5	3451	6.2	3452	6.9	3453	6.9	3454	6.0	3455	6.0	3456	6.0	3457	6.0
3455	7.1	3456	6.7	3457	5.8	3458	5.8	3459	5.9	3460	5.9	3461	5.9	3462	5.9
3460	5.2	3461	6.3	3462	6.6	3463	6.6	3464	7.1	3465	7.1	3466	7.1	3467	7.1
3465	6.8	3466	6.1	3467	6.9	3468	6.9	3469	6.6	3470	6.6	3471	6.6	3472	6.6
3470	6.2	3471	6.1	3472	6.3	3473	6.3	3474	6.4	3475	6.4	3476	6.4	3477	6.4
3476	5.8	3477	6.8	3478	7.0	3479	7.0	3480	7.2	3481	7.2	3482	7.2	3483	7.2
3481	6.3	3482	6.8	3483	6.9	3484	6.9	3485	6.4	3486	6.4	3487	6.4	3488	6.4
3486	6.2	3487	6.3	3488	7.1	3489	7.1	3490	6.2	3491	6.2	3492	6.2	3493	6.2
3493	6.6	3494	6.8	3495	6.2	3496	6.2	3497	6.8	3498	6.8	3499	6.8	3500	6.8
3498	6.3	3499	6.9	3500	6.3	3501	6.3	3502	6.9	3503	6.9	3504	6.9	3505	6.9

Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm
3503	67	3504	68	3505	67	3506	64	3507	65
3508	67	3509	65	3510	65	3511	60	3512	66
3513	68	3515	66	3516	72	3517	64	3518	64
3524	70	3525	62	3526	70	3527	62	3528	63
3529	74	3530	75	3531	71	3532	60	3533	61
3534	68	3535	66	3536	63	3537	65	3538	72
3539	64	3540	56	3541	57	3542	64	3543	66
3544	66	3545	69	3546	59	3547	69	3549	64
3550	68	3551	62	3552	62	3553	74	3554	68
3555	64	3556	69	3559	68	3559	68	3560	71
3561	73	3562	62	3563	69	3564	64	3565	68
3566	67	3567	66	3568	63	3569	61	3570	66
3571	70	3572	63	3573	68	3574	68	3575	62
3576	67	3577	59	3578	70	3579	70	3580	74
3581	67	3582	72	3583	71	3584	68	3585	67
3586	71	3587	76	3589	63	3589	76	3590	66
3591	68	3592	66	3593	62	3594	60	3595	64
3596	69	3597	62	3598	61	3599	70	3600	70
3601	70	3602	70	3603	72	3604	71	3605	69
3606	73	3607	61	3608	65	3609	63	3610	65
3611	62	3612	61	3614	62	3616	71	3617	65
3618	66	3619	68	3620	71	3621	62	3622	70
3623	71	3624	69	3625	71	3626	65	3627	62
3628	62	3629	71	3630	64	3631	66	3632	62
3633	74	3634	69	3635	62	3636	73	3637	61
3638	68	3639	73	3640	60	3641	68	3642	62
3644	65	3645	67	3646	69	3647	70	3648	65
3649	63	3650	63	3652	72	3653	64	3655	74
3656	74	3657	60	3657	74	3658	66	3659	64
3660	68	3661	65	3662	69	3663	65	3664	70
3665	60	3666	69	3667	68	3668	72	3669	63
3670	63	3671	57	3672	71	3673	61	3674	64
3675	68	3676	59	3677	73	3678	70	3680	66
3681	59	3682	70	3683	65	3684	70	3685	67
3686	70	3687	64	3688	67	3689	58	3690	64
3691	71	3692	71	3693	71	3694	74	3695	66
3696	66	3697	70	3698	63	3699	61	3700	68
3701	65	3702	65	3703	63	3704	70	3705	68
3706	69	3707	68	3708	68	3709	67	3710	63

Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm
3711	67	3712	66	3713	70	3714	72	3715	65	3716	67	3717	65	3718	69
3716	67	3717	59	3718	68	3719	69	3720	69	3721	57	3722	61	3723	61
3721	57	3723	63	3724	65	3725	63	3726	62	3727	61	3728	62	3729	70
3727	61	3728	62	3729	58	3730	56	3731	66	3732	62	3733	62	3734	62
3732	62	3733	70	3734	70	3735	59	3736	67	3737	70	3738	69	3739	69
3737	70	3738	63	3739	62	3740	68	3741	62	3742	73	3743	73	3744	73
3742	73	3743	72	3744	75	3745	64	3746	71	3747	72	3748	72	3749	72
3747	72	3748	64	3749	68	3750	68	3751	60	3752	70	3753	69	3754	70
3752	70	3753	63	3754	66	3755	68	3756	73	3757	69	3758	66	3759	66
3757	69	3758	66	3759	60	3760	65	3761	70	3762	66	3763	69	3764	66
3762	66	3763	69	3764	62	3765	71	3766	67	3767	61	3768	62	3769	64
3767	61	3768	62	3769	64	3770	64	3771	63	3772	70	3773	59	3774	71
3773	70	3774	69	3775	67	3776	69	3777	71	3778	60	3779	60	3780	61
3780	59	3781	70	3782	60	3783	58	3784	61	3785	71	3786	62	3787	61
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4894	69	4895	61	4896	68	4897	66	4898	64				
4899	66	4900	64	4901	70	4902	62	4903	63				
4904	73	4905	64	4906	72	4907	68	4908	70				
4909	69	4910	68	4911	65	4912	66	4913	71				
4914	64	4915	65	4916	64	4917	64	4918	67				
4919	70	4920	62	4921	64	4922	66	4923	71				

Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm
4924	69	4925	66	4926	67	4927	68	4928	67
4929	65	4930	60	4931	69	4932	61	4933	59
4934	63	4935	69	4936	63	4937	68	4938	63
4939	67	4940	64	4941	61	4942	66	4943	61
4944	59	4945	67	4946	65	4947	64	4948	68
4949	61	4950	64	4951	63	4952	62	4953	72
4954	70	4955	67	4956	66	4957	65	4958	64
4959	62	4960	66	4961	70	4962	62	4963	65
4964	63	4965	61	4966	63	4967	63	4968	72
4969	64	4970	61	4971	66	4972	64	4973	65
4974	69	4975	68	4976	67	4977	64	4978	72
4979	62	4980	70	4981	60	4982	63	4983	62
4985	70	4986	64	4987	64	4988	62	4989	63
4990	63	4991	61	4992	60	4993	63	4994	66
4995	63	4996	69	4997	63	4998	63	4999	66
5000	66	5001	64	5002	65	5003	65	5004	61
5004	64	5005	62	5006	67	5007	68	5008	66
5009	72	5010	71	5011	61	5012	62	5013	65
5014	63	5015	63	5016	63	5017	66	5018	60
5019	62	5020	64	5021	62	5022	61	5023	65
5024	67	5025	63	5026	65	5027	66	5028	63
5029	65	5030	65	5031	65	5032	65	5033	67
5034	65	5035	71	5036	67	5037	65	5038	68
5039	64	5040	65	5041	63	5042	63	5043	64
5044	67	5045	65	5046	69	5047	66	5048	64
5049	63	5050	63	5051	65	5052	68	5053	67
5054	64	5055	70	5056	63	5057	68	5058	66
5059	66	5060	68	5061	63	5062	67	5063	68
5064	65	5065	63	5066	63	5067	64	5068	64
5069	66	5070	64	5071	62	5072	62	5073	67
5074	63	5075	62	5076	66	5077	64	5078	62
5079	65	5080	69	5081	62	5082	63	5083	64
5084	65	5085	66	5086	64	5087	63	5088	66
5089	73	5090	70	5091	74	5092	72	5093	66
5094	65	5095	66	5096	65	5097	68	5098	64
5099	63	5100	64	5101	65	5102	69	5103	66
5104	62	5105	67	5106	64	5107	69	5108	64
5109	71	5110	68	5111	67	5112	72	5113	67
5114	70	5115	67	5116	63	5117	66	5118	67
5119	69	5120	65	5121	64	5122	71	5123	68

Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm
5124	67 0	5126	69 0	5127	65 0	5128	63 5
5129	64 0	5131	63 0	5132	64 0	5133	63 0
5134	66 0	5136	65 0	5137	73 5	5138	66 0
5139	57 0	5141	75 5	5142	71 5	5143	70 0
5144	67 0	5146	66 5	5147	64 0	5148	68 5
5149	70 5	5151	66 5	5152	65 0	5153	65 5
5154	65 5	5156	62 5	5157	65 0	5158	65 5
5159	71 5	5161	65 0	5162	67 0	5163	69 0
5164	70 5	5166	62 5	5167	71 0	5168	70 5
5169	62 5	5171	68 5	5172	68 0	5173	73 0
5174	66 5	5176	64 0	5177	67 5	5178	64 0
5179	73 0	5181	66 0	5182	61 5	5183	75 5
5184	63 0	5186	63 0	5187	72 0	5188	67 5
5189	65 0	5191	70 5	5192	63 5	5193	69 0
5194	62 5	5196	66 0	5197	68 0	5198	64 0
5199	65 5	5201	66 5	5202	62 0	5203	64 0
5204	66 0	5206	63 0	5207	64 0	5208	64 5
5209	64 5	5211	68 5	5212	65 0	5213	76 0
5214	67 0	5216	64 0	5217	65 0	5218	70 5
5219	66 0	5221	65 0	5222	64 0	5223	63 0
5224	75 0	5226	63 0	5227	62 5	5228	71 0
5229	62 5	5231	65 5	5232	68 0	5233	63 5
5234	61 5	5236	64 0	5237	64 5	5238	64 5
5239	73 0	5241	67 0	5242	64 0	5243	64 5
5244	63 0	5246	67 0	5247	65 5	5248	63 0
5249	66 0	5251	70 5	5252	77 0	5253	64 5
5254	68 0	5256	64 0	5257	61 5	5258	62 5
5259	62 0	5261	66 0	5262	61 5	5263	67 5
5264	64 0	5266	63 0	5267	64 0	5268	66 0
5269	64 5	5271	60 0	5272	66 0	5273	64 0
5274	65 0	5276	63 5	5277	63 5	5278	64 5
5280	61 5	5281	67 0	5282	66 0	5283	65 0
5284	57 5	5286	63 0	5287	62 0	5288	67 0
5289	56 0	5291	63 0	5292	65 0	5293	65 0
5294	62 5	5296	64 5	5297	61 5	5298	65 0
5299	69 0	5301	65 5	5302	64 5	5303	64 5
5304	63 5	5306	63 5	5307	62 5	5308	62 0
5309	66 0	5311	62 5	5312	44 0	5313	64 5
5314	66 5	5316	63 5	5317	62 0	5318	66 0
5319	66 5	5321	62 5	5322	63 5	5323	63 5

Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm
5324	60	5325	60	5326	70	5327	68	5328	63	5329	63	5330	70	5331	67	5332	68
5329	66	5330	42	5331	70	5332	67	5333	63	5334	67	5335	66	5336	67	5337	65
5334	64	5335	66	5336	67	5337	67	5338	68	5339	68	5340	64	5341	71	5342	72
5339	67	5340	62	5341	71	5342	67	5343	64	5344	66	5345	62	5346	67	5347	68
5344	66	5345	66	5346	67	5347	67	5348	61	5349	62	5350	66	5351	79	5352	74
5349	62	5350	66	5351	79	5352	74	5353	61	5354	67	5355	66	5356	66	5357	63
5354	67	5355	59	5356	66	5357	66	5358	61	5359	67	5360	62	5361	62	5362	63
5359	64	5360	63	5361	62	5362	63	5363	62	5364	64	5365	63	5366	59	5367	64
5364	64	5365	63	5366	59	5367	64	5368	62	5369	62	5370	64	5371	61	5372	62
5369	59	5370	64	5371	61	5372	62	5373	62	5374	63	5375	63	5376	65	5377	61
5374	63	5375	63	5376	65	5377	61	5378	71	5379	62	5380	61	5381	64	5382	57
5379	62	5380	61	5381	64	5382	57	5383	61	5384	62	5385	65	5386	61	5387	61
5384	64	5385	65	5386	64	5387	61	5388	66	5389	64	5390	63	5391	77	5392	70
5389	64	5390	63	5391	77	5392	70	5393	74	5394	68	5395	70	5396	71	5397	64
5394	68	5395	70	5396	71	5397	64	5398	63	5399	63	5400	65	5401	65	5402	74
5399	63	5400	65	5401	65	5402	74	5403	62	5404	61	5405	66	5406	62	5407	63
5404	61	5405	66	5406	62	5407	63	5408	64	5409	69	5410	63	5411	64	5412	63
5409	69	5410	63	5411	64	5412	63	5413	65	5414	69	5415	65	5416	56	5417	62
5414	69	5415	65	5416	56	5417	62	5418	65	5419	66	5420	67	5421	56	5422	63
5419	66	5420	67	5421	56	5422	63	5423	65	5424	65	5425	59	5426	62	5427	64
5424	65	5425	59	5426	62	5427	64	5428	64	5429	64	5430	59	5431	62	5432	65
5429	64	5430	59	5431	62	5432	65	5433	66	5434	67	5435	62	5436	66	5437	68
5434	67	5435	62	5436	66	5437	68	5438	67	5439	61	5440	64	5441	63	5442	65
5439	61	5440	64	5441	63	5442	65	5443	67	5444	64	5445	66	5446	64	5447	69
5444	64	5445	66	5446	64	5447	69	5448	61	5449	63	5450	67	5451	66	5452	73
5449	63	5450	67	5451	66	5452	73	5453	66	5454	62	5455	61	5456	65	5457	64
5454	62	5455	61	5456	65	5457	64	5458	63	5459	63	5460	64	5461	74	5462	63
5459	63	5460	64	5461	74	5462	63	5463	63	5464	66	5465	64	5466	63	5467	65
5464	66	5465	64	5466	63	5467	65	5468	66	5469	58	5470	64	5471	67	5472	64
5469	58	5470	64	5471	67	5472	64	5473	67	5474	65	5475	64	5476	61	5477	61
5474	65	5475	64	5476	61	5477	61	5478	67	5479	68	5480	65	5481	66	5482	66
5479	68	5480	65	5481	66	5482	66	5483	69	5484	69	5485	67	5486	67	5487	67
5484	69	5485	67	5486	67	5487	67	5488	65	5489	64	5490	62	5491	62	5492	62
5489	62	5490	62	5491	62	5492	62	5493	64	5494	58	5495	66	5496	66	5497	66
5494	58	5495	66	5496	66	5497	66	5498	64	5499	65	5500	68	5501	74	5502	64
5499	65	5500	68	5501	74	5502	64	5503	63	5504	64	5505	69	5506	67	5507	67
5504	64	5505	69	5506	67	5507	67	5508	68	5509	68	5510	72	5511	69	5512	69
5509	68	5510	72	5511	69	5512	69	5513	70	5514	62	5515	64	5516	65	5517	65
5514	62	5515	64	5516	65	5517	65	5518	62	5519	65	5520	65	5521	65	5522	60
5519	64	5520	65	5521	65	5522	60	5523	62	5524	62	5525	65	5526	65	5527	65

Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm
5524	64	5525	62	5526	66	5527	70	5528	70	5529	68	5530	63	5531	63
5529	63	5530	59	5531	63	5532	64	5533	64	5534	65	5535	65	5536	65
5534	63	5535	65	5536	65	5537	67	5538	67	5539	67	5540	65	5541	64
5545	64	5546	63	5547	61	5548	60	5549	60	5550	64	5551	64	5552	63
5550	65	5551	64	5552	63	5553	73	5554	73	5555	73	5556	68	5557	68
5555	65	5556	64	5557	66	5558	66	5559	73	5560	73	5561	66	5562	66
5560	61	5561	64	5562	60	5563	60	5564	60	5565	66	5566	69	5567	69
5565	66	5566	65	5567	69	5568	60	5569	60	5570	66	5571	67	5572	66
5570	65	5571	67	5572	66	5573	66	5574	64	5575	64	5576	67	5577	67
5576	65	5577	65	5578	66	5579	66	5580	63	5581	64	5582	64	5583	64
5580	63	5581	64	5582	60	5583	60	5584	60	5585	68	5586	73	5587	60
5585	58	5586	55	5587	60	5588	60	5589	62	5590	63	5591	64	5592	64
5590	63	5591	65	5592	67	5593	67	5594	67	5595	68	5596	61	5597	61
5595	68	5596	65	5597	67	5598	67	5599	62	5600	60	5601	69	5602	69
5600	60	5601	65	5602	63	5603	63	5604	63	5605	67	5606	65	5607	65
5605	67	5606	62	5607	63	5608	61	5609	61	5610	69	5611	62	5612	62
5610	59	5611	62	5612	65	5613	65	5614	61	5615	64	5616	58	5617	58
5615	64	5616	58	5617	61	5618	61	5619	61	5620	59	5621	62	5622	62
5620	59	5621	62	5622	63	5623	63	5624	64	5625	62	5626	65	5627	65
5625	64	5626	65	5627	65	5628	64	5629	62	5630	64	5631	66	5632	66
5630	65	5631	60	5632	62	5633	62	5634	62	5635	67	5636	60	5637	60
5635	62	5636	61	5637	63	5638	60	5639	60	5640	61	5641	61	5642	61
5640	65	5641	63	5642	62	5643	62	5644	64	5645	64	5646	62	5647	62
5645	64	5646	63	5647	63	5648	65	5649	65	5650	63	5651	63	5652	63
5650	58	5651	61	5652	67	5653	67	5654	63	5655	66	5656	65	5657	65
5655	63	5656	66	5657	63	5658	65	5659	65	5660	64	5661	64	5662	64
5660	63	5661	67	5662	62	5663	63	5664	63	5665	65	5666	65	5667	65
5665	59	5666	62	5667	62	5668	63	5669	63	5670	64	5671	64	5672	64
5670	64	5671	65	5672	60	5673	60	5674	62	5675	65	5676	65	5677	65
5675	67	5676	66	5677	64	5678	64	5679	62	5680	68	5681	68	5682	68
5680	65	5681	60	5682	61	5683	61	5684	61	5685	60	5686	61	5687	61
5685	62	5686	65	5687	62	5688	62	5689	62	5690	62	5691	62	5692	62
5690	65	5691	64	5692	64	5693	64	5694	64	5695	62	5696	62	5697	62
5695	64	5696	63	5697	63	5698	63	5699	63	5700	62	5701	62	5702	62
5700	58	5701	61	5702	67	5703	67	5704	65	5705	63	5706	65	5707	65
5705	63	5706	66	5707	63	5708	63	5709	61	5710	61	5711	61	5712	61
5710	59	5711	62	5712	65	5713	65	5714	61	5715	61	5716	61	5717	61
5715	64	5716	58	5717	61	5718	61	5719	61	5720	61	5721	61	5722	61
5720	59	5721	62	5722	63	5723	63	5724	64	5725	64	5726	64	5727	64
5725	67	5726	66	5727	64	5728	64	5729	62	5730	68	5731	68	5732	68
5730	65	5731	60	5732	62	5733	62	5734	67	5735	60	5736	60	5737	60
5735	62	5736	61	5737	63	5738	60	5739	60	5740	61	5741	61	5742	61
5740	65	5741	63	5742	62	5743	62	5744	64	5745	64	5746	64	5747	64
5745	64	5746	63	5747	62	5748	64	5749	64	5750	62	5751	61	5752	61
5750	58	5751	61	5752	67	5753	67	5754	65	5755	63	5756	63	5757	63
5755	63	5756	66	5757	63	5758	63	5759	66	5760	66	5761	66	5762	66
5760	64	5761	67	5762	65	5763	65	5764	65	5765	64	5766	64	5767	64
5765	59	5766	62	5767	62	5768	63	5769	63	5770	64	5771	64	5772	64
5770	64	5771	65	5772	60	5773	60	5774	62	5775	65	5776	65	5777	65
5775	67	5776	66	5777	64	5778	64	5779	62	5780	68	5781	68	5782	68
5780	65	5781	60	5782	62	5783	62	5784	67	5785	60	5786	60	5787	60
5785	62	5786	61	5787	61	5788	64	5789	64	5790	62	5791	62	5792	62
5790	50	5791	65	5792	61	5793	66	5794	66	5795	61	5796	61	5797	61
5795	65	5796	64	5797	58	5798	66	5799	66	5800	65	5801	65	5802	65
5800	65	5801	66	5802	62	5803	62	5804	64	5805	65	5806	63	5807	63
5805	63	5806	61	5807	61	5808	66	5809	66	5810	64	5811	64	5812	64
5810	64	5811	64	5812	62	5813	62	5814	62	5815	63	5816	63	5817	63
5815	63	5816	62	5817	62	5818	62	5819	63	5820	66	5821	66	5822	66
5820	66	5821	63	5822	63	5823	63	5824	65	5825	65	5826	65	5827	65

Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm	Tag No.	Length cm
5825	58	5826	61	5827	58	5828	64	5829	65	5830	65
5830	67	5831	63	5832	60	5833	63	5834	60	5835	60
5835	63	5836	61	5837	60	5838	61	5839	55	5840	55
5840	63	5841	62	5842	66	5843	51	5844	62	5845	60
5845	59	5846	68	5847	73	5848	58	5849	60	5850	60
5850	61	5851	58	5852	61	5853	61	5854	61	5855	65
5855	65	5856	59	5857	59	5858	65	5859	62	5860	62
5860	64	5861	65	5862	67	5863	59	5864	62	5865	62
5865	65	5866	62	5867	63	5868	65	5869	67	5870	63
5870	62	5871	69	5872	62	5873	62	5874	63		
5875	66	5876	65	5877	64	5878	62	5879	60		
5880	61	5881	62	5882	65	5883	66	5884	61		
5885	66	5886	65	5887	64	5888	66	5889	62		
5890	64	5891	65	5892	65	5893	63	5894	65		
5895	63	5896	65	5897	60	5898	67	5899	65		
5900	70	5901	64	5902	63	5903	66	5904	57		
5905	66	5906	63	5907	64	5908	68	5909	60		
5910	62	5911	62	5912	66	5913	65	5914	61		
5915	63	5916	65	5917	65	5918	61	5919	66		
5920	70	5921	65	5922	63	5923	73	5924	61		
5925	64	5926	69	5927	67	5928	62	5929	61		
5930	69	5931	65	5932	72	5933	65	5934	68		
5935	65	5936	64	5937	64	5938	66	5939	65		
5940	70	5941	65	5942	69	5943	61	5944	59		
5945	67	5946	64	5947	65	5948	67	5949	72		
5950	60	5951	64	5952	59	5953	64	5954	67		
5955	65	5956	66	5957	72	5958	63	5959	66		
5960	60	5961	66	5962	68	5963	65	5964	66		
5965	64	5966	62	5967	66	5968	63	5969	65		
5970	64	5971	64	5972	60	5973	61	5974	66		
5975	71	5976	65	5977	67	5978	73	5979	66		
5980	62	5981	64	5982	72	5983	65	5984	72		
5985	66	5986	64	5987	65	5988	68	5989	64		
5990	63	5991	64	5992	70	5993	65	5994	65		
5995	61	5996	68	5997	66	5998	62	5999	62		
6000	63	6001	69	6002	65	6003	65	6004	66		
6005	70	6006	70	6007	63	6008	67	6009	64		
6010	64	6011	65	6012	62	6013	65	6014	61		
6015	66	6016	65	6017	62	6018	69	6019	65		
6020	70	6021	64	6022	68	6023	61	6024	66		

Tag No.	Length cm	Tag No.	Length mm	Tag No.	Length cm	Tag No.	Length mm	Tag No.	Length cm	Tag No.	Length mm	Tag No.	Length cm	Tag No.	Length mm	Tag No.	Length cm	Tag No.	Length mm
6025	64	6026	73	6027	73	6028	71	6029	64	6030	64	6031	64	6032	64	6033	64	6034	64
6030	65	6031	60	6032	67	6033	67	6034	67	6035	64	6036	67	6037	67	6038	67	6039	67
6035	64	6036	53	6037	63	6038	61	6039	67	6040	67	6041	61	6042	61	6043	67	6044	67
6040	67	6041	67	6042	61	6043	61	6044	67	6045	70	6046	69	6047	66	6048	65	6049	64
6045	70	6046	69	6047	66	6048	65	6049	64	6050	63	6051	65	6052	67	6053	62	6054	65
6050	63	6051	65	6052	67	6053	62	6054	65	6055	66	6056	61	6057	63	6058	63	6059	66
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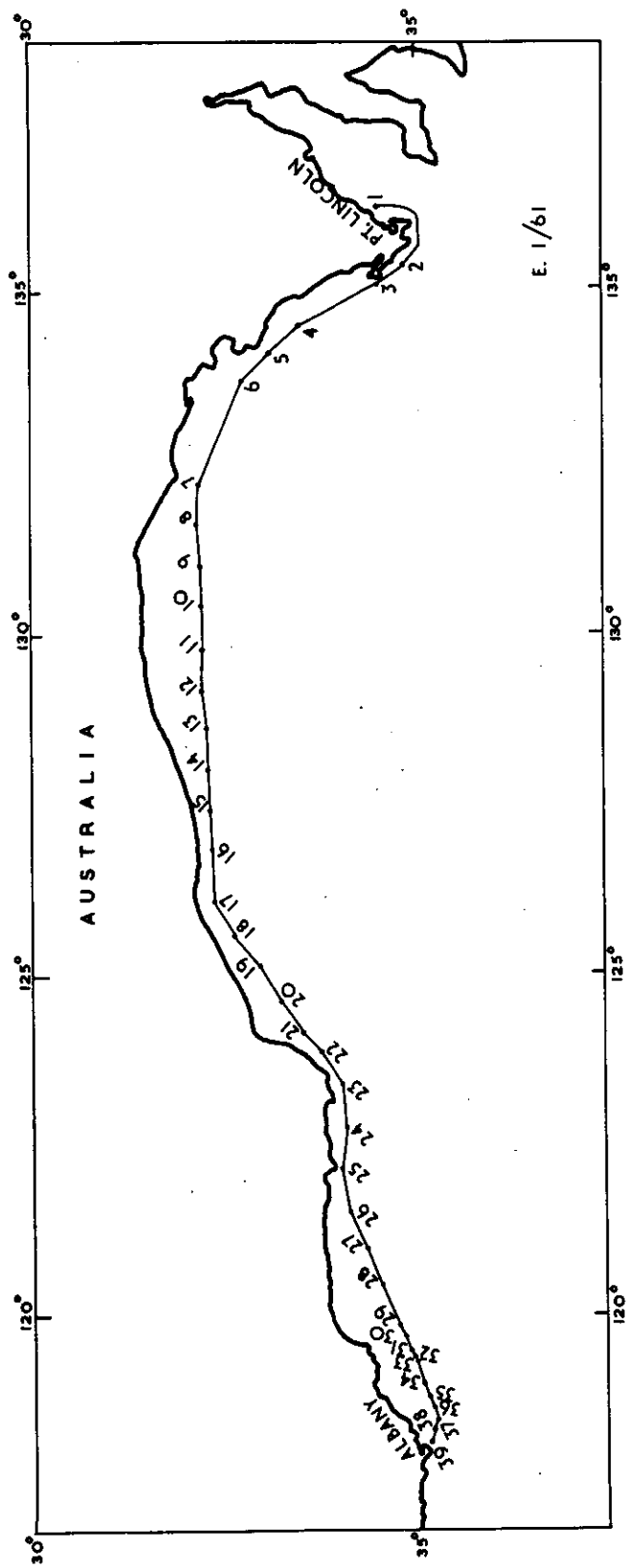


Fig. 1.- Track chart of Cruise E1/61.

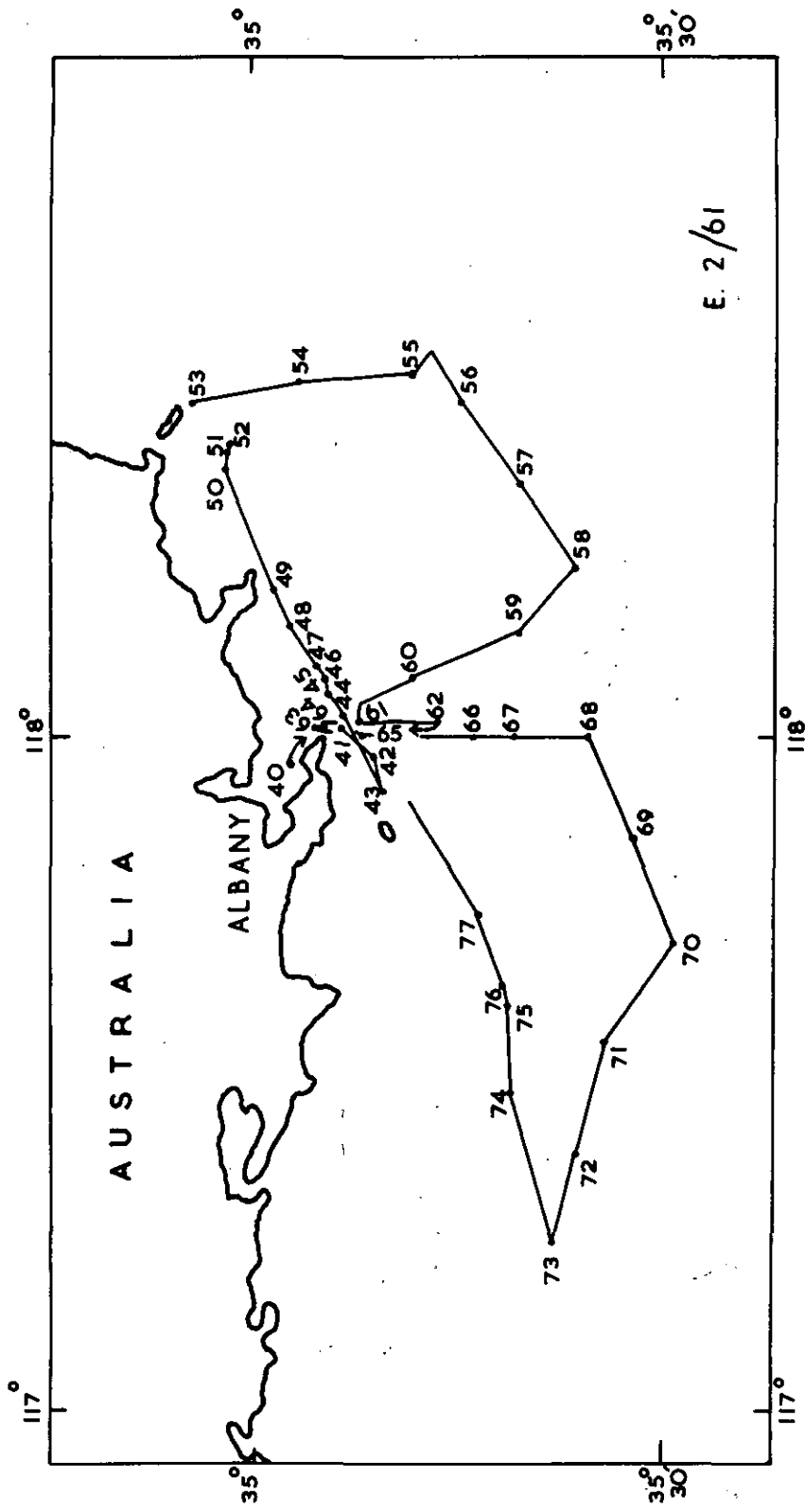


Fig. 2.- Track chart of Cruise E2/61.

