

978-1-108-05283-2 - Island Life: Or, The Phenomena and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates Alfred Russel Wallace

Frontmatter

More information

#### CAMBRIDGE LIBRARY COLLECTION

Books of enduring scholarly value

#### Life Sciences

Until the nineteenth century, the various subjects now known as the life sciences were regarded either as arcane studies which had little impact on ordinary daily life, or as a genteel hobby for the leisured classes. The increasing academic rigour and systematisation brought to the study of botany, zoology and other disciplines, and their adoption in university curricula, are reflected in the books reissued in this series.

#### Island Life

First published in 1880, this study of the biology and geography of islands investigates some of the most pressing questions of nineteenth-century natural science. Why do countries as far-flung as Britain and Japan share similar flora and fauna when those of neighbouring islands in Malaysia are utterly unalike? What is the origin of life in New Zealand? And why do the geological formations of Scotland and Wales appear to be the result of glaciers when those countries lie in the temperate zone? Dismissing popular theories of submerged continents and 'special creation', Alfred Russel Wallace (1823–1913) presents extensive evidence of the mass migration of species, and of drastic and repeated climatic changes across the globe. Drawing on a vast range of sources and the newest ocean soundings to support his theories, Wallace wrote the text for the intelligent general reader. It remains a fascinating introduction to the subject matter today.



Cambridge University Press has long been a pioneer in the reissuing of out-of-print titles from its own backlist, producing digital reprints of books that are still sought after by scholars and students but could not be reprinted economically using traditional technology. The Cambridge Library Collection extends this activity to a wider range of books which are still of importance to researchers and professionals, either for the source material they contain, or as landmarks in the history of their academic discipline.

Drawing from the world-renowned collections in the Cambridge University Library and other partner libraries, and guided by the advice of experts in each subject area, Cambridge University Press is using state-of-the-art scanning machines in its own Printing House to capture the content of each book selected for inclusion. The files are processed to give a consistently clear, crisp image, and the books finished to the high quality standard for which the Press is recognised around the world. The latest print-on-demand technology ensures that the books will remain available indefinitely, and that orders for single or multiple copies can quickly be supplied.

The Cambridge Library Collection brings back to life books of enduring scholarly value (including out-of-copyright works originally issued by other publishers) across a wide range of disciplines in the humanities and social sciences and in science and technology.



## Island Life

Or, The Phenomena and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates

ALFRED RUSSEL WALLACE





#### CAMBRIDGE UNIVERSITY PRESS

Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paolo, Delhi, Mexico City

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org Information on this title: www.cambridge.org/9781108052832

© in this compilation Cambridge University Press 2012

This edition first published 1880 This digitally printed version 2012

ISBN 978-1-108-05283-2 Paperback

This book reproduces the text of the original edition. The content and language reflect the beliefs, practices and terminology of their time, and have not been updated.

Cambridge University Press wishes to make clear that the book, unless originally published by Cambridge, is not being republished by, in association or collaboration with, or with the endorsement or approval of, the original publisher or its successors in title.

The original edition of this book contains a number of colour plates, which have been reproduced in black and white. Colour versions of these images can be found online at www.cambridge.org/9781108052832



ISLAND LIFE.



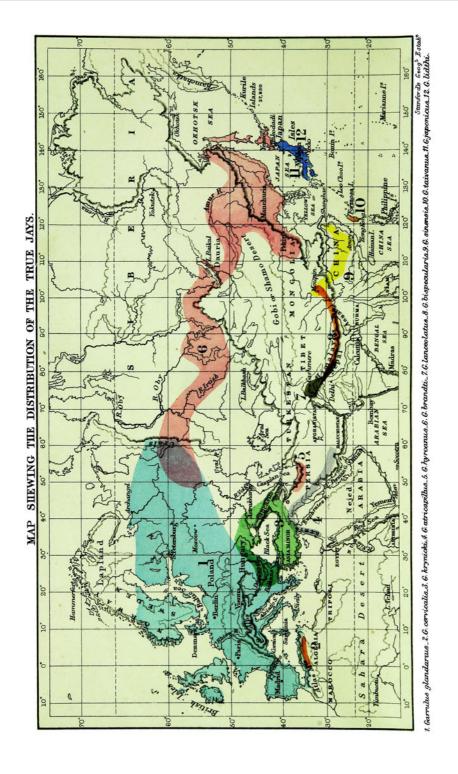




Frontmatter



Frontmatter





978-1-108-05283-2 - Island Life: Or, The Phenomena and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates Alfred Russel Wallace

