Lord Howe Island, a Riddle of the Pacific

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THE RIDDLE of the origin and natural history of Lord Howe Island is not yet solved and the progress of our knowledge only shows us that the problem is more complicated than we can suppose. The fact is that the island, being only 7 miles long and half a mile in width, has quite a strange flora and fauna. They are not an accidental mixture of introduced species or of very widely spread elements, but consist of a number of endemic forms of which the relationships are not quite clear. Not only the presence of some families and genera is interesting but also the absence of others.

Lord Howe Island is situated only 300 miles from Port Macquarie and 420 miles from Sydney (Fig. 1), but the basic flora is quite different from that of the mainland of Australia. Neither eucalypts nor acacias are represented in its flora, nor parrots or magpies in its fauna. Norfolk Island is also not very far from Lord Howe Island (about 450 miles), but the araucarias, so typical of Norfolk Island, are quite absent on Lord Howe Island, although there are some beautiful specimens growing near homes as introduced trees. The typical elements of New Zealand are also practically absent on Lord Howe Island. The flora and fauna of Lord Howe Island are very specific, but where did their elements come from, if they are different from the countries westward, northward, and southward of Lord Howe Island?

Our knowledge of the flora and fauna of Lord Howe Island is very poor. We have not enough material for generalisation, although some interesting facts are known. Therefore, it will be wise to approach the problem only little by little by describing and analysing different groups of animals or plants. It will be useful to concentrate our attention on the problem not only in its details, but also as a whole. It seems to be that nobody yet has been especially concerned with this problem, but for the history of the Pacific it is doubtless of very great importance. In order to understand the fauna and flora it is necessary always to have in mind the following facts:

1. On Lord Howe Island are growing four different species of palms, all endemic (Figs. 2, 4). That gives us a reason to think that the flora of the island is basically a tropical one. We cannot expect the development of four species of palms in quite recent time, so that it is quite evident that a mild climate has existed on the island for a very long time, and the fauna also must have developed the elements characteristic of a subtropical or tropical origin.

2. There are two mountains on the island (2,500 ft. and 2,800 ft.) which can give a place for development of the elements of a flora and fauna typical of a more temperate climate. (See Fig. 3.)

3. Apart from bats, mammals are absent from the island, nor are there fossils evident. There are only rats and mice, introduced by man. The rats have played an extremely important part in the impoverishment of the fauna. They caused the extinction of not only

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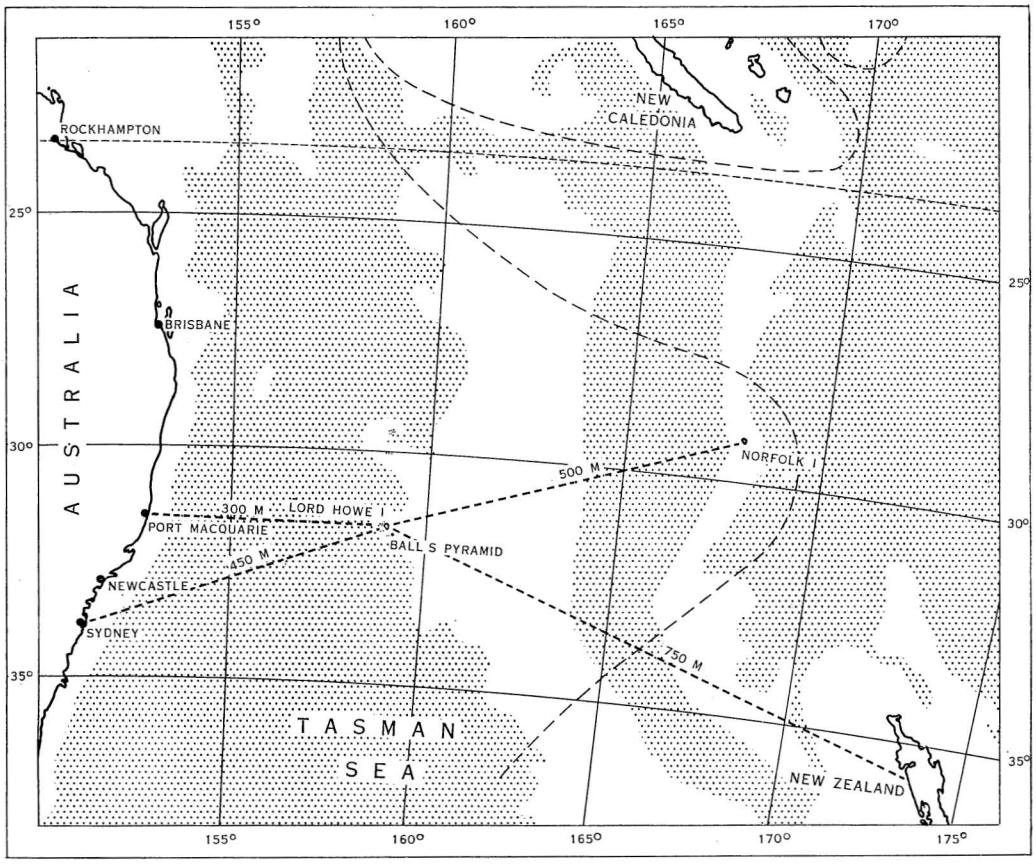