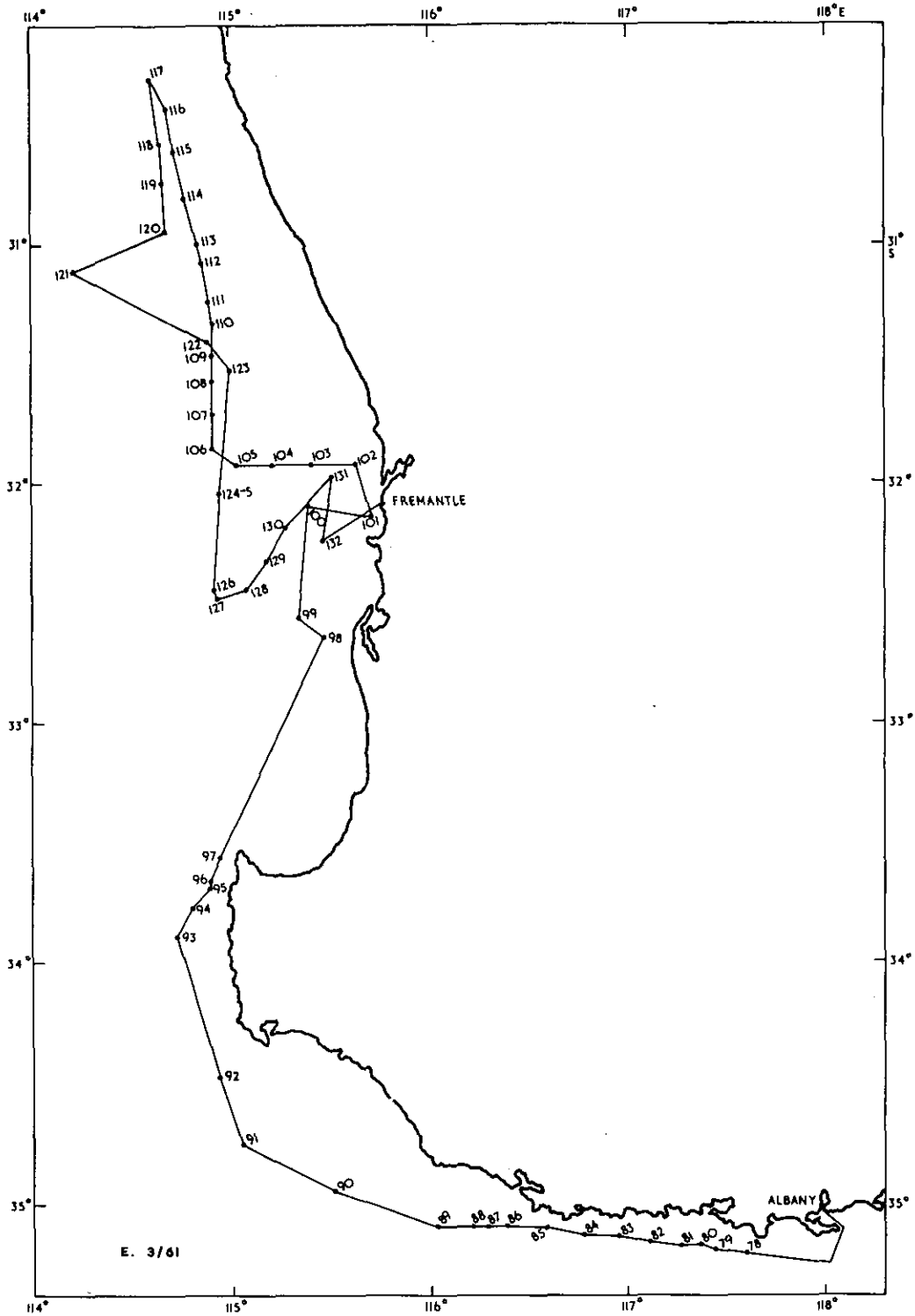


Fig. 3.- Track chart of Cruise E3/61.

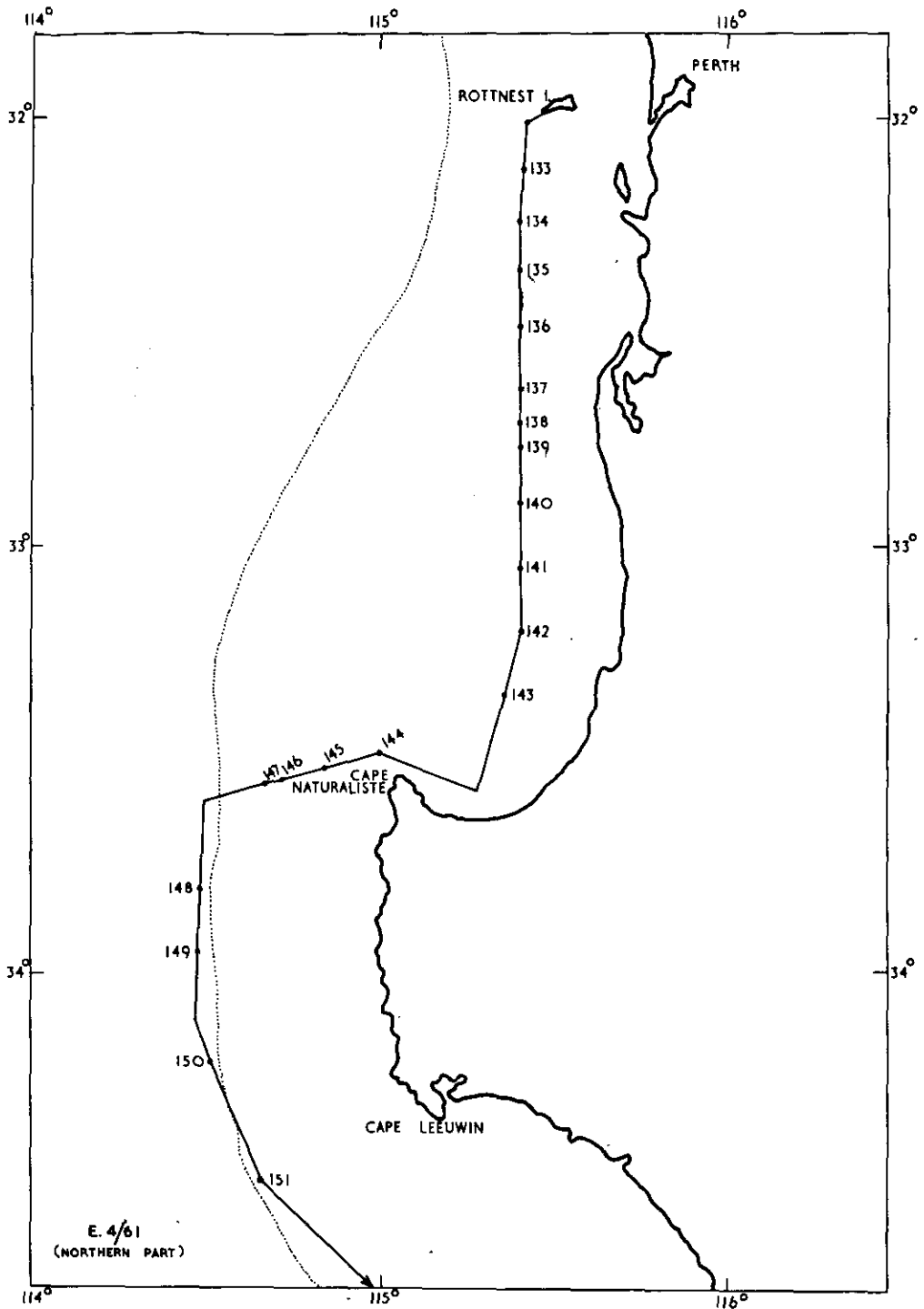


Fig. 4.- Track chart of cruise E4/61 - Part 1.

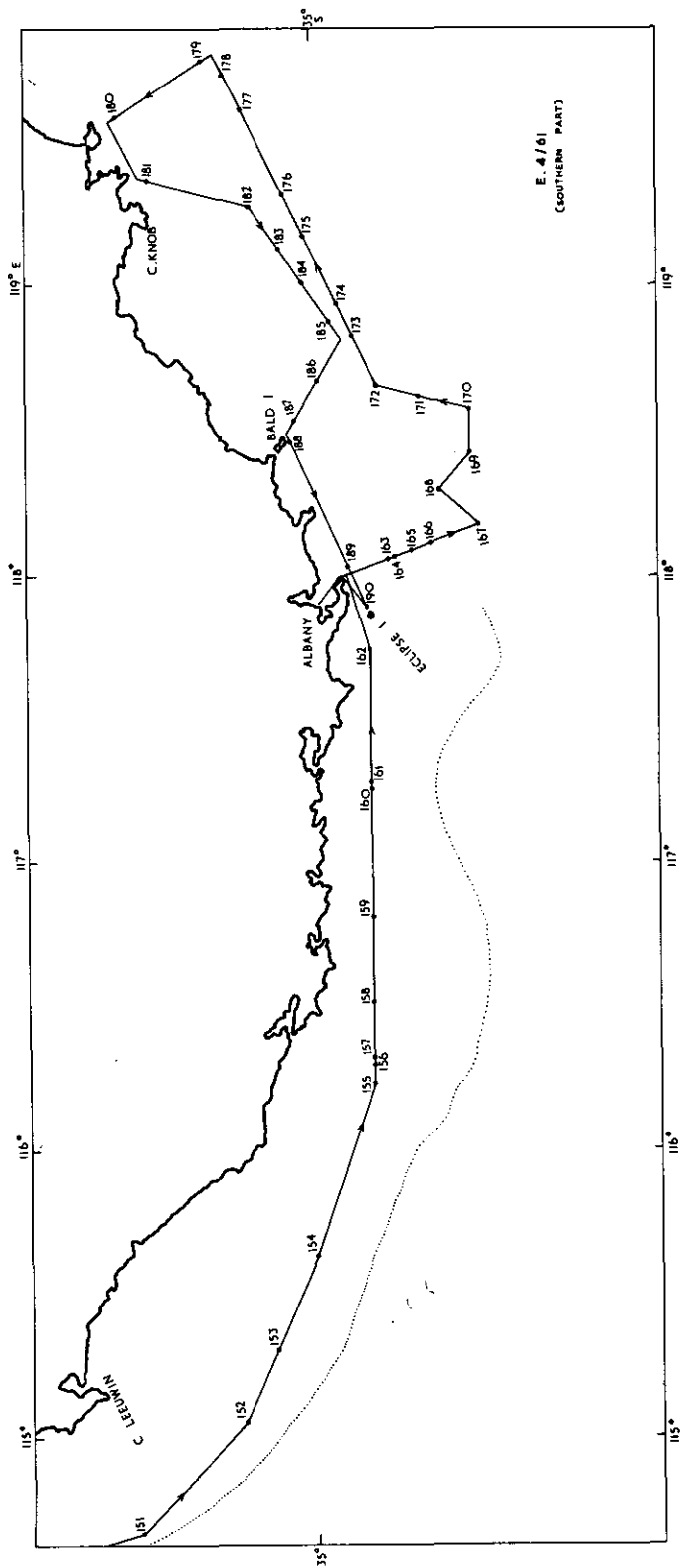


Fig. 5.- Track chart of Cruise E4/61 - Part 2.

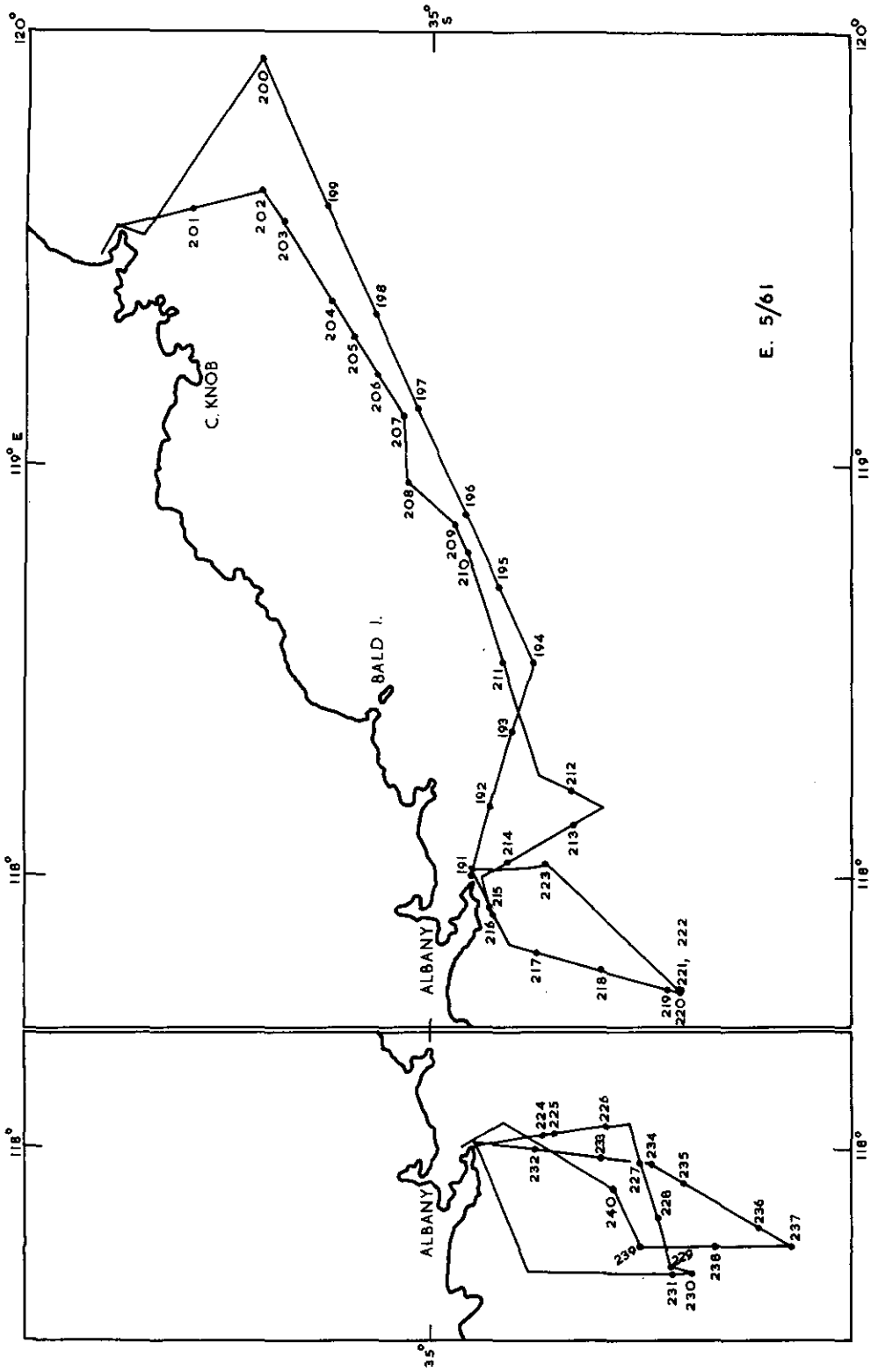


Fig. 6.- Track chart of Cruise E5/61.