Frontmatter

More information

# ISLAND LIFE:

OR,

THE PHENOMENA AND CAUSES OF

## Insular Faunas and Floras.

INCLUDING A REVISION AND ATTEMPTED SOLUTION OF THE PROBLEM OF

Geological Climates.

BY

## ALFRED RUSSEL WALLACE,

AUTHOR OF "THE MALAY ARCHIPELAGO," "TROPICAL NATURE," "THE GEOGRAPHICAL DISTRIBUTION OF ANIMALS," &c.

Wondon:
MACMILLAN AND CO.
1880.

The Right of Translation and Reproduction is Reserved.



LONDON:
R. CLAY, SONS, AND TAYLOR,
BREAD STREET HILL.



978-1-108-05283-2 - Island Life: Or, The Phenomena and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates Alfred Russel Wallace

Frontmatter

More information

TO

## SIR JOSEPH DALTON HOOKER,

K.C.S.I., C.B., F.R.S., &C., &C.,

WHO, MORE THAN ANY OTHER WRITER,

HAS ADVANCED OUR KNOWLEDGE OF THE GEOGRAPHICAL

DISTRIBUTION OF PLANTS, AND ESPECIALLY

OF INSULAR FLORAS,

## I Medicate this Volume,

ON A KINDRED SUBJECT,

AS A TOKEN OF ADMIRATION AND REGARD.



Frontmatter



978-1-108-05283-2 - Island Life: Or, The Phenomena and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates Alfred Russel Wallace

Frontmatter

More information

## PREFACE.

THE present volume is the result of four years' additional thought and research on the lines laid down in my Geographical Distribution of Animals, and may be considered as a popular supplement to and completion of that work.

It is, however, at the same time a complete work in itself; and, from the mode of treatment adopted, it will, I hope, be well calculated to bring before the intelligent reader the wide scope and varied interest of this branch of natural history. Although some of the earlier chapters deal with the same questions as my former volumes, they are here treated from a different point of view; and as the discussion of them is more elementary and at the same time tolerably full, it is hoped that they will prove both instructive and interesting. The plan of my larger work required that genera only should be taken account of; in the present volume I often discuss the distribution of species, and this will help to render the work more intelligible to the unscientific reader.

The full statement of the scope and object of the present essay given in the "Introductory" chapter, together with the "Summary" of the whole work and the general view of the more important arguments given in the "Conclusion," render it unnecessary for me to offer any further remarks on these points. I may, however, state generally that, so far as I am able to



978-1-108-05283-2 - Island Life: Or, The Phenomena and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates Alfred Russel Wallace

Frontmatter

More information

viii PREFACE,

judge, a real advance has here been made in the mode of treating problems in Geographical Distribution, owing to the firm establishment of a number of preliminary doctrines or "principles," which in many cases lead to a far simpler and yet more complete solution of such problems than have been hitherto possible. The most important of these doctrines are those which establish and define—(1) The former wide extension of all groups now discontinuous, as being a necessary result of "evolution"; (2) The permanence of the great features of the distribution of land and water on the earth's surface; and, (3) The nature and frequency of climatal changes throughout geological time.

I have now only to thank the many friends and correspondents who have given me information or advice. Besides those whose assistance is acknowledged in the body of the work, I am especially indebted to four gentlemen who have been kind enough to read over the proofs of chapters dealing with questions on which they have special knowledge, giving me the benefit of valuable emendations and suggestions. Mr. Edward R. Alston has looked over those parts of the earlier chapters which relate to the mammals of Europe and the North Temperate zone; Mr. S. B. J. Skertchley, of the Geological Survey, has read the chapters which discuss the glacial epoch and other geological questions; Professor A. Newton has looked over the passages referring to the birds of the Madagascar group; while Sir Joseph D. Hooker has given me the invaluable benefit of his remarks on my two chapters dealing with the New Zealand flora.