FIG. 1. Map showing position of Lord Howe Island. Latitude, 30° 33′ S., Longitude, 150° 5′ E.

some endemic birds but also of one species on insect, *Carabidion australe*, a phasmid.

4. The endemism of some elements of fauna, for example, of birds is very great, not only among the existing species but also in those recently extinct, some of which were completely restricted to the island.

5. Characteristic also is the absence of some Reptilia: snakes are quite absent, fresh water Chelonias also. There are recorded only three species of lizards. Amphibia are quite absent. An extinct turtle (probably a sea species)—*Meiolania platyceps*—was not rare on Lord Howe Island. Of the other three species of this genus, one, *M. oweni*, was found at Darling Downs, Queensland; a second, *M. mackayi*, was found on the small Walpole Island (about 100 miles south east of New Caledonia); and the third, *M. argentina*, in Patagonia. *Meiolania platyceps* became extinct rather recently. (Anderson, 1925, 1926.)

6. There are data that various species of plants and animals arrived from time to time on the island, but later disappeared as a result of unfavourable conditions on the island, or from accidental causes, because the island is comparatively very small and the number of new immigrants usually is not so high as to resist occasional destruction.

7. The endemism on Lord Howe Island can be of two kinds: neoendemism and paleoendemism. The neoendemism can be very new, i.e., the species can be created in comparatively very short time: a flock of migrant birds can reach the island and produce a population with more narrow limits of char-