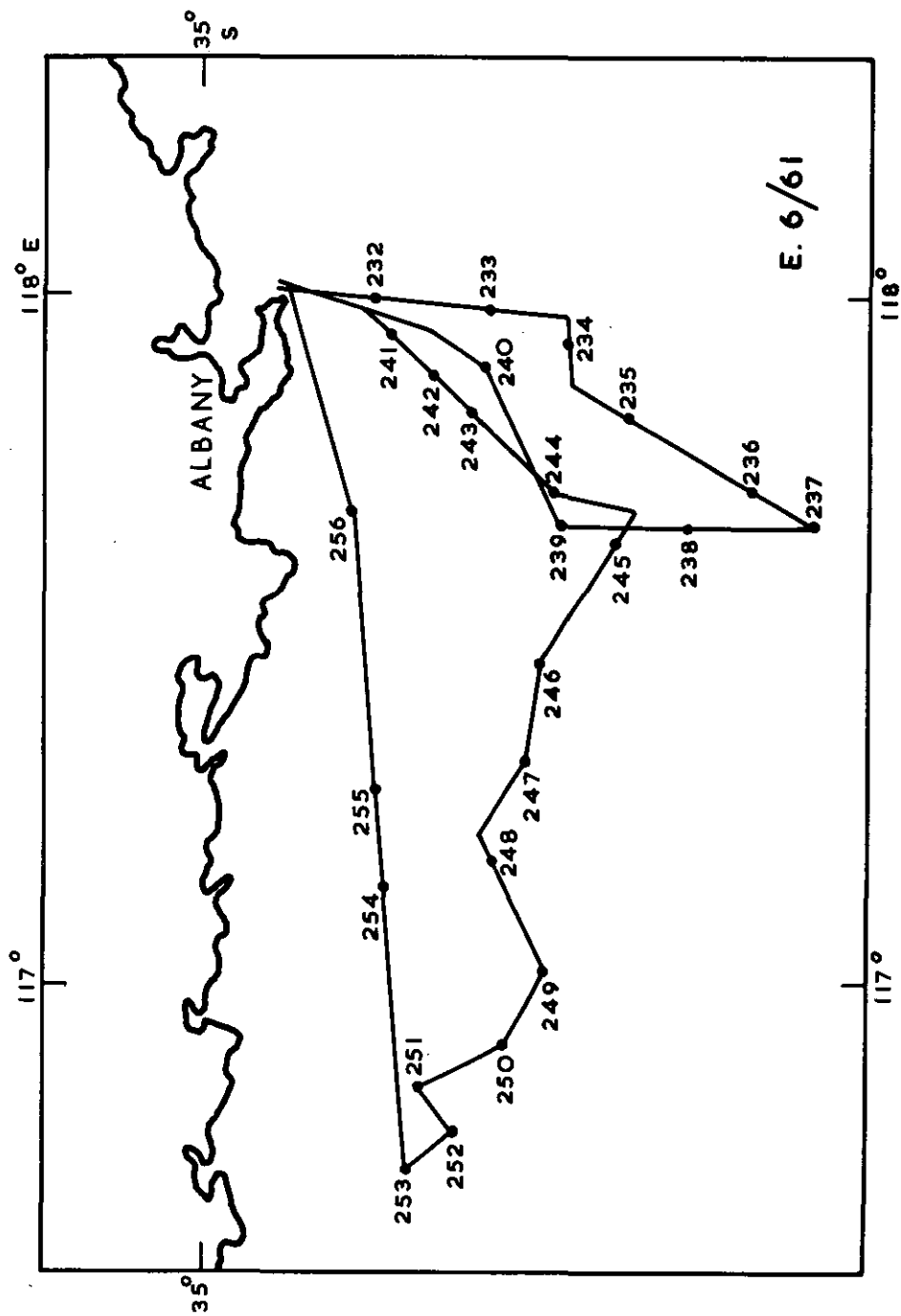
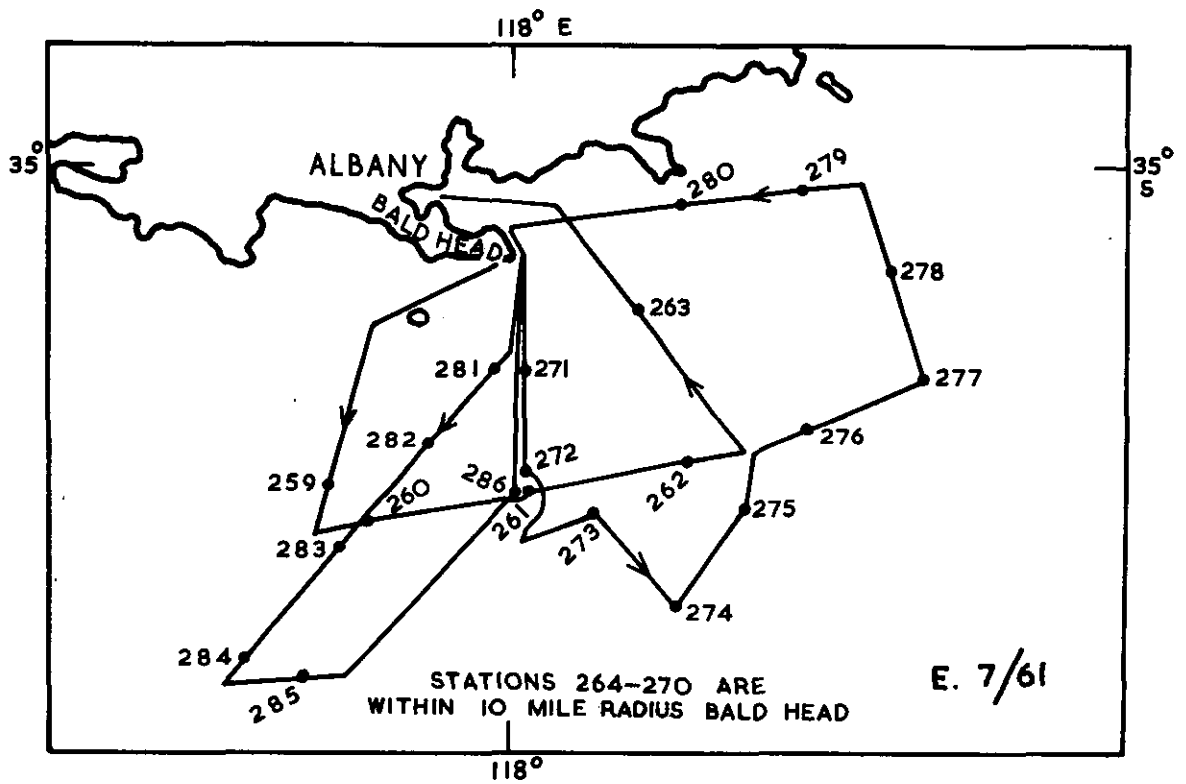


Fig. 7.- Track chart of Cruise E6/61.



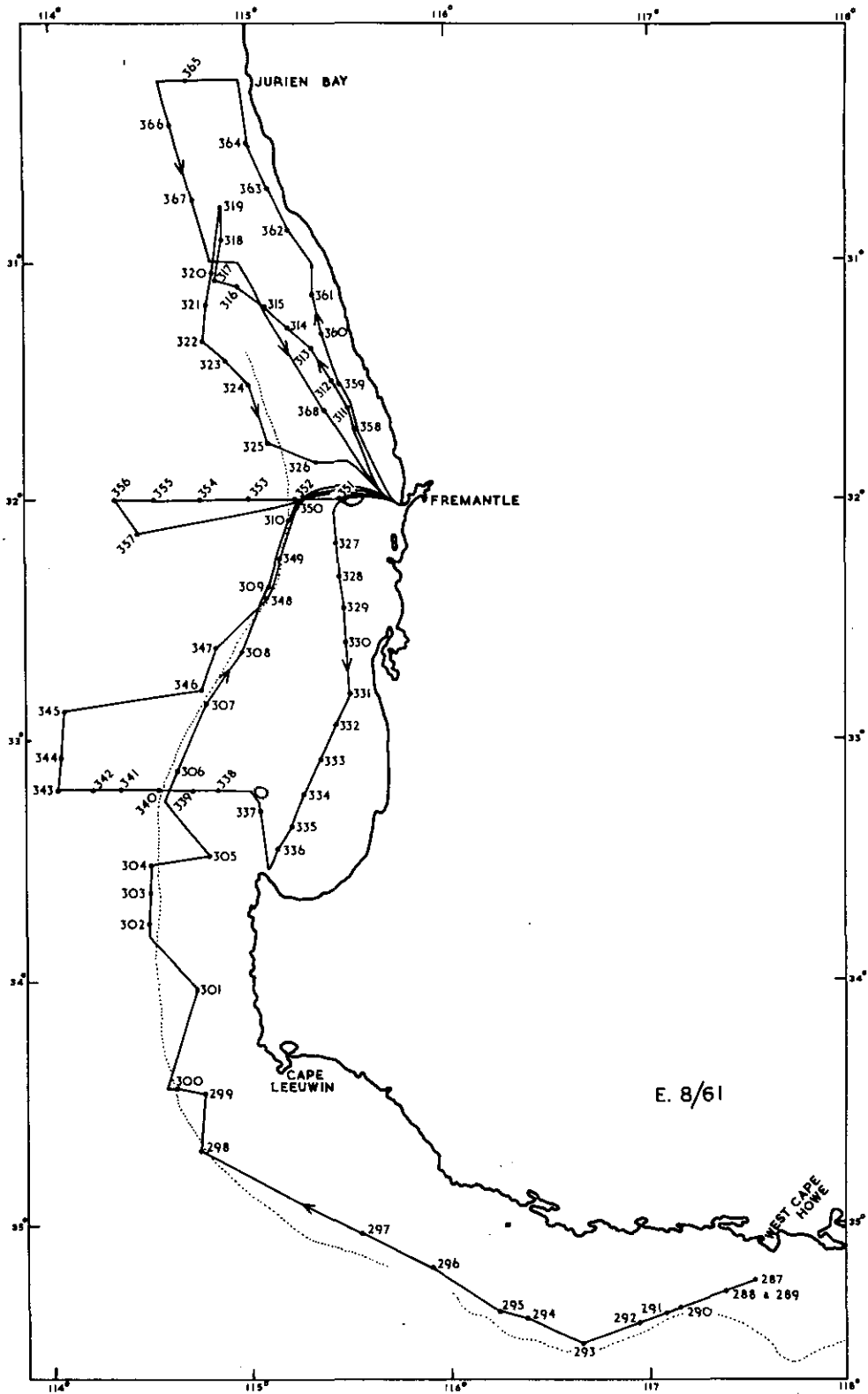


Fig. 9.- Track chart of Cruise E8/61.

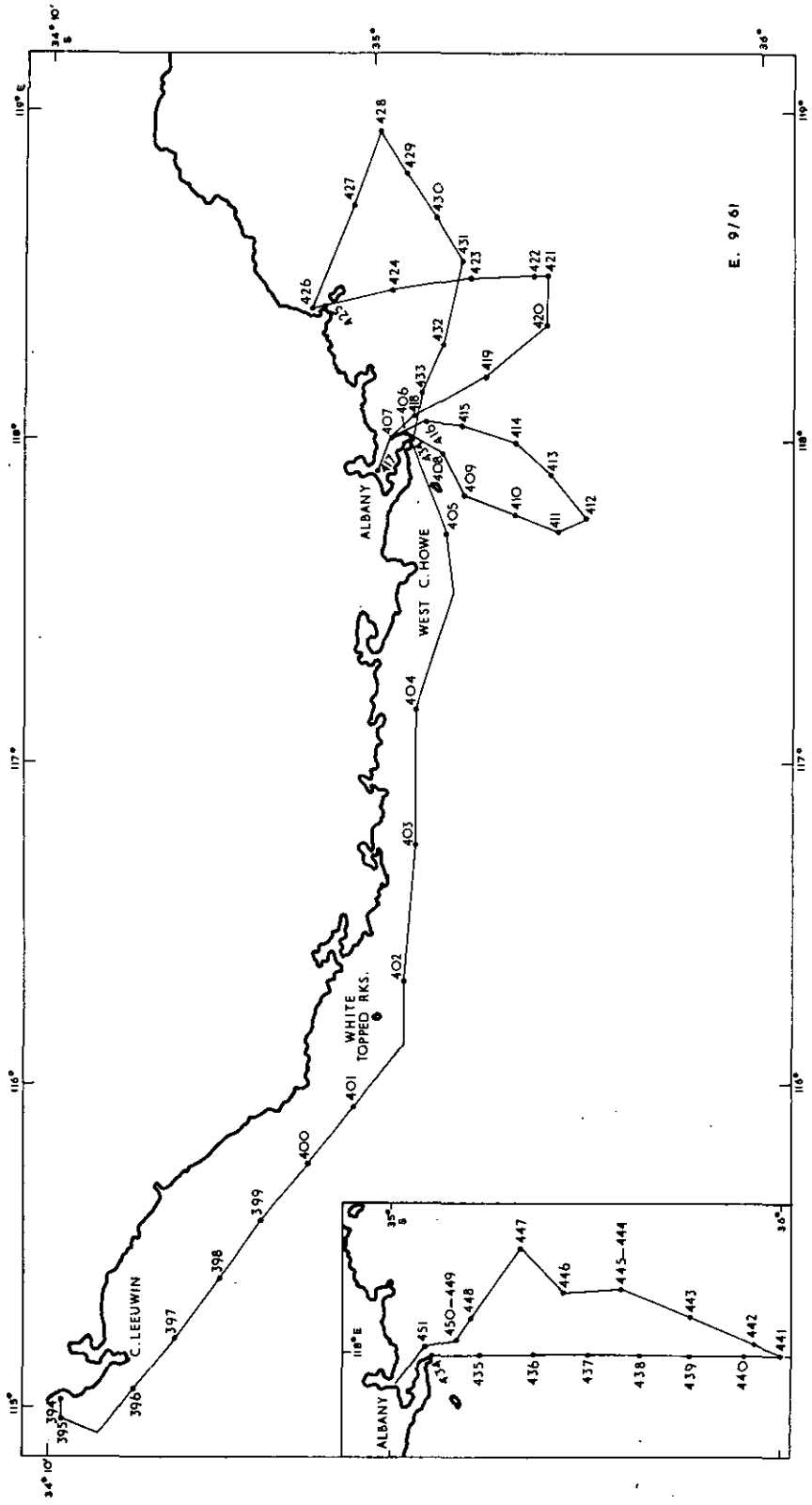


Fig. 10.- Track chart of Cruise E9/61.

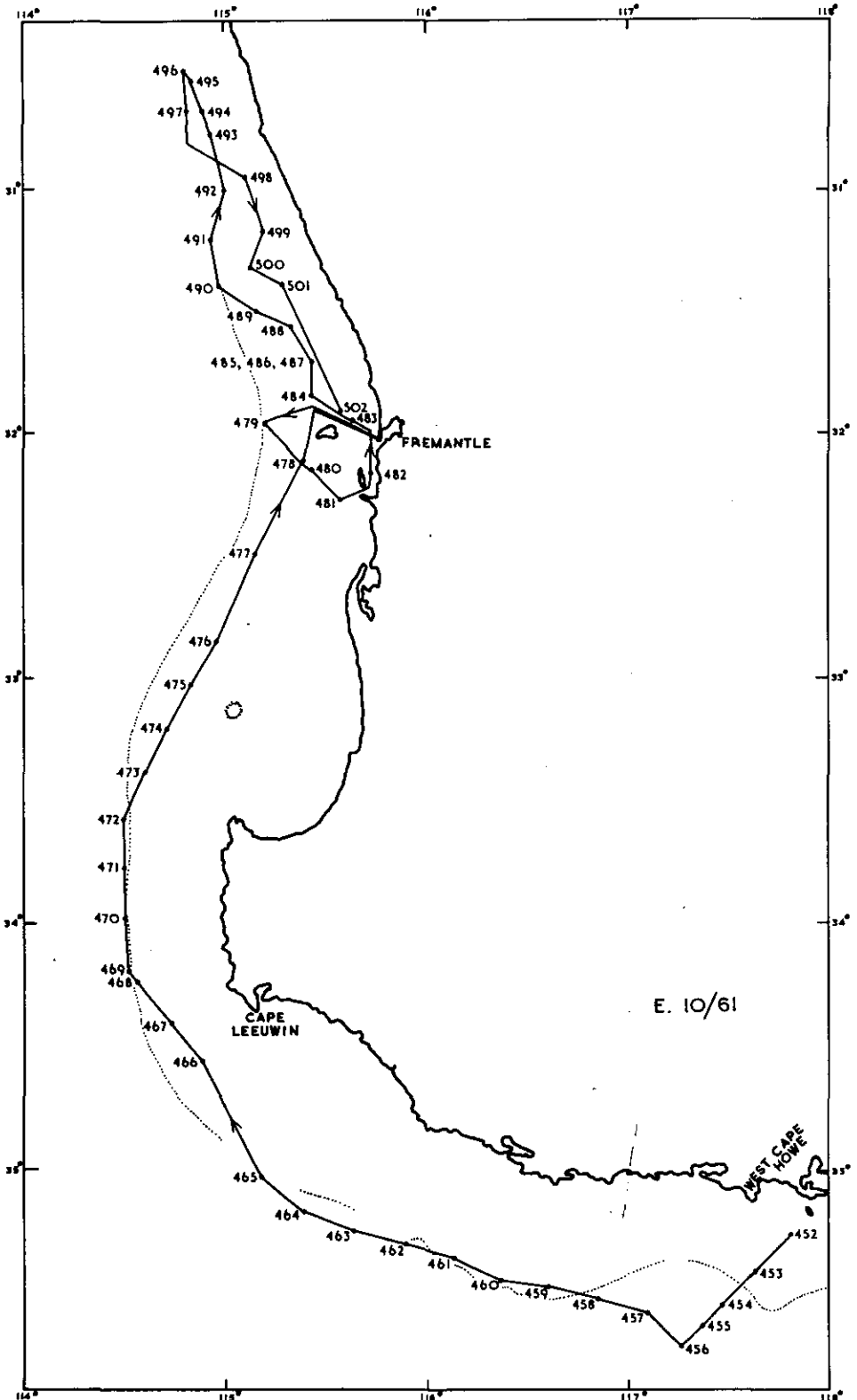


Fig. 11.- Track chart of Cruise E10/61.