CROYDON, August, 1880.



978-1-108-05283-2 - Island Life: Or, The Phenomena and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates Alfred Russel Wallace

Frontmatter

More information

## CONTENTS.

#### PART I.

THE DISPERSAL OF ORGANISMS; ITS PHENOMENA, LAWS, AND CAUSES.

#### CHAPTER L

#### INTRODUCTORY.

Remarkable Contrasts in the distribution of Animals—Britain and Japan—Australia and New Zealand—Bali and Lombok—Florida and Bahama Islands—Brazil and Africa—Borneo, Madagascar, and Celebes—Problems in distribution to be found in every country—Can be solved only by the combination of many distinct lines of inquiry, biological and physical—Islands offer the best subjects for the study of distribution—Outline of the subjects to be discussed in the present volume.

Pages 3-11

#### CHAPTER II.

#### THE ELEMENTARY FACTS OF DISTRIBUTION.

#### CHAPTER III.

CLASSIFICATION OF THE FACTS OF DISTRIBUTION .- ZOOLOGICAL REGIONS.

The Geographical Divisions of the Globe do not correspond to Zoological Divisions—
The range of British Mammals as indicating a Zoological Region—Range of East
Asian and North African Mammals—The Range of British Birds—Range of East
Asian Birds—The limits of the Palæarctic Region—Characteristic features of the
Palæarctic Region—Definition and characteristic groups of the Ethiopian Region—Of the Oriental Region—Of the Australian Region—Of the Nearctic Region
—Of the Neotropical Region—Comparison of Zoological Regions with the Geographical Divisions of the Globe

Pages 31—53



978-1-108-05283-2 - Island Life: Or, The Phenomena and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates Alfred Russel Wallace

Frontmatter

More information

X

#### CONTENTS.

#### CHAPTER IV.

#### EVOLUTION AS THE KEY TO DISTRIBUTION.

Importance of the Doctrine of Evolution—The Origin of New Species—Variation in Animals—The amount of variation in North American Birds—How new species arise from a variable species—Definition and Origin of Genera—Cause of the extinction of Species—The rise and decay of Species and Genera—Discontinuous specific areas, why rare—Discontinuity of the area of Parus palustris—Discontinuity of Emberiza scheeniclus—The European and Japanese Jays—Supposed examples of discontinuity among North American Birds—Distribution and antiquity of Families—Discontinuity a proof of antiquity—Concluding Remarks

Pages 54-69

#### CHAPTER V.

#### THE POWERS OF DISPERSAL OF ANIMALS AND PLANTS.

#### CHAPTER VI.

GEOGRAPHICAL AND GEOLOGICAL CHANGES: THE PERMANENCE OF CONTINENTS.

#### CHAPTER VII.

CHANGES OF CLIMATE WHICH HAVE INFLUENCED THE DISPERSAL OF ORGANISMS:
THE GLACIAL EPOCH.



978-1-108-05283-2 - Island Life: Or, The Phenomena and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates Alfred Russel Wallace

Frontmatter

More information

#### CONTENTS.

хi

#### CHAPTER VIII.

#### THE CAUSES OF GLACIAL EPOCHS.

Various suggested causes—Astronomical causes of changes of Climate—Difference of Temperature caused by varying distances of the Sun—Properties of air and water, snow and ice, in relation to Climate—Effects of snow on Climate—High land and great moisture essential to the initiation of a Glacial Epoch—Perpetual snow nowhere exists on lowlands—Conditions determining the presence or absence of perpetual Snow—Efficiency of Astronomical causes in producing Glaciation—Action of meteorological causes in intensifying Glaciation—Summary of causes of Glaciation—Effect of clouds and fog in cutting off the Sun's heat—South Temperate America as illustrating the influence of Astronomical causes on Climate—Geographical changes how far a cause of Glaciation—Land acting as a barrier to ocean-currents—The theory of interglacial periods and their probable character—Probable effect of winter in aphelion on the climate of Britain—The essential principle of climatal change restated—Probable date of the last Glacial Epoch—Changes of the sea-level dependent on Glaciation—The planet Mars as bearing on the theory of excentricity as a cause of Glacial Epochs

Pages 121-162

#### CHAPTER IX.

ANCIENT GLACIAL EPOCHS, AND MILD CLIMATES IN THE ARCTIC REGIONS.

Mr. Croll's views on ancient Glacial Epochs-Effects of Denudation in destroying the evidence of remote Glacial Epochs-Rise of sea-level connected with Glacial Epochs a cause of further denudation-What evidence of early Glacial Epochs may be expected-Evidences of Ice-action during the Tertiary Period-The weight of the negative evidence-Temperate climates in the Arctic Regions-The Miocene Arctic flora-Mild Arctic climates of the Cretacious Period-Stratigraphical evidence of long-continued mild Arctic conditions-The causes of mild Arctic climates—Geographical conditions favouring mild northern climates in Tertiary times-The Indian Ocean as a source of heat in Tertiary times-Condition of North America during the Tertiary Period-Effect of high excentricity on warm Polar climates-Evidences as to climate in the Secondary and Palæozoic Epochs-Warm Arctic climates in early Secondary and Palzozoic times-Conclusions as to the climates of Secondary and Tertiary Periods-General view of Geological Climates as dependent on the physical features of the Earth's surface -Estimate of the comparative effects of geographical and physical causes in producing changes of climate . Pages 163-202

#### CHAPTER X.

THE EARTH'S AGE, AND THE RATE OF DEVELOPMENT OF ANIMALS AND PLANTS.



978-1-108-05283-2 - Island Life: Or, The Phenomena and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates Alfred Russel Wallace

Frontmatter

More information

xii

#### CONTENTS.

#### PART II.

#### INSULAR FAUNAS AND FLORAS.

#### CHAPTER XI.

#### THE CLASSIFICATION OF ISLANDS.

Importance of Islands in the study of the Distribution of Organisms—Classification of Islands with reference to Distribution—Continental Islands—Oceanic Islands

Pages 233—237

#### CHAPTER XII.

OCEANIC ISLANDS :- THE AZORES AND BERMUDA.

#### THE AZORES, OR WESTERN ISLANDS.

#### BERMUDA.

#### CHAPTER XIII

#### THE GALAPAGOS ISLANDS.



978-1-108-05283-2 - Island Life: Or, The Phenomena and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates Alfred Russel Wallace

Frontmatter

More information

#### CONTENTS.

ziii

#### CHAPTER XIV.

#### ST. HELENA.

#### CHAPTER XV.

#### THE SANDWICH ISLANDS.

Position and Physical features—Zoology of the Sandwich Islands—Birds—Reptiles—Land-shells—Insects—Vegetation of the Sandwich Islands—Peculiar features of the Hawaiian Flora—Antiquity of the Hawaiian Fauna and Flora—Concluding observations on the Fauna and Flora of the Sandwich Islands—General Remarks on Oceanic Islands

#### CHAPTER XVI.

#### CONTINENTAL ISLANDS OF RECENT ORIGIN: GREAT BRITAIN.

Characteristic Features of Recent Continental Islands—Recent Physical Changes of the British Isles—Proofs of Former Elevation—Submerged Forests—Buried River Channels—Time of Last Union with the Continent—Why Britain is poor in Species—Peculiar British Birds—Fresh-water Fishes—Cause of Great Speciality in Fishes—Peculiar British Insects—Lepidoptera confined to the British Isles—Peculiarities of the Isle of Man Lepidoptera—Coleoptera confined to the British Isles—Trichoptera peculiar to the British Isles—Land and Fresh-water Shells—Peculiarities of the British Flora—Peculiarities of the Irish Flora—Peculiar British Mosses and Hepatica—Concluding Remarks on the Peculiarities of the British Fauna and Flora

Pages 312—347

#### CHAPTER XVII.

#### BORNES AND JAVA.

Position and physical features of Borneo—Zoological features of Borneo: Mammalia —Birds—The affinities of the Bornean fauna—Java, its position and physical features—General character of the fauna of Java—Differences between the fauna of Java and that of the other Malay Islands—Special relations of the Javan fauna to that of the Asiatic continent—Past geographical changes of Java and Borneo—The Philippine Islands—Concluding Remarks on the Malay Islands

Pages 348-362

#### CHAPTER XVIII.

#### JAPAN AND FORMOSA.

Japan, its position and Physical features—Zoological features of Japan—Mammalia—Birds—Birds common to Great Britain and Japan—Birds peculiar to Japan—Japan Birds recurring in distant areas—Formosa—Physical features of Formosa—Animal life of Formosa—Mammalia—Land birds peculiar to Formosa—Formosan birds recurring in India or Malaya—Comparison of faunas of Hainan, Formosa, and Japan—General Remarks on Recent Continental Islands

Pages 363-382



978-1-108-05283-2 - Island Life: Or, The Phenomena and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates Alfred Russel Wallace

Frontmatter

More information

xiv

#### CONTENTS.

#### CHAPTER XIX.

ANCIENT CONTINENTAL ISLANDS: THE MADAGASCAR GROUP.

Remarks on Ancient Continental Islands—Physical features of Madagascar—Biological features of Madagascar—Mammalia—Reptiles—Relation of Madagascar to Africa—Early history of Africa and Madagascar—Anomalies of distribution and how to explain them—The birds of Madagascar as indicating a supposed Lemurian Continent—Submerged Islands between Madagascar and India—Concluding remarks on "Lemuria"—The Mascarene Islands—The Comoro Islands—The Seychelles Archipelago—Birds of the Seychelles—Reptiles and Amphibia—Fresh-water Fishes—Land Shells—Mauritius, Bourbon, and Rodriguez—Birds—Extinct Birds and their probable origin—Reptiles—Flora of Madagascar and the Mascarene Islands—Curious relations of Mascarene plants—Endemic genera of Mauritius and Seychelles—Fragmentary character of the Mascarene Flora—Flora of Madagascar allied to that of South Africa—Preponderance of Ferns in the Mascarene Flora—Concluding Remarks on the Madagascar Group

#### CHAPTER XX.

#### ANOMALOUS ISLANDS: CELEBES.

Anomalous relations of Celebes—Physical features of the Island—Zoological character of the Islands around Celebes—The Malayan and Australian Banks—Zoology of Celebes: Mammalia—Probable derivation of the Mammals of Celebes—Birds of Celebes—Birds of Celebes—Birds peculiar to Celebes—Celebes not strictly a Continental Island—Peculiarities of the Insects of Celebes—Himalayan types of Birds and Butterflies in Celebes—Peculiarities of shape and colour of Celebesian Butterflies—Concluding Remarks—Appendix on the Birds of Celebes. Pages 421—441

#### CHAPTER XXI.

#### ANOMALOUS ISLANDS; NEW ZEALAND.

Position and Physical features of New Zealand—Zoological character of New Zealand—Mammalia—Wingless birds living and extinct—Recent existence of the Moa—Past changes of New Zealand deduced from its wingless Birds—Birds and Reptiles of New Zealand—Conclusions from the peculiarities of the New Zealand—Fauna.

Pages 442—456

#### CHAPTER XXII.

THE FLORA OF NEW ZEALAND: ITS AFFINITIES AND PROBABLE ORIGIN.