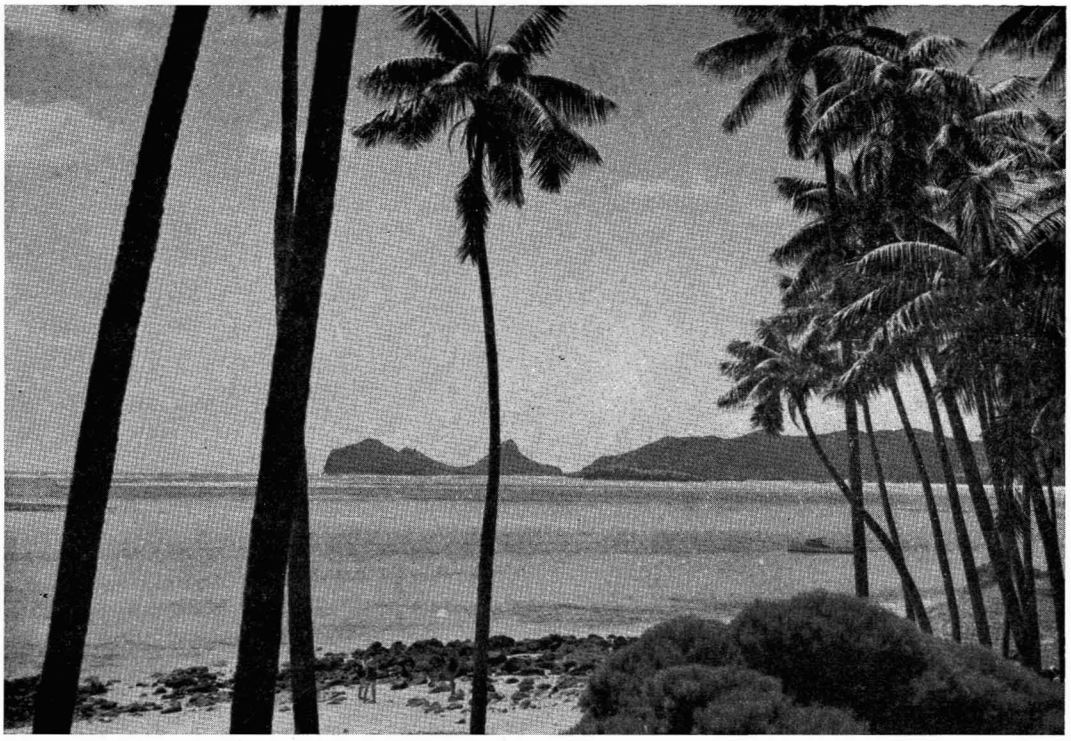

FIG. 2. A view across the lagoon, from the foot of Mt. Lidgbird, showing sands and coral rocks of the seashore. On the horizon is Mt. Eliza with its toothlike form. Photo by Miss Z. Liepa.

acters than the ancestral one. In a series of generations, which may be very small, a new species can evolve, distinct from the ancestral form but practically the same, being only impoverished in its genes (characters). This sort of endemism is of no interest to us. Only paleoendemism can give us solid data about the past of the island and its natural history.

8. Paleontological data about Lord Howe Island are very scarce because, first of all, no one has concerned himself with this matter, and second, the soils are not favourable for the preservation of fossils. The soils of the island are of two sorts: old coral reefs, which cannot contain the land fauna or contain only their occasional remnants; and volcanic soils or derivatives of them. The latter are situated very high on the island and are practically unexplored. It is possible that some bones of extinct birds, etc., could have been preserved by volcanic soils as result of a fall of rock, but nobody has been interested in their discovery.

9. The absence of some groups, families, etc., is a very complicated problem. First, it could be only lack of material, because nobody has systematically collected during a whole year on the island. Second, these groups may have been present but now are extinct owing to the influence of different conditions: the influence of man and his domesticated or semidomesticated animals, the introduction of stronger rivals, or a change of climate, all of which would have the stronger effect. Also their rarity could be caused by some too small biological niches on the island, etc. In this regard it is interesting to record the absence of such common fly families as Tabanidae, Nemestrinidae, Apioceridae, subfamily Asilinae, Coelopidae, etc.

10. Some Calliphoridae (Diptera) show

FIG. 3. A general view of Lord Howe Island from Malabar Hill. In centre, Mt. Lidgbird, at right Mt. Gower. The latter is 2,800 feet high. Photo by Miss Z. Liepa.

very interesting features in regard to their distribution: the *Calliphora hortona* group, with bright orange knobs at base of wings, so typical to New Zealand and present in Sydney area (probably introduced), are absent on the island.

Lucilia sericata Meig., a semidomesticated fly, is present in enormous numbers, but the Australian sheep blow-fly, *Lucilia cuprina* Wied., is quite absent. Very strange also is the absence of the typical forms of blow-flies of the mainland, *C. stygia* F. and *C. augur;* on Norfolk Island both species are represented, whilst on the mainland they are present literally everywhere.

11. There are some interesting caves at North Bay, but owing to the shattered condition of the rock, they are very dangerous to enter. One cave about three-quarters of a mile from the shore has been explored for about 250 yards. There are some fine stalactites and shawl formations in it, but the numerous cracks around show that there may be a great fall of rock at any time. These caves were not explored biologically, but the animals they shelter can give extremely interesting data about the origin of life on the island.

CLIMATE

In order to understand the origin and composition of the fauna of the island, it is necessary first of all to know the climate of Lord Howe Island.

Table 1 presents the data published by Russell (1895), based on eight years of meteorological observations relating only to the low parts of the island. The mountain area of the island is meteorologically unknown. It is

TABLE 1

COMPARISON OF THE CLIMATES OF SYDNEY, LORD HOWE ISLAND, AND PORT MACQUARIE

	SYDNEY	LORD HOWE ISLAND	ABOUT PORT MACQUARIE
	°F.	°F.	°F.
Mean shade temperature	62.9	68.6	65.3
Highest shade temp. ever recorded on any day	108.5	110.7	116.0
Lowest shade temp. ever recorded on any day	35.9	45.0	24.0
Spring mean shade temperature	62.9	68.0	65.6
Summer mean shade temperature	70.7	74.8	73.1
Autumn mean shade temperature	64.1	69.0	66.6
Winter mean shade temperature	54.0	62.4	55.7

AVERAGE MONTHLY TEMPERATURES

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Sydney	71.4	70.9	69.3	64.5	58.5	54.4	52.5	55.0	58.7	63.3	66.6	69.7	62.9
L. H. Is.	75.5	75.0	71.4	69.7	65.0	63.7	61.0	62.4	65.3	67.6	71.4	73.8	68.6
Port Macquarie District	74.0	73.4	71.9	67.3	60.5	56.1	54.3	56.5	60.8	65.9	69.6	72.0	65.3

evident that this area is much more humid and cooler. Clouds very often cover the tops of the mountains and rainfalls are more frequent there than on the low part of the island.

The comparison of the average monthly temperatures shows that the climate of Lord Howe Island is distinctly warmer than in Sydney (5.7°F. in year's temperature) and noticeably warmer than in Port Macquarie. The climate is more moderate, with only 14° of difference between the warmer and colder months, while in Sydney it is 19.9°, and in Port Macquarie 19.7°. This gives good ground for the existence of a number of tropical plants and animals, but it seems that the high humidity is a strong handicap for elements of the flora and fauna which prefer arid conditions.

It is necessary to add that the island is subject at times to strong winds and high seas. It is never very cold, as the warm current, which is also responsible for the most southerly coral reef in the world, helps to maintain an even climate which rarely goes below 60 or above 80 degrees Fahrenheit.

Annual rainfall is about 75 inches.

If we take meteorological data over the period from 1917 to 1938, the average annual rainfall was 67.30 inches. The mean daily temperature over the same period was 66.4 degrees, the mean daily maximum being 71.9 degrees and the mean daily minimum 60.9 degrees, with a difference only in 11 degrees. The highest reading recorded during that period was 89.0 degrees and the lowest 42.8 degrees.

Oliver (1917) gives the following tables on the climate of Lord Howe Island.

Atmospheric pressure varies regularly with the direction of the wind, being highest in south-east and east weather, and lowest in north-west and west weather. The highest reading recorded was 774.4 mm., on 9 June, 1912, east wind; the lowest, 750.3 mm., on 16 September, 1911, wind north-west.

Temperature, judged by both season and direction of wind, varies in a regular manner. The maximum temperature recorded was 30° C., on 8 February, 1912; the minimum, 6.1° C., on 30 August, 1911.

Rainfall is distributed fairly evenly throughout the year, though the average for the winter months is higher than that of the summer months. The average annual rainfall for 12 years is 1,818 mm., on 196 days. During the period selected for analysis, out of a total of 1,265 mm., 779 mm., or over 60 per cent, fell during northerly weather.

SOILS

The island consists practically of but two geological formations: a basaltic series forming about two-thirds of the island, and a thin-bedded calcareous deposit composed of coral sand, covering the lower ground and flanking the three isolated volcanic masses.

This coral-sand rock consists of comminuted and completely rounded coral debris, with grains of volcanic material such as augite, magnatite, and altered lava, with occasional fragments of echinoderms, shells, foraminifera, and other invertebrates. Generally speaking, the constituents of the coral-sand rock agree very closely with the component particles of the present beach at the island. It varies in thickness, and its greatest elevation is about 250 feet above sea level.

In such way the island is composed of two distinct types of rock, the older or base being of volcanic origin, and the upper of decomposed coral formed into a coarse sort of sandstone.

A noticeable feature of the coral rock is the stratification in layers; most of the layers are inclined at an angle of about 30 degrees. This lifting was thought to be caused by earth

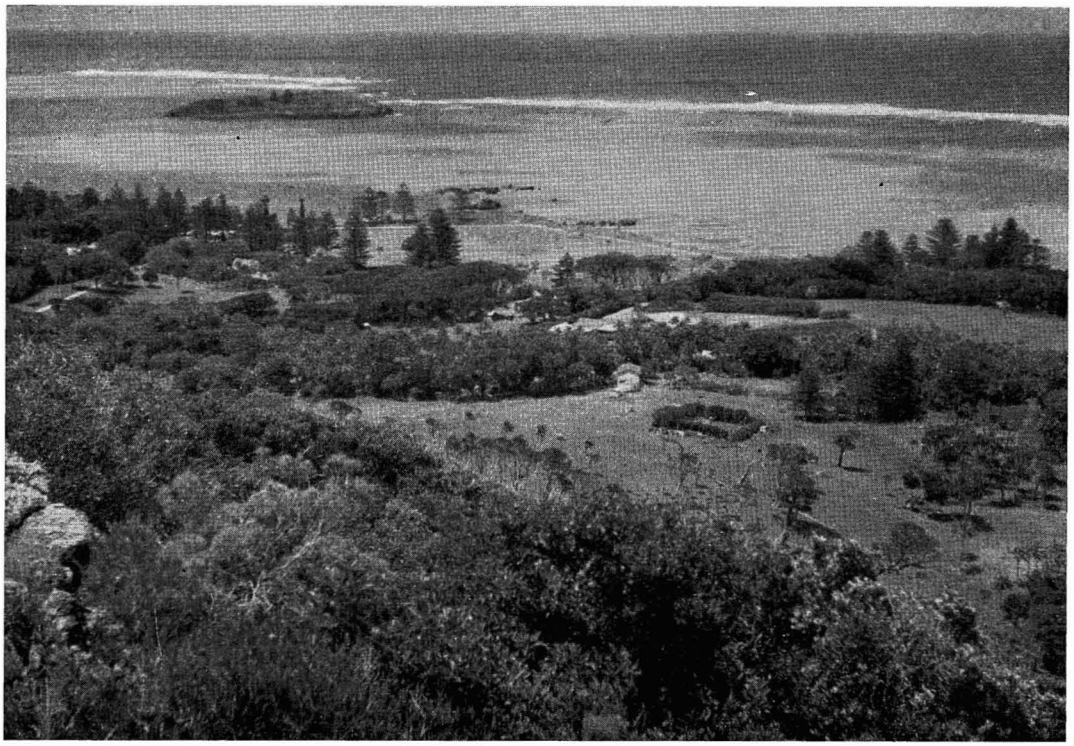

FIG. 4. Inhabitated area of the island, "The Old Settlement." Large trees are araucarias, introduced from Norfolk Island. In mid-photo are the dominating Howea palms. A line of surf marks the boundary of the coral reef. Rabbit Island in background. Photo by Miss Z. Liepa.

TABLE 2
WEATHER DATA, BY MONTHS, LORD HOWE ISLAND

	BAROMETER	TEMPERATURE (C.°)			RAINFALL		RELATIVE HUMIDITY	CLOUD	WIND
	Mm.	Min.	Max.	Mean	Days	Mm.	Per Cent	0–10	Direction
1911									
July	762	13.1	17.9	15.5	21	192	79	6.4	S.W., S.E.
August	764	12.0	17.4	14.7	22	97	75	5.9	S.E.
September	762	13.6	20.2	16.9	8	154	75	7.1	S.W.
October	764	14.4	21.5	17.9	11	132	66	5.7	S.W.
November	762	16.8	23.8	20.3	8	91	73	5.6	N.W., S.W.
December	757	19.2	26.1	22.6	6	17	73	6.4	N.W.
1912									
January	760	18.8	25.5	22.2	10	83	65	6.2	S.E.
February	762	19.2	26.1	22.6	5	83	66	6.2	S.E.
March	761	18.3	25.3	21.8	14	73	62	7.0	S.E.
April	762	17.2	23.4	20.3	14	102	71	7.5	S.W.
May	764	14.1	20.5	17.3	20	113	71	6.4	S.E.
June	766	14.4	19.2	16.7	15	128	72	6.3	S.
Averages	762	15.9	22.2	19.1	154	1,265	71	6.4	

movements, but the theory now is held that the sand was deposited on the slanting sides of hummocks by the wind and hardened in successive layers when soaked with rain water.