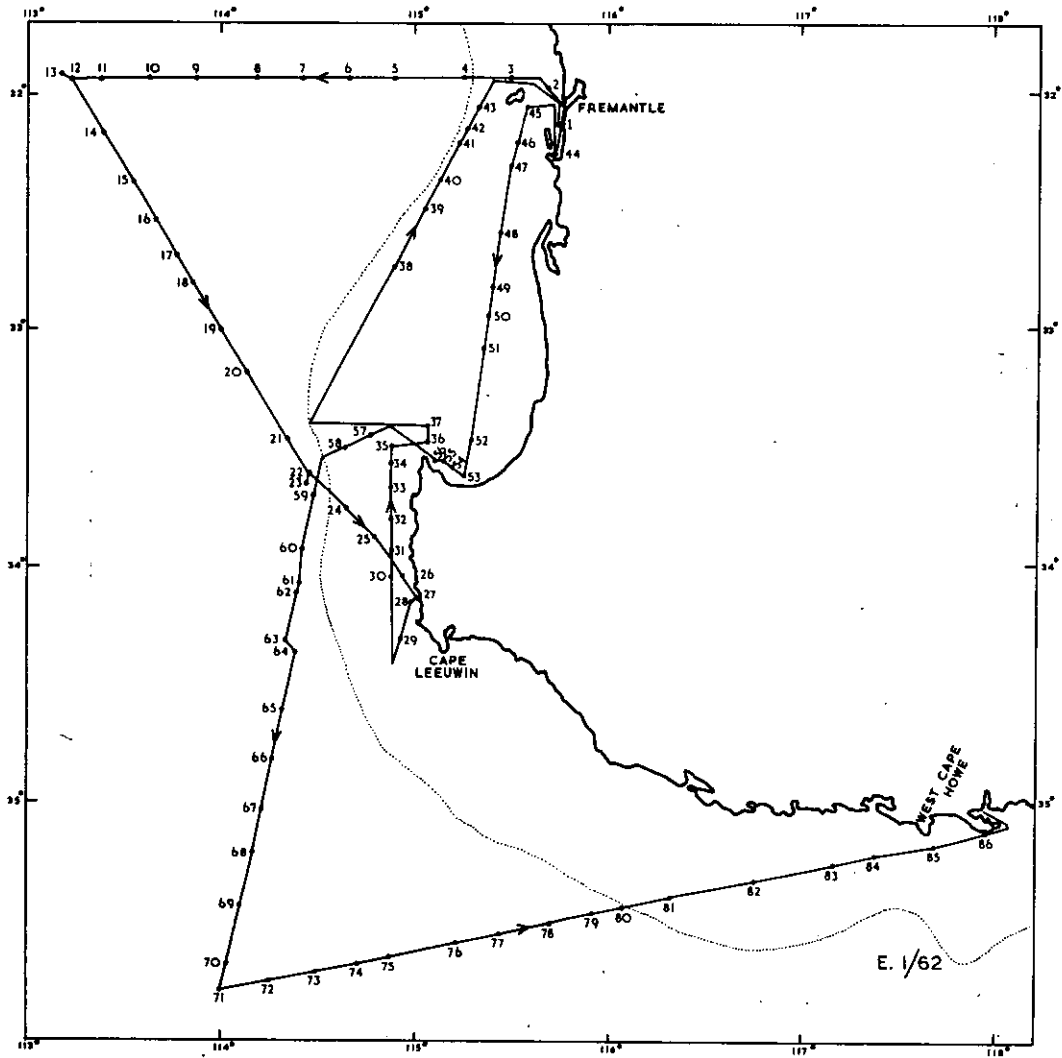


Fig. 12.- Track chart of Cruise E1/62.

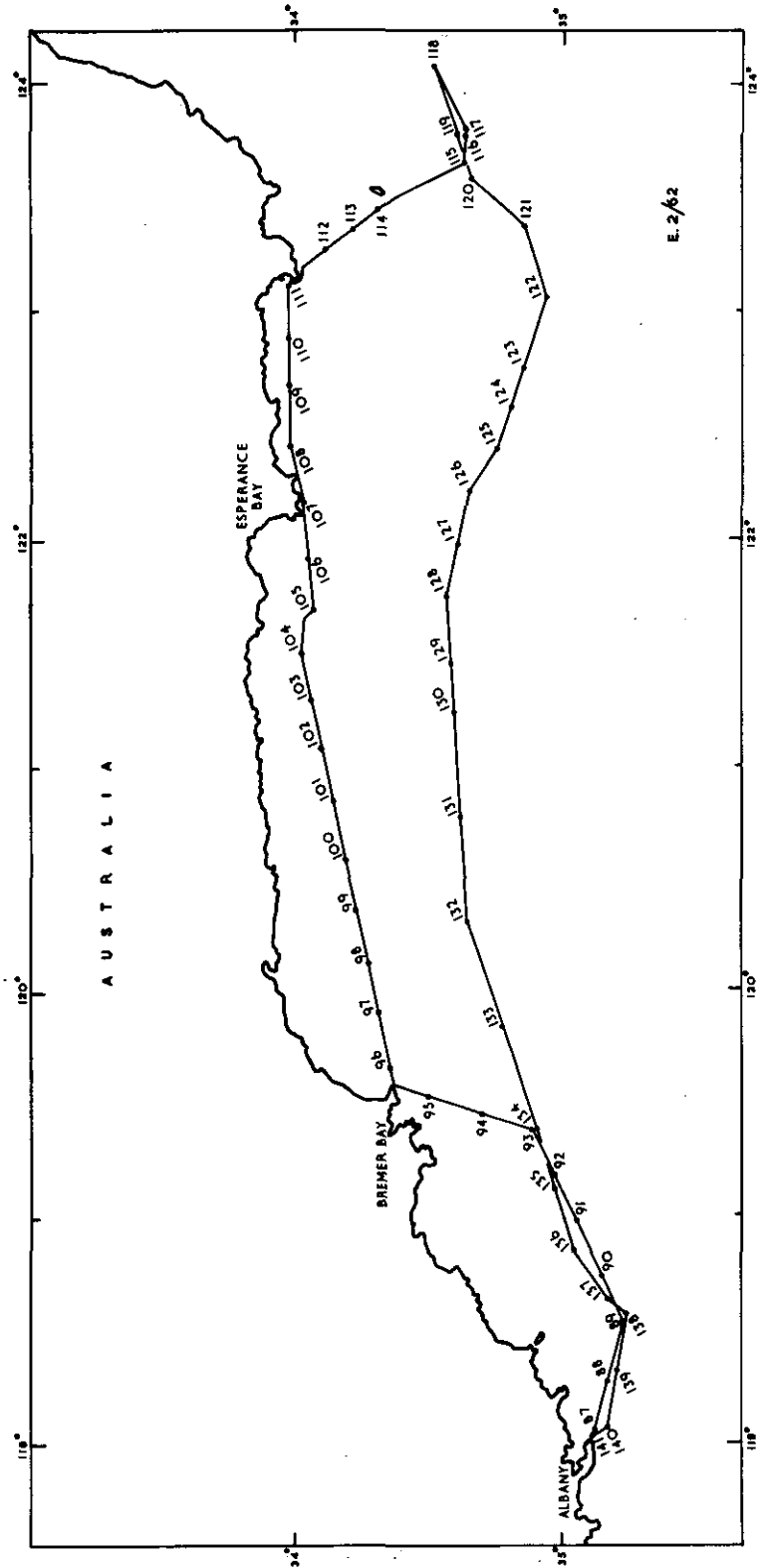


Fig. 13.- Track chart of Cruise E2/62.

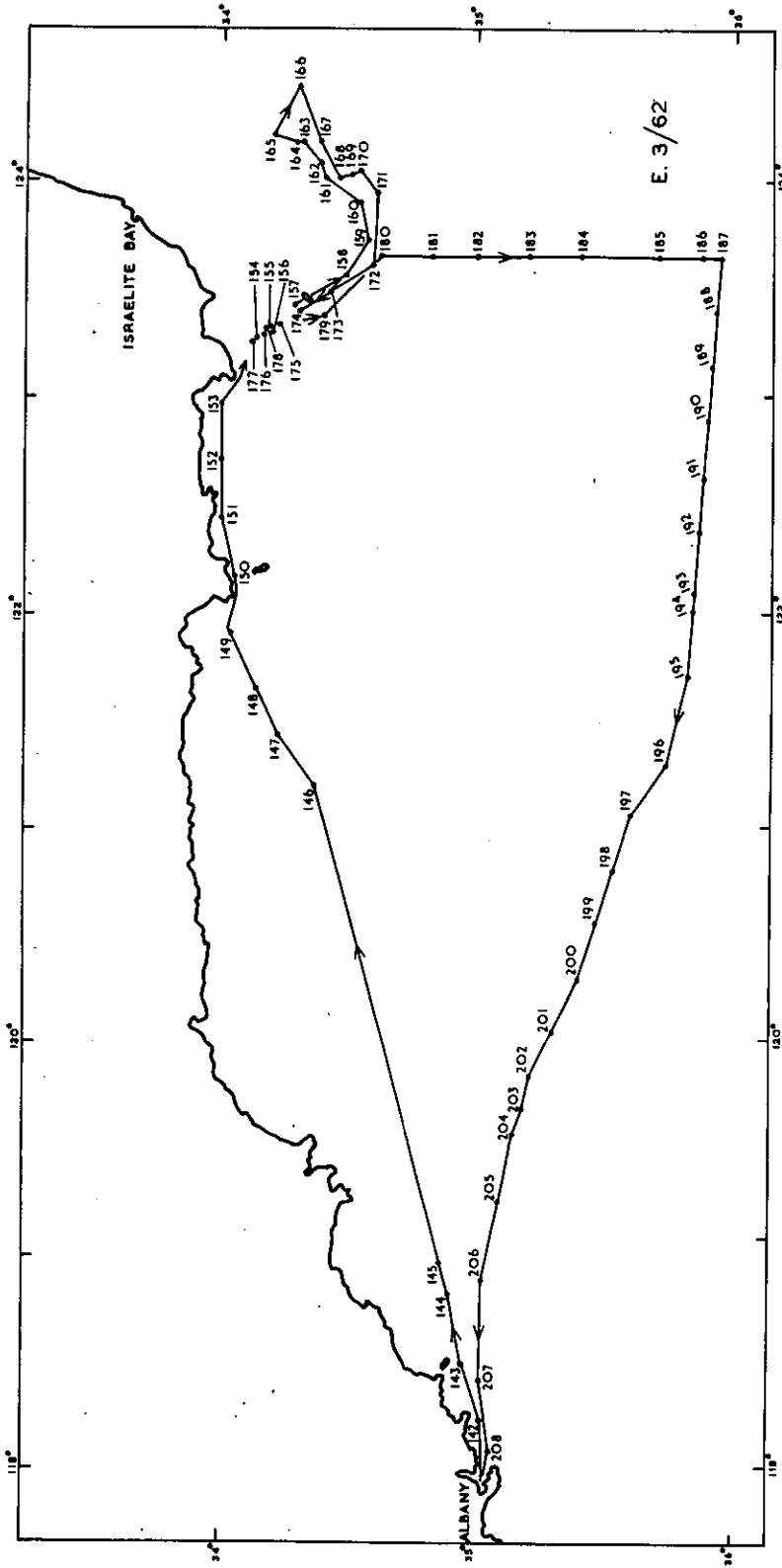


Fig. 14.- Track chart of Cruise E3/62.

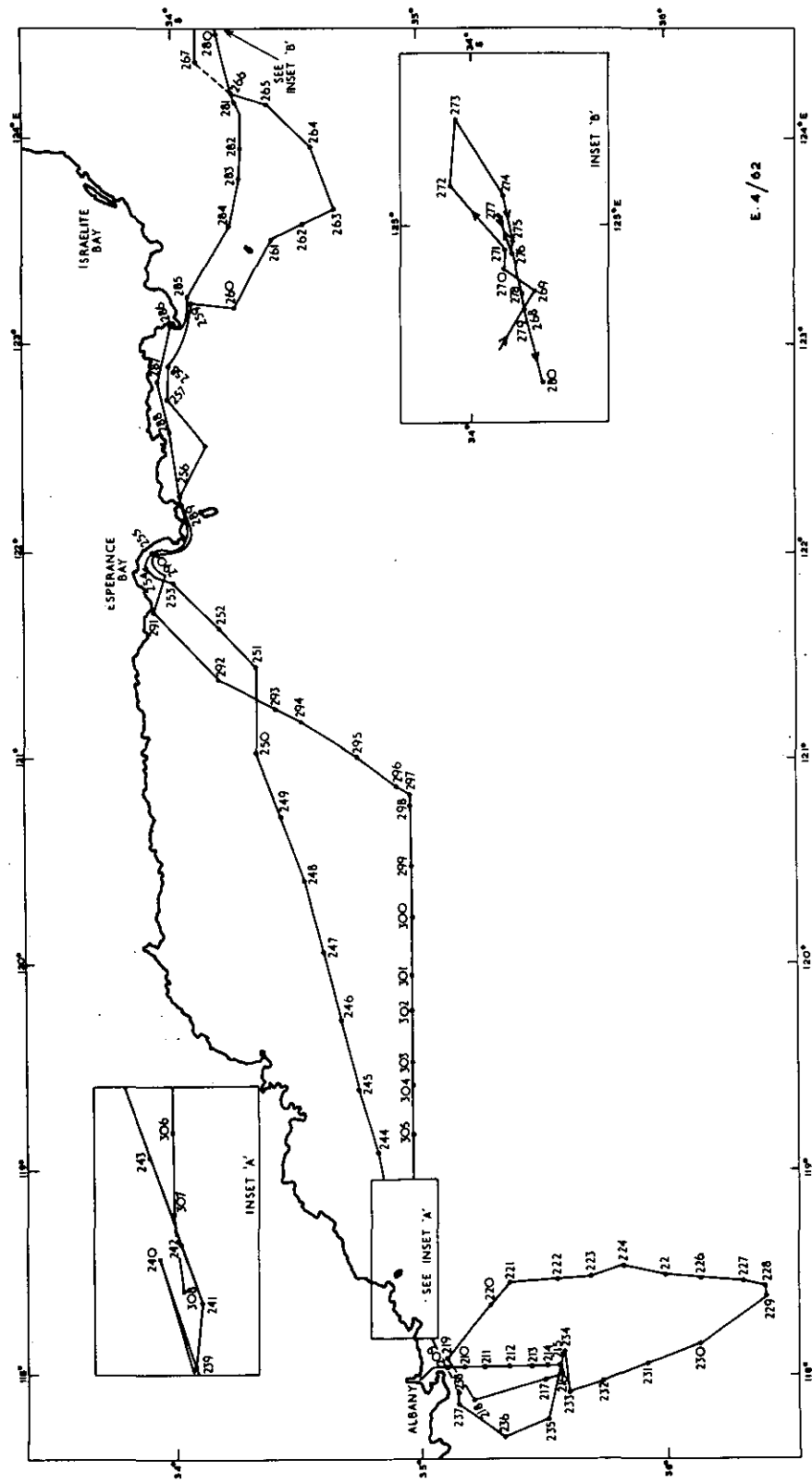


Fig. 15.- Track chart of Cruise E4/62.

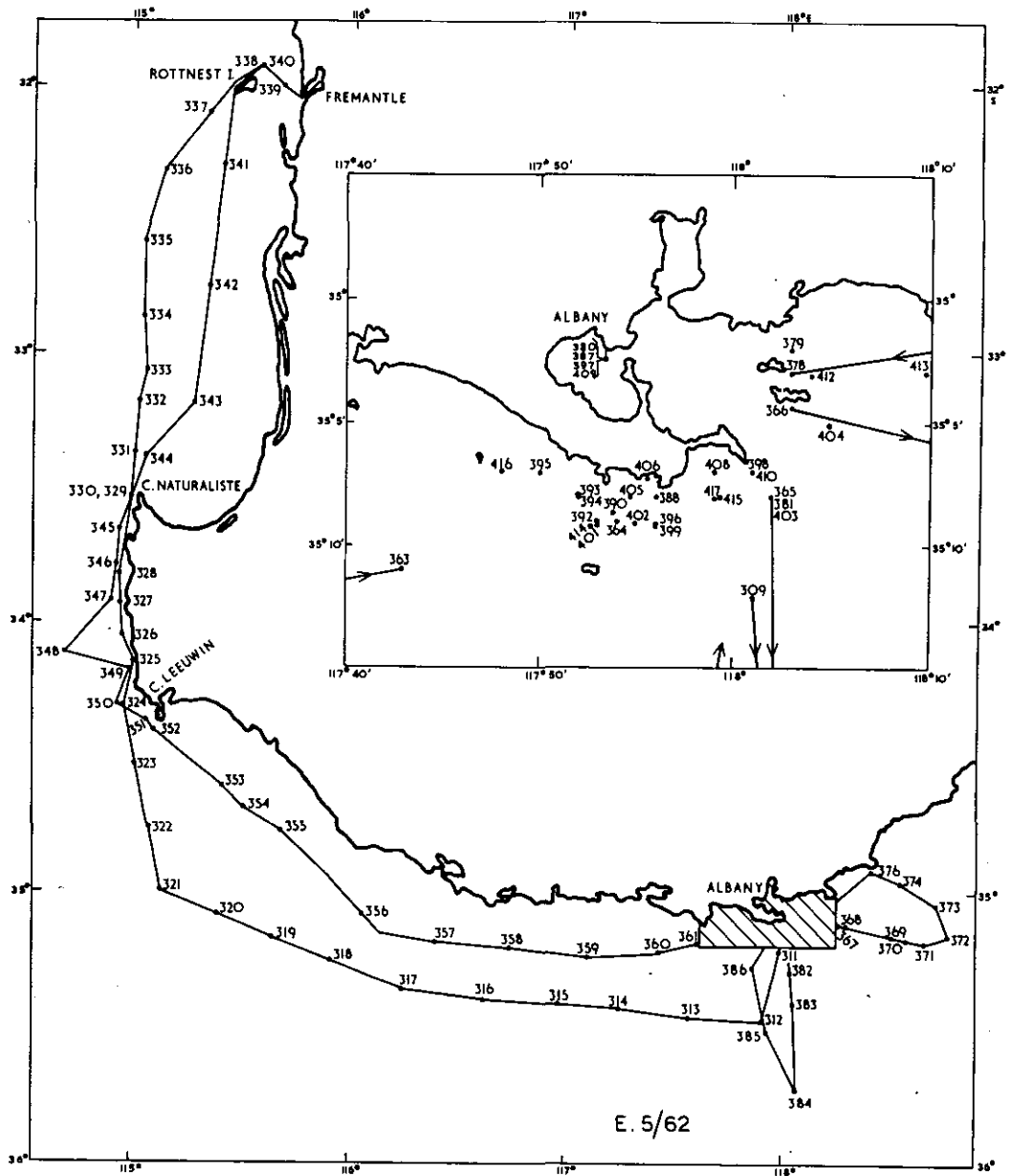


Fig. 16.- Track chart of Cruise E5/62.

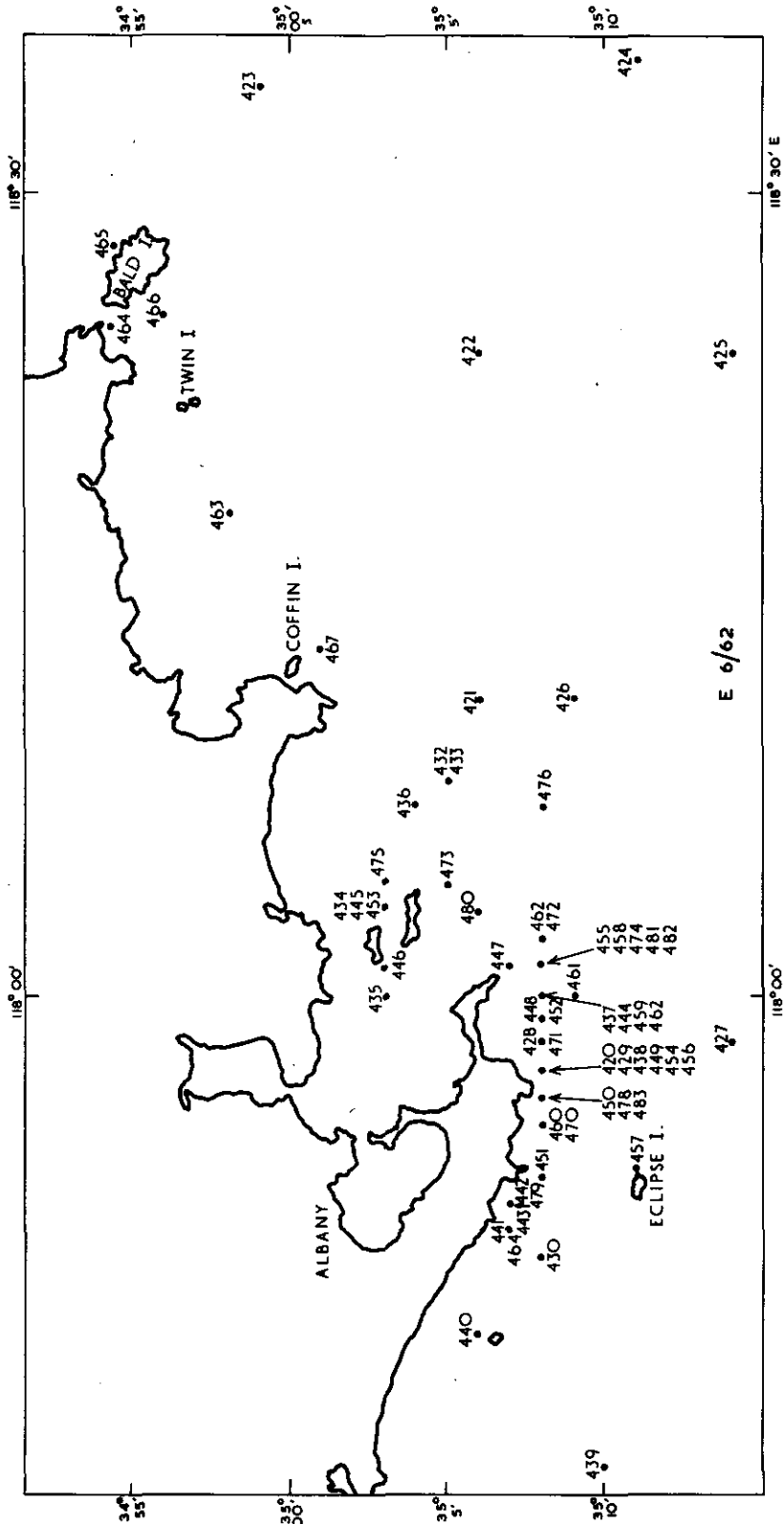


Fig. 17.- Track chart of Cruise E6/62.

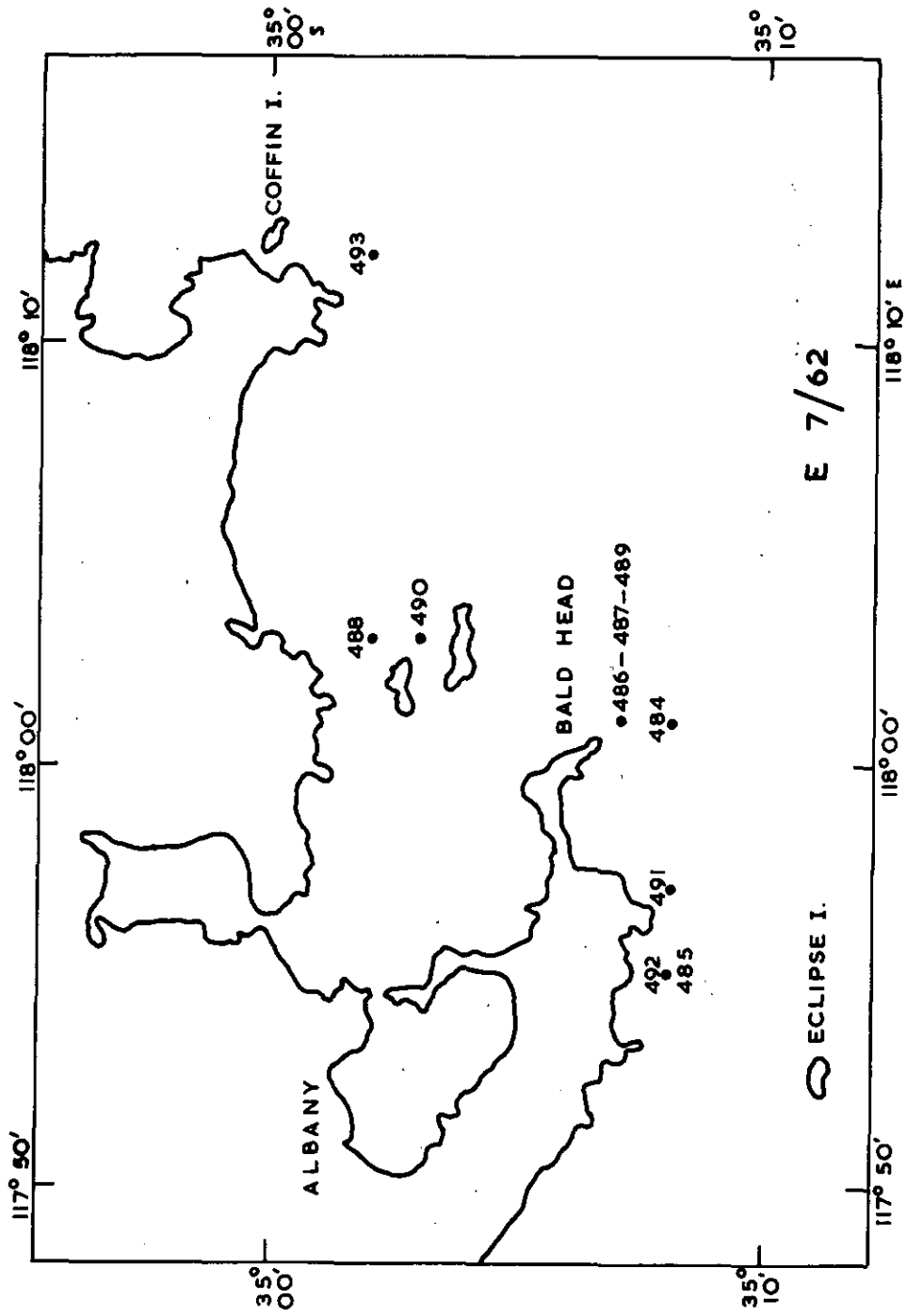


Fig. 18.- Track chart of Cruise E7/62.

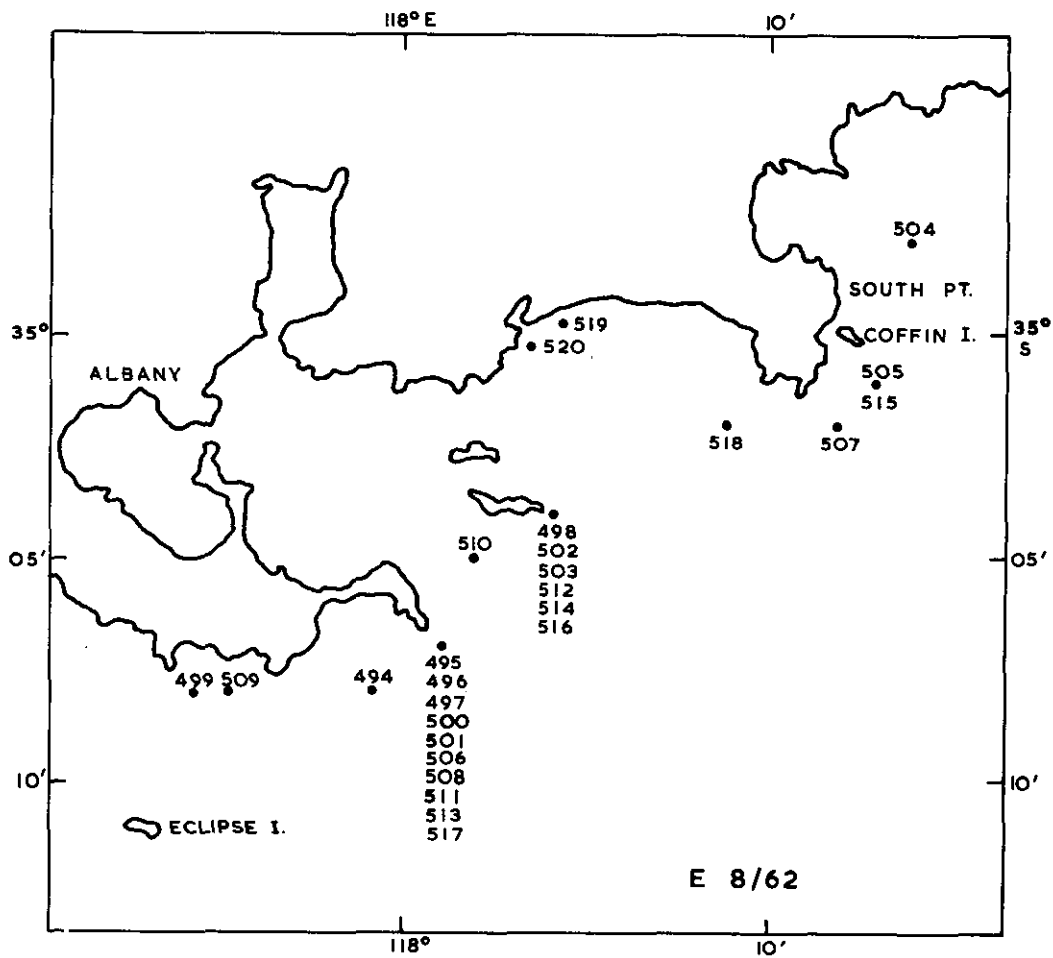


Fig. 19.- Track chart of Cruise E8/62.

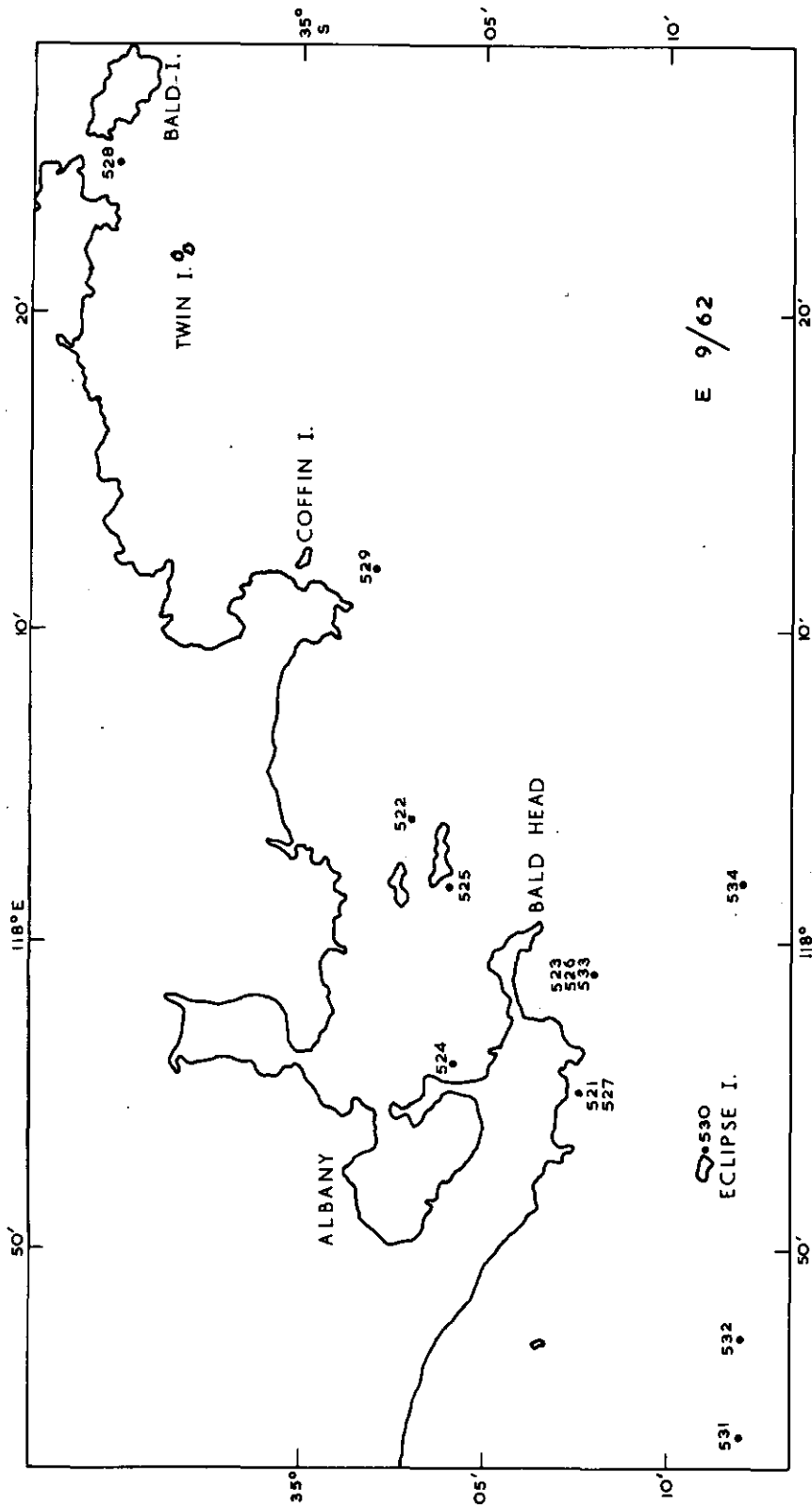


Fig. 20.- Track chart of Cruise E9/62.