Relations of the New Zealand Flora to that of Australia—General features of the Australian Flora—The Floras of South-eastern and South-western Australia—Geological explanation of the differences of these two floras—The origin of the Australian element in the New Zealand Flora—Tropical character of the New Zealand Flora explained—Species common to New Zealand and Australia mostly temperate forms—Why easily dispersed plants have often restricted ranges—Summary and Conclusion on the New Zealand Flora . . . Pages 457—476



978-1-108-05283-2 - Island Life: Or, The Phenomena and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates Alfred Russel Wallace

Frontmatter

More information

#### CONTENTS.

X۷

#### CHAPTER XXIII.

ON THE ARCTIC ELEMENT IN SOUTH TEMPERATE FLORAS.

European species and genera of plants in the Southern Hemisphere—Aggressive power of the Scandinavian flora—Means by which plants have migrated from north to south—Newly moved soil as affording temporary stations to migrating plants—Elevation and depression of the snow-line as aiding the migration of plants—Changes of climate favourable to migration—The migration from north to south has been long going on—Geological changes as aiding migration—Proofs of migration by way of the Andes—Proofs of migration by way of the Himalayas and Southern Asia—Proofs of migration by way of the African highlands—Supposed connection of South Africa and Australia—The endemic genera of plants in New Zealand—The absence of Southern types from the Northern Hemisphere—Concluding remarks on the New Zealand and South Temperate floras

Pages 477-498

#### CHAPTER XXIV.

#### SUMMARY AND CONCLUSION.

The present volume is the development and application of a theory—Statement of the Biological and Physical causes of dispersal—Investigation of the facts of dispersal—of the means of dispersal—of geographical changes affecting dispersal—of climatal changes affecting dispersal—The Glacial Epoch and its causes—Alleged ancient glacial epochs—Warm polar climates and their causes—Conclusions as to geological climates—How far different from those of Mr. Croll—Supposed limitations of geological time—Time amply sufficient both for geological and biological development—Insular faunas and floras—The North Atlantic Islands—The Galapagos—St. Helena and the Sandwich Islands—Great Britain as a recent Continental Island—Borneo and Java—Japan and Formosa—Madagascar as an ancient Continental Island—Celebes and New Zealand as anomalous Islands—The Flora of New Zealand and its origin—The European element in the South Temperate Floras—Concluding Remarks

Pages 499—512



978-1-108-05283-2 - Island Life: Or, The Phenomena and Causes of Insular Faunas and Floras, Including a Revision and Attempted Solution of the Problem of Geological Climates Alfred Russel Wallace

Frontmatter

More information

## MAPS AND ILLUSTRATIONS.

1. Map showing the Distribution of the true Jays Frontispiece.	PAGE
2. Map showing the Zoological Regions	31
3. Map showing the Distribution of Parcs Palustris To face	64
4. A GLACIER WITH MORAINES (From Sir C. Lyell's Principles of Geology) .	105
5. Map of the Ancient Rhone Glacier (From Sir C. Lyell's Antiquity of Man)	107
6. Diagram showing the effects of Excentricity and Precession on	100
CLIMATE	123
7. Diagram of Excentricity and Precession	124
8. Map showing the Extent of the North and South Polar Ice	133
9. Diagram showing Changes of Excentricity during Three Million Years	165
10. Outline Map of the Azores	239
11. Map of Bermuda and the American Coast	254
12. Section of Bermuda and adjacent Sea-bottom	255
13. Map of the Galapagos and adjacent Coasts of South America	267
14. Map of the Galapagos	267
15. Map of the South Atlantic, showing position of St. Helena	282
16. Map of the Sandwich Islands	299
17. Map of the North Pacific, with its submerged Banks	300
18. Map showing the Bank connecting Britain with the Continent .	314



Frontmatter

MAPS AND ILLUSTRATIONS. x	vi
19. Map of Borneo and Java, showing the Great Sudmarine Bank	v G1
OF SOUTH-EASTERN ASIA	349
20. Map of Japan and Formosa	364
21. Physical Sketch Map of Madagascar (From Nature)	388
22. Map of Madagascar Group, showing Depths of Sea	387
23. Map of the Indian Ocean	396
24. Map of Celebes and the surrounding Islands	423
25. Map showing Depths of Sea around Australia and New Zealand .	443
26. Map showing the probable condition of Australia during	100



Frontmatter



ISLAND LIFE.