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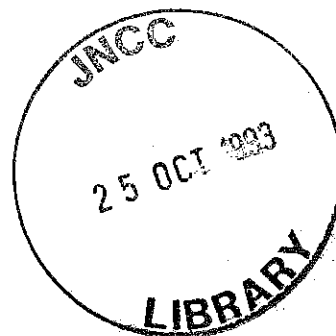
Research & survey in nature conservation

No. 18

A sea-cliff bibliography

compiled by
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Introduction

The Coastal Ecology Branch of the Chief Scientist Directorate was established in August 1979. One of the functions of the branch is to co-ordinate research and survey in the field of terrestrial coastal conservation. To this end a research programme has been developed with four main aims:

1. to describe the size, location and quality of the main coastal habitats in Great Britain;
2. to assess the impact of major development projects on sites of national importance for nature conservation;
3. to provide guidance on the management of the main coastal habitats for nature conservation;
4. to investigate the role of physical and biological processes in the maintenance of natural and semi-natural coastal habitats.

The results are disseminated in various Nature Conservancy Council publications:

- a. CSD reports: of specialist interest; limited numbers of 'hard' copies are produced, usually by the contractor, and the contents are later made available as Chief Scientist Directorate reports on microfiche through the Nature Conservancy Council's Information and Library Services.
- b. "Contract surveys".
- c. "Research & survey in nature conservation".
- d. "Focus on nature conservation".

This bibliography is published in the "Research & survey" series and has been produced at Lancaster University as part of a study of the management of sea-cliff vegetation in Great Britain.

Dr Pat Doody
Head, Coastal Ecology Branch
Chief Scientist Directorate

Sea-cliff vegetation management

In July 1986 a three-year contract was initiated between the Nature Conservancy Council and Lancaster University to investigate the past and present land-use of cliff-top land in Britain and to produce a handbook for the practical management of cliff-top vegetation for nature conservation. The results of this work will be published in due course.

It was decided that a bibliography of sea-cliff references should be produced and published in the Nature Conservancy Council's "Research & survey" series and this document presents the results. Only British references are included and no attempt has been made to cover the sea-cliffs of the rest of Europe.

References are listed in alphabetical order in ten major groups: (1) vegetation survey (including floras), (2) conservation and management, (3) recreation, (4) agriculture and land-use, (5) grazing, (6) plant ecology and physiology, (7) fauna (excluding seabird studies except where these cover effects on vegetation), (8) history, including palaeontology and archaeology, (9) natural history, (10) geology, geography and soils.

References which fall under more than one of these headings appear under the first heading and are listed by number alone under the remainder. Abstracts are provided for some of the references. Publications from major organizations are listed by author where known but otherwise under the title of the organization, e.g. Nature Conservancy Council.

The bibliographic database PAPERBASE (Wight Scientific) was used for the compilation of this bibliography and the references are stored on disc at the Nature Conservancy Council's Headquarters in Peterborough. Additional references and comments will be gratefully received by Dr P.J. Doody, Nature Conservancy Council, Northminster House, Peterborough PE1 1UA, from whom further information may be obtained. A suitable record sheet for entering new references is provided at the back of this volume.

Acknowledgments

I am grateful to Dr T.A. Rowell (Nature Conservancy Council, Peterborough) for much practical assistance with PAPERBASE during the final stages of the preparation of this bibliography. Katherine Hearn and Cathy Jackson (National Trust, Cirencester) provided the information on the Trust's Biological Survey reports.

A sea-cliff bibliography

Vegetation studies, including floras

1. ANTHONY, J. 1959. Contribution to the flora of Sutherland. Transactions and Proceedings of the Botanical Society of Edinburgh, 38, 7-15.

Includes a brief discussion of the cliff communities in the region of Bettyhill.

2. ASPREY, G.F. 1947. The vegetation of the islands of Canna and Sanday. Journal of Ecology, 34, 182-193.

Includes a description of the sea-cliff vegetation.

3. ATKINSON, R., & ROBERTS, B. 1952. Notes on the botany of North Rona and Sula Sgeir. Transactions and Proceedings of the Botanical Society of Edinburgh, 30, 52-60.

4. BAKER, J.G. 1872. On the botany of the Lizard peninsula. Journal of Botany, 9, 353-358.

See also: Journal of Botany, 10, 14-16, and 35-42.

5. BARKLEY, S.Y. 1953. The vegetation of the island of Soay, Inner Hebrides. Transactions and Proceedings of the Botanical Society of Edinburgh, 36, 119-131.

Includes a brief discussion of the cliff flora.