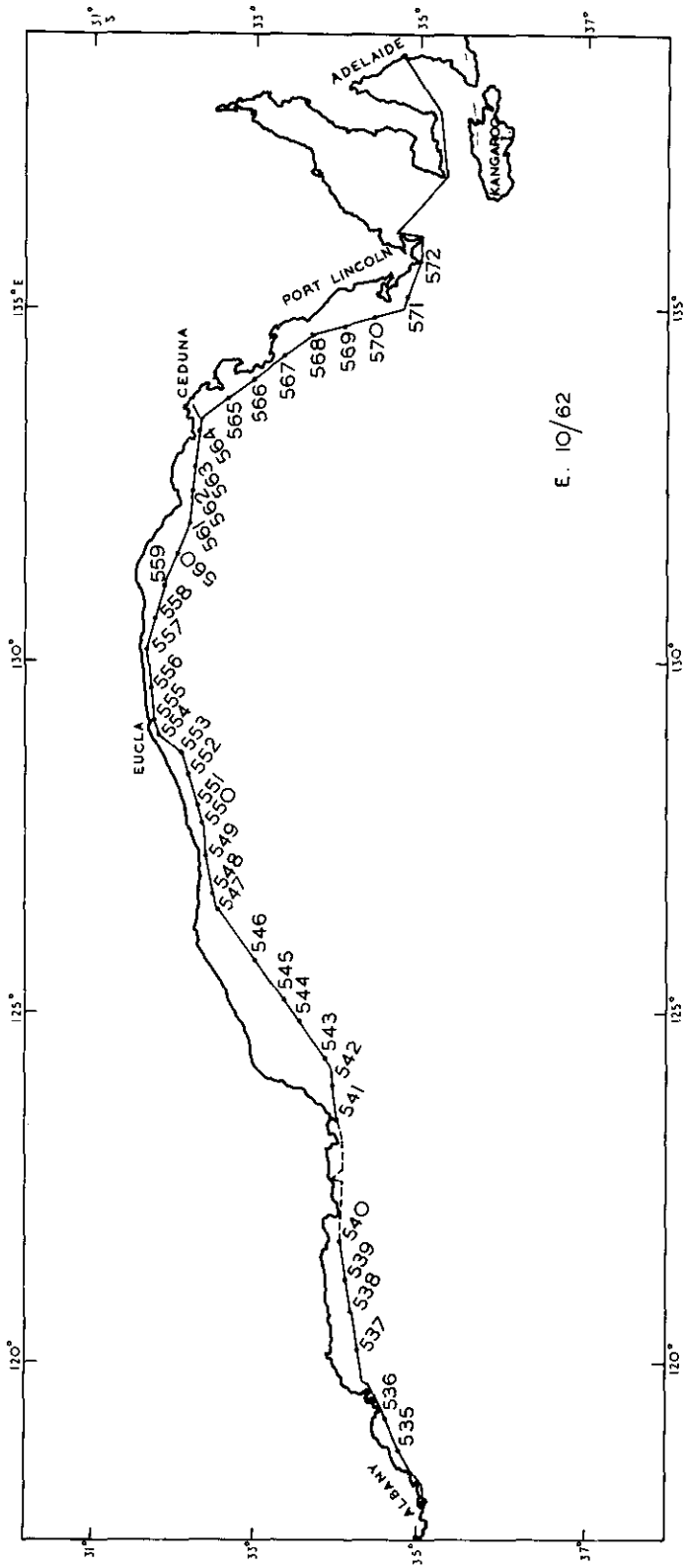


Fig. 21.- Track chart of Cruise E10/62.

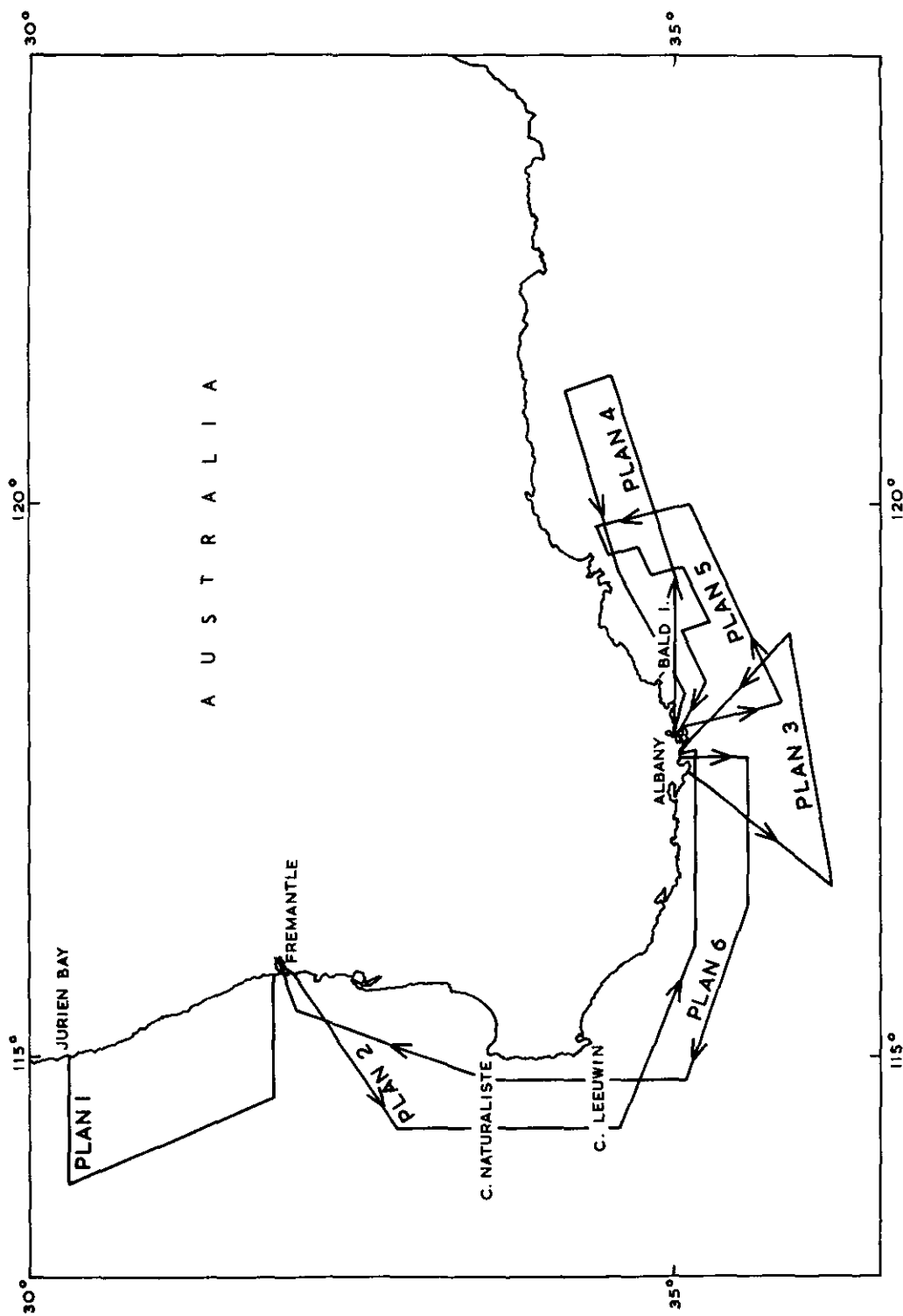


Fig. 22.- Formal plans on which aerial flights were conducted.
For detail see Appendix 4.

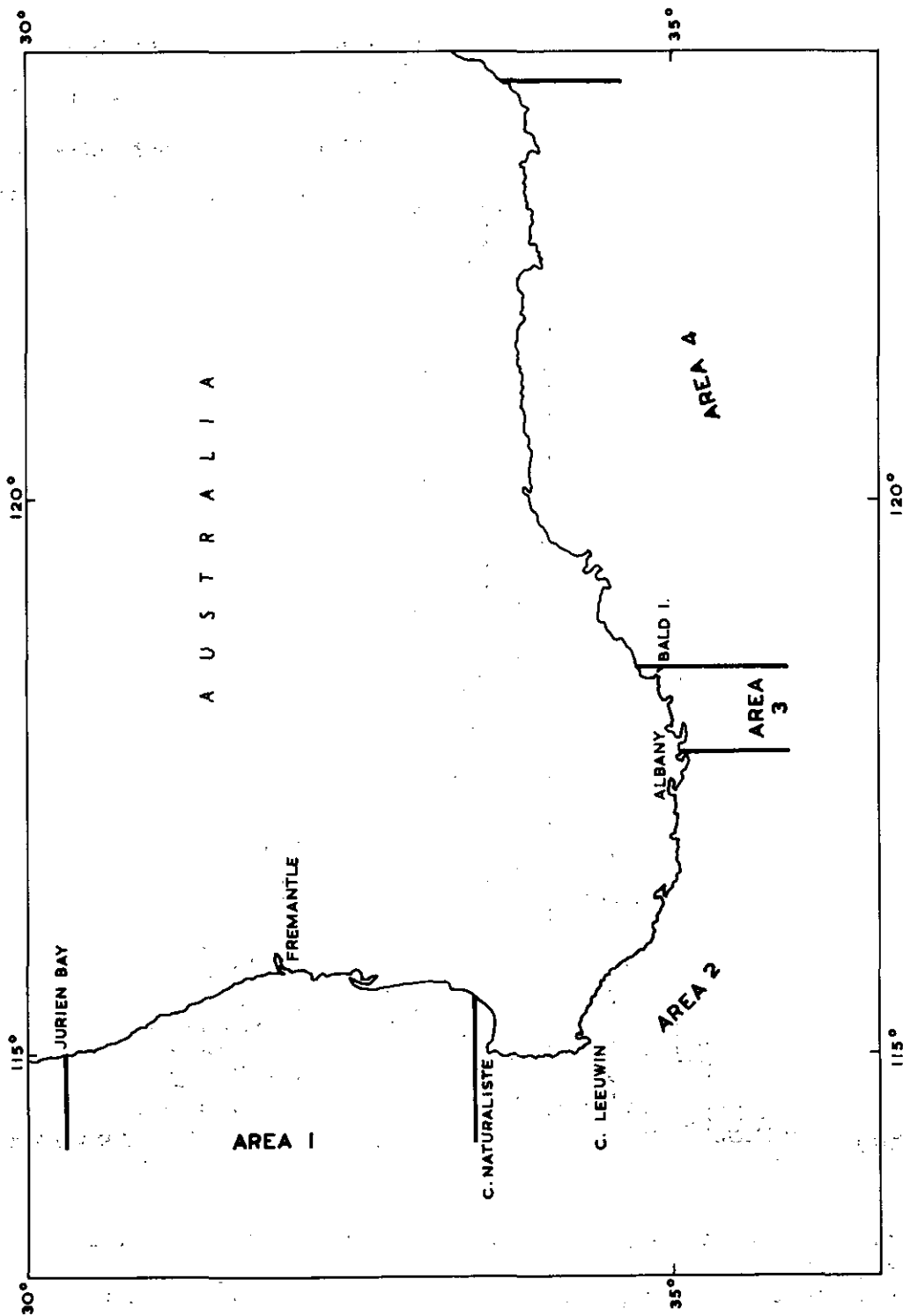


Fig. 23.- Areas into which the survey area was divided for record purposes.

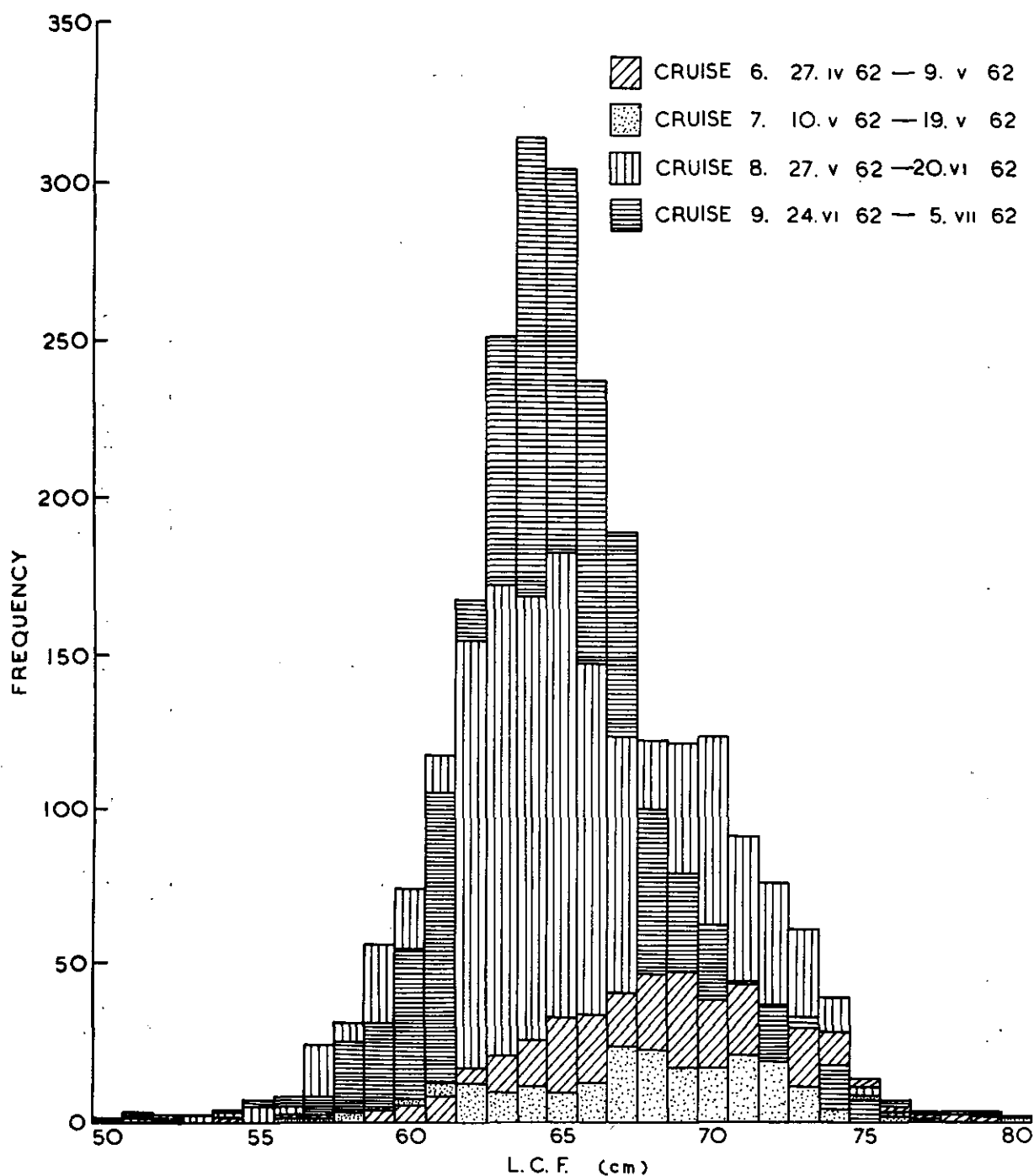


Fig. 24.- Length frequency histogram of the L.C.Fs. of the 2+ age group of southern bluefin tuna taken by Estelle Star in the vicinity of Albany, W.A. (West Cape Howe to Bald Island) on Cruises 6-9 inclusive, 1962.

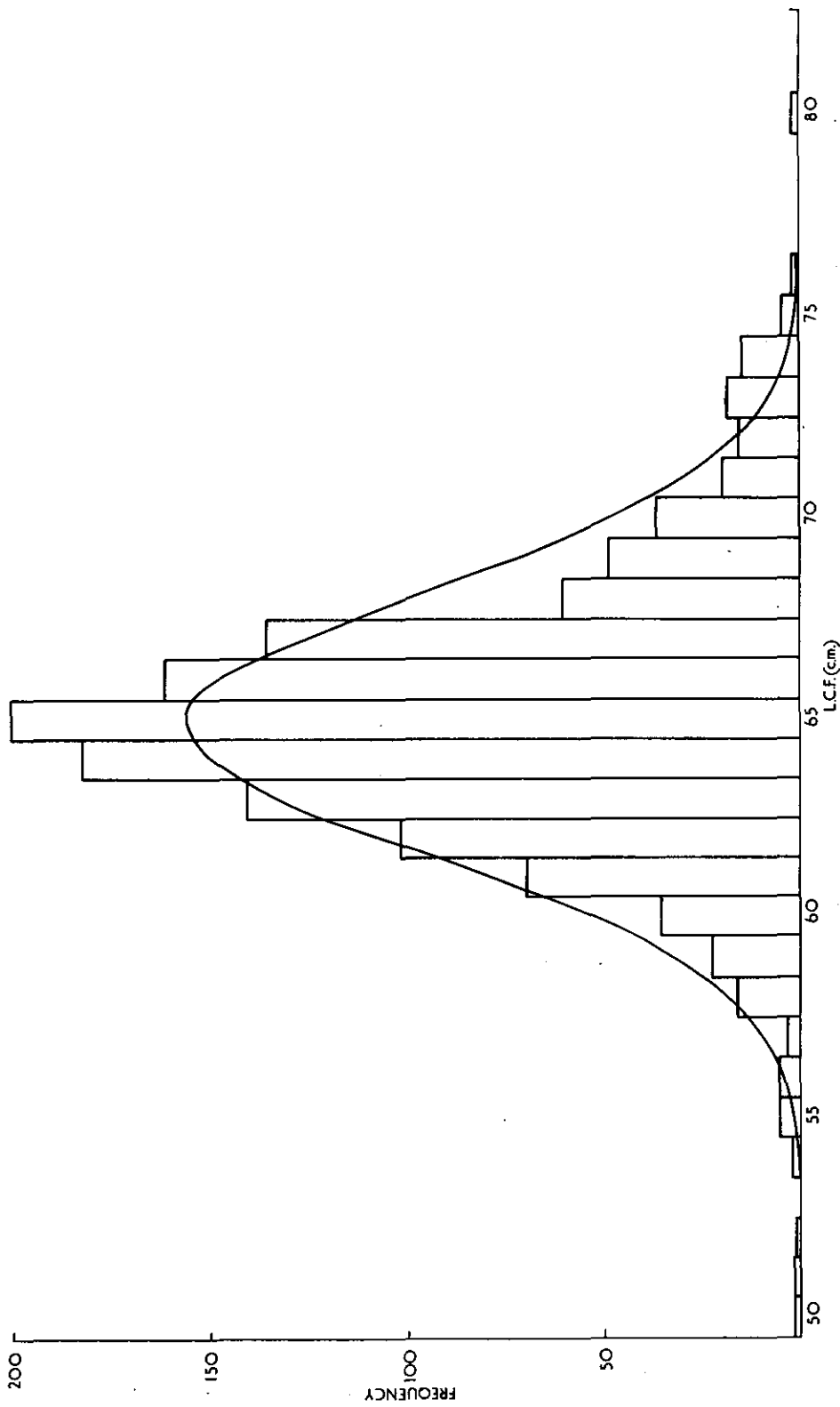


Fig. 25.- Length frequency histogram of the L.C.Fs. of the 2+ age group of southern bluefin tuna taken by Estelle Star around Vancouver Rock, W.A., on 4 and 5/7/62. The curve shown is the normal curve fitted to the data.

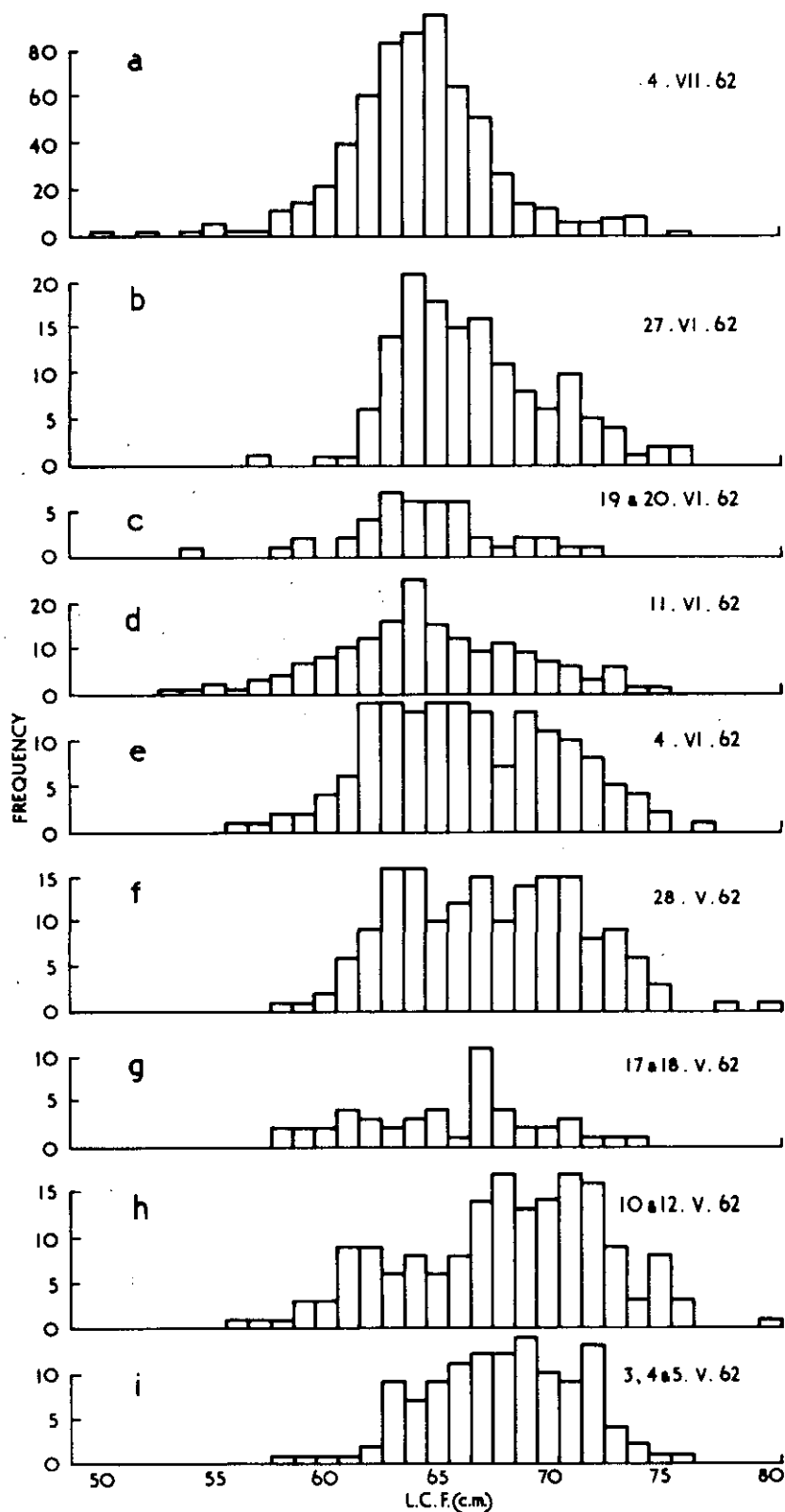


Fig. 26.- Length frequency histogram of the 2+ age group of southern bluefin tuna taken by *Estelle Star* in the vicinity of Albany, W.A. (Peak Head to Breaksea Is.) in May, June and July 1962. The data were selected to show the size composition at approximately weekly intervals.

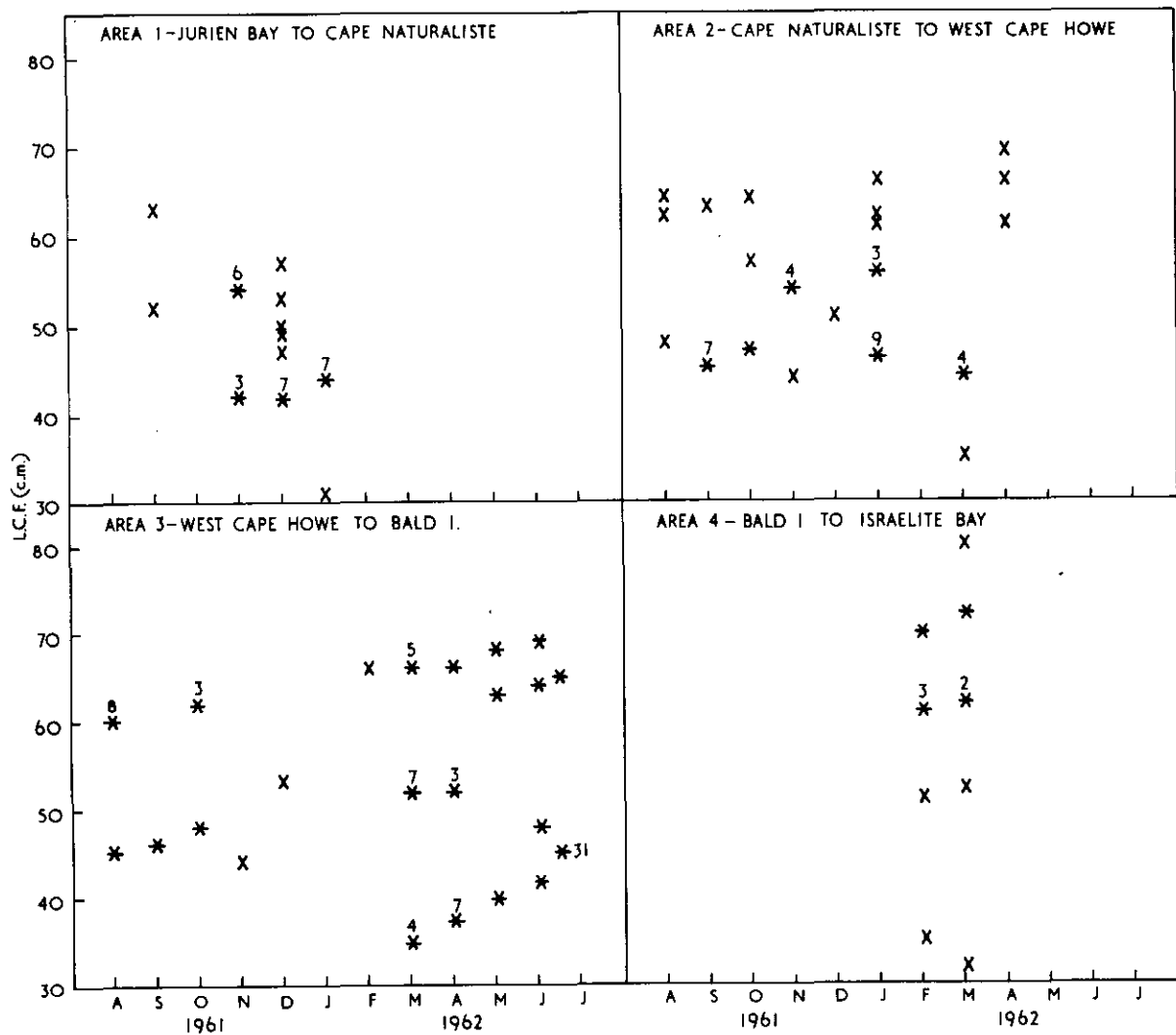


Fig. 27.- Length frequency distribution of southern bluefin tuna, W.A. Data from Estelle Star cruises 1961 and 1962.
 Symbols - * Modal frequency of a group of 10 or more specimens.
 *N Mean length of a group with no prominent mode (N = number of specimens)
 X Individual lengths.

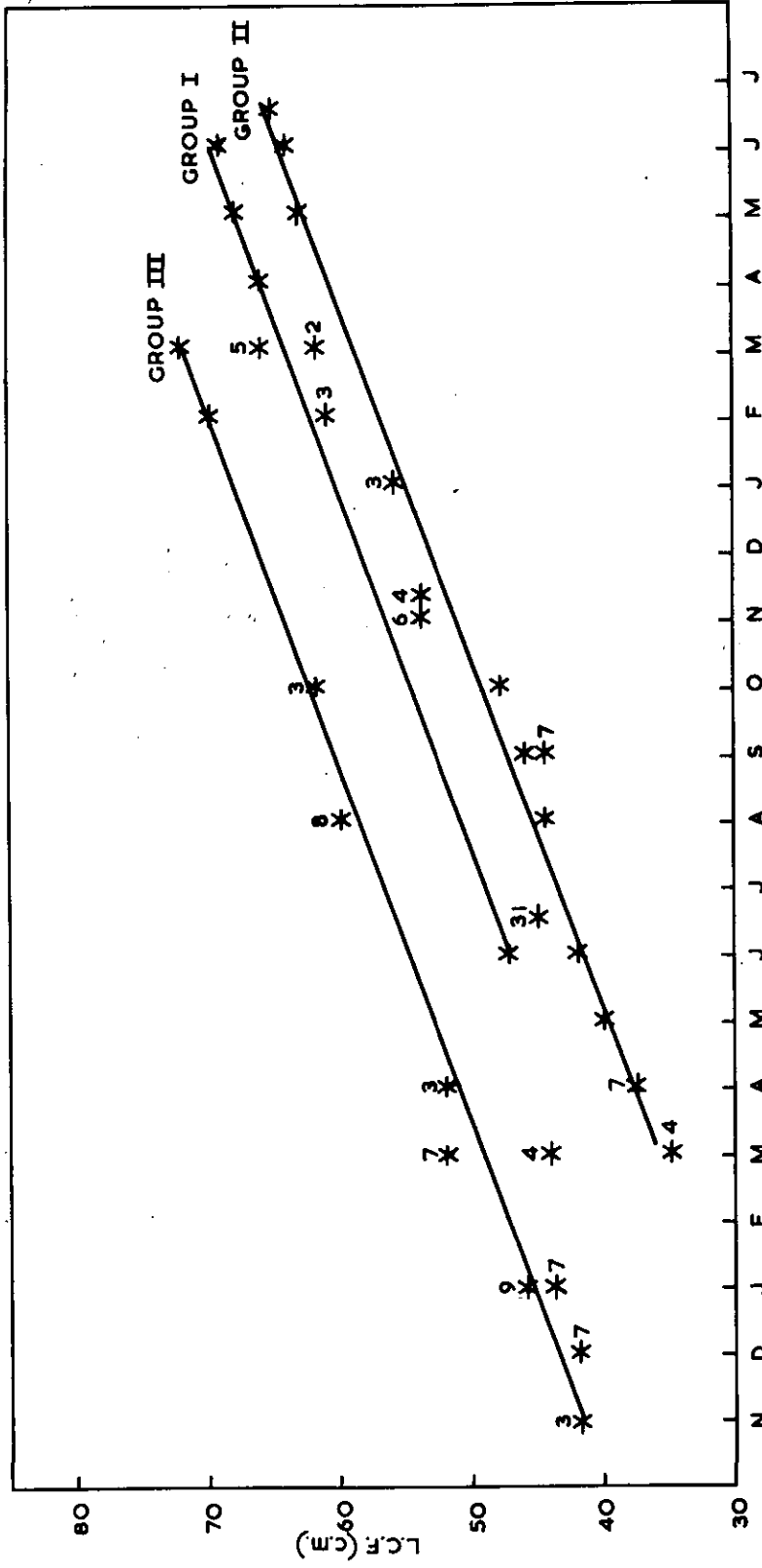


Fig. 28.- Modal lengths, month by month, of the three West Australian groups of southern bluefin tuna. (Symbols as in legend of Figure 27).