The absence of shells in the coral rock is considered evidence that wind also played a part in carrying the sand into position, as shells, being heavier, were not carried as far as the sand.

There have been several uplifts on the whole island, and in one spot in particular the coral rock is seen about 400 feet above sea level. A portion of the west coast near the boat landing, seems to have sunk in recent times, as tree trunks and roots have been formed in position in the mud or sand, though now covered with 6 ft. or more of water at high tide.

The soil on the lower parts of the island is very rich in places, especially those parts which have been fertilized by decaying banyan trees, etc.

Most of the hill country is too rough and stony for cultivation, and the total area available for cultivation does not amount to more than 2,000 acres (Figs. 3, 4).

Before the advent of man on Lord Howe Island the only animals that had any effect on the plant formations and the soil were two species of burrowing petrels, *Puffinus carneipes* and *Pterodroma melanopus*. In talus slopes near the sea these birds make their burrows each year, completely overturning the soil and replenishing it with a rich manure; but whether or not this process is essential to bringing forth the edaphic conditions which result in the tussock sedge and herbaceous plant formations found there is difficult to say. These birds may have played a part also in the destruction of fossils.

VEGETATION

Oliver (1917) has made an analysis of the flora, and has stated that the whole flora contains 209 species of plants, among which 70, or 33 per cent, are endemic. In this number are not included 30 species of introduced plants and all cultivated plants.

Of the 169 genera of vascular plants 4 genera are endemic (*Colmeroia* and *Hedyscepe* are allied to New Zealand forms, *Negria* to

TABLE 3
THE DURATION AND CHARACTER OF WEATHER AT LORD HOWE ISLAND, CLASSED BY WIND-DIRECTION

	BAROMETER	TEMPERATURE (C.°)			RAINFALL		RELATIVE HUMIDITY	CLOUD	WIND
	Mm.	Min.	Max.	Mean	Days	Mm.	Per Cent	0–10	Days
South-east	764	15.3	21.9	18.6	23	44	67	6.0	71
East	765	16.2	22.6	19.4	12	75	70	6.6	28
North-east	764	15.7	22.5	19.1	17	136	71	5.8	39
North	761	18.0	23.2	20.6	20	317	77	8.2	30
North-west	760	18.6	24.2	21.4	21	326	77	7.4	46
West	760	14.3	22.5	18.4	13	165	77	7.3	22
South-west	761	15.0	21.8	18.4	34	157	69	5.7	80
South	762	15.2	21.7	18.5	14	45	70	5.7	50

both New Zealand and New Caledonian genera, while *Howea* is related to Malayan and tropical Australian genera).

Of the non-endemic genera 95 are widely distributed, occurring in Australia, New Zealand, and the rest of Polynesia exclusive of New Zealand; 47 more range widely throughout tropical countries, but do not reach New Zealand. Their presence may be due largely to the accident of latitude, and stamps the flora as subtropical. The remaining genera have the following range: New Zealand 1 (*Carmichaelia*), Australia 5, Polynesia 3, New Zealand and Australia 11, New Zealand and Polynesia 2, Africa 1 (*Moraea*).

Numerically, therefore, Australian genera (158) preponderate; Polynesia (exclusive of New Zealand) comes second with 147, and New Zealand has 109 genera. The presence of a large proportion of widely distributed genera and species might have been expected in the flora of an isolated island, because species possessing facilities for wide dispersal would naturally form the bulk of immigrants after land connection has been severed.

The author thinks that the presence on the island of the wedding lily, *Moraea Robinsoniana* Moore and Muell., is not a case of discontinuous distribution. It is more probable that it was transported by whalers, whose vessels very often landed on Lord Howe Island for fresh water. The whalers as a rule were visiting the cold waters of the southern hemisphere, and could easily transport unwittingly the seeds of this ornamental plant. This suggestion is not only theoretical: J. W. Maiden (1898) wrote: "The industry (of onions) commenced about fifty years ago through the finding on the beach (by Mrs. Andrew) of two or three onions which had been thrown overboard by a passing vessel." During stay in harbour the whalers' vessels usually did some cleaning and repair work, and all rubbish was thrown overboard.

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