6. BELLAMY, D. 1974. Summary of fieldwork on Skomer 1974. Nature Conservancy Council. (Unpublished report).

7. BELLAMY, D. 1974. The vegetation of gull and rabbit colonies on Skomer Island in relation to social behaviour. University College, Cardiff, Department of Zoology. (Unpublished report).

8. BELLAMY, D. 1976. Report on fieldwork carried out on Skomer September 1976. 1. Development of methods for assessing changes in diversity of invertebrate populations and communities. 2. Changes in vegetation 1972-1976. University College, Cardiff, Department of Zoology. (Unpublished report).

9. BELLAMY, D. 1977. Some comments on the changes in the vegetation of Skomer 1972-7 in relation to stability of the sub-maritime cliff habitat. University College, Cardiff, Department of Zoology. (Unpublished report).

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10. BELLAMY, D. 1978. A commentary on the decline in diversity of Skomer Island and some proposed experiments in management to arrest and reverse this trend. University College, Cardiff, Department of Zoology. (Unpublished report).
11. BENNETT, A. 1986. An assessment of the loss of moorland on the Mainland and South Ronaldsay, Orkney 1932-1985. Nature Conservancy Council. (Unpublished report).
12. BIRKS, H.J.B. 1972. The past and present vegetation of the Isle of Skye: a palaeoecological study. Cambridge, Cambridge University Press.
13. BIRKS, H.J.B., & WILLIAMS, W. 1983. Late-Quaternary vegetational history of the Inner Hebrides. Proceedings of the Royal Society of Edinburgh Section B, 83, 269-292.
14. BIRSE, E.L. 1980. Plant communities of Scotland - A preliminary phytocoenonia. Craigiebuckler, Aberdeen, Macaulay Institute for Soil Research.
15. BIRSE, E.L. 1984. The phytocoenonia of Scotland - additions and revision. Craigiebuckler, Aberdeen, Macaulay Institute for Soil Research.
16. BOWEN, E.J. 1930. A survey of the flora of the North Gower coast. Proceedings of the Swansea Science and Field Naturalist Society, 1, 109.
17. BRAY, G.C. 1981. Skomer botanical survey 1979. I. The vegetation survey - methods, results and discussion. University College, Cardiff. (Unpublished report).
18. BRAY, G.C. 1981. Skomer botanical survey 1979. II. Quadrat point locations - maps and measurements. University College, Cardiff. (Unpublished report).
19. BRAY, G.C. 1982. Skomer botanical survey supplement No 1. The effects of Gulls on vegetation - a review of the literature and possible consequences for the plant communities on Skomer resulting from increases in gull numbers. Nature Conservancy Council, Aberystwyth and University College, Cardiff. (Unpublished report).
20. BRAY, G.C. 1987. Skomer botanical survey, 1979-1987. III. Environmental data, quadrat re-recordings, and the monitoring of changes in the coastal vegetation. University College, Cardiff. (Unpublished report).
21. BREWSTER, D., HEARN, K.A., & JARMAN, R.A. 1975. A survey of the vegetation of North-West Sutherland. London University. (Unpublished report, Nature Conservancy Council CSD report No 116).

Vegetation

Five coastal plant communities are described from a study of eleven cliffs: (1) Agrostis capillaris - Festuca rubra machair, (2) Festuca - Agrostis coastal grassland, (3) Agrostis - Festuca grassland, (4) coastal Nardus - Agrostis - Festuca grass heath, (5) coastal Calluna - Nardus - Agrostis - Festuca grass heath. The vegetation of exposed cliffs was strongly affected by salt spray with luxuriant, herbaceous, species-poor vegetation with prominent Armeria maritima and Cochlearia officinalis with Empetrum nigrum on the upper reaches of the slopes. Eutrophication from sea-bird guano had little effect upon these vegetation types. Vegetation of less exposed cliffs contained more Empetrum grading up from the Armeria - Cochlearia zone. Other dwarf shrubs were present, including Calluna vulgaris, Salix repens and Erica spp. Three types of vegetation occurred on more sheltered cliffs: (1) Vegetation in which Luzula sylvatica, Pteridium aquilinum and Empetrum were co-dominant in a thick luxuriant sward; this type probably arises in absence of grazing and burning. (2) A fern- and bryophyte-rich vegetation tending towards scrub with woodland associates. (3) Cliff grasslands with grass and Calluna and only Armeria and Plantago maritima as maritime species. Large-scale and haphazard burning management has been carried out over the study area. Effects of burning depend on the speed of the fire, age of the heather, time between burns, floristic composition, environmental factors, regeneration characteristics of the heather and grazing. Species lists for each community are provided and two sites of special ecological interest are identified.

22. BRICKLE, N.E. 1985. A study of cliff-top vegetation on the Pembrokeshire peninsula. BSc project report. Polytechnic of Central London. (Unpublished report).
23. BRISTOL UNIVERSITY. 1981. Botanical Survey of the Lizard peninsula. Bristol University. (Unpublished report).
24. BRISTOL UNIVERSITY LIZARD PROJECT. 1983. A survey of Mullion Cove, harbour and cliffs with conservation management recommendations. Report No 6. (Unpublished report).
25. BRISTOL UNIVERSITY LIZARD PROJECT. 1983. A provisional check list of the Lizard flora - 1982.. Report No 7. (Unpublished report).
26. BRISTOL UNIVERSITY LIZARD PROJECT. 1983. A survey of the National Trust Poltesco property and conservation management recommendations. Report No 8. (Unpublished report).
27. BRISTOL UNIVERSITY LIZARD PROJECT. 1983. The conservation status of the Predannack Airfield Quarry and management recommendations. Restricted Report No 5. (Unpublished report).

Vegetation

28. BRISTOL UNIVERSITY LIZARD PROJECT. 1984. Survey of Black Head to Chynalls Point and conservation management recommendations. Report No 12. (Unpublished report).
29. BRISTOL UNIVERSITY LIZARD PROJECT. 1984. Survey of Kennack Sands and conservation management recommendations. Report No 13. (Unpublished report).
30. BRISTOL UNIVERSITY LIZARD PROJECT. 1984. Survey of the coast path of the Lizard District and management recommendations. Report No 14. (Unpublished report).
31. BRISTOL UNIVERSITY LIZARD PROJECT. 1984. Botanical Survey of the areas damaged by fire and sea water application at Castle Island, Tintagel. Special Report. (Unpublished report).
32. BRISTOL UNIVERSITY LIZARD PROJECT. 1984. The conservation status of Godrevy Cove. Restricted Report No 7. (Unpublished report).
33. BRISTOL UNIVERSITY LIZARD PROJECT. 1984. Interesting and new finds in the Lizard flora. Restricted Report No 8. (Unpublished report).
34. BRISTOL UNIVERSITY LIZARD PROJECT. 1985. Survey of the inland footpaths in the Lizard District. Report No 18. (Unpublished report).
35. BRISTOL UNIVERSITY LIZARD PROJECT. 1985. Survey of the National Trust property at Kynance Cove and Lizard Downs with recommendations for nature conservation management. Report No 19. (Unpublished report).
36. BRISTOL UNIVERSITY LIZARD PROJECT. 1985. A botanical survey of Coverack cliffs and Lowland Point with conservation management recommendations. Report No 21. (Unpublished report).
37. BRISTOL UNIVERSITY LIZARD PROJECT. 1987. Survey of the past and present land-use of the clifflands of the Lizard District, Cornwall. Restricted Report No 11. (Unpublished report).
38. BULLARD, E.R. 1975. Orkney. A checklist of vascular plants. Stromness, Rendall.
39. BULLARD, E.R. 1975. Orkney habitats: an outline ecological framework. In: The natural environment of Orkney, Ed. by R. Goodier, pp. 19-28. Edinburgh, Nature Conservancy Council.
40. BULLARD, E.R., & GOODE, D.A. 1975. The vegetation of Orkney. In: The natural environment of Orkney, Ed. by R. Goodier, pp. 31-48. Edinburgh, Nature Conservancy Council.
41. BURNETT, J.H. (Ed). 1964. The vegetation of Scotland. London, Oliver & Boyd.

Vegetation

42. CAMPBELL, M.S. 1945. The flora of Uig (Lewis). Arbroath, Buncle.
43. CHAPMAN, V.J. 1964. Coastal vegetation. Oxford.

Includes a short chapter on sea-cliff vegetation.

44. COOMBE, D.E., & FROST, L.C. 1956. The heaths of the Cornish serpentine. Journal of Ecology, 44, 226-256.
45. COOPER, E.A. 1988. Vegetation maps of British sea cliffs and cliff-tops. 1. Holyhead Anglesey: Gors Goch to North Stack. Nature Conservancy Council & University of Lancaster. (Unpublished report).

A series of reports forming part of an NCC research contract at Lancaster University to assess the resources required to provide similar accounts of all the sea-cliff and cliff-top vegetation of Britain. The NVC plant communities are identified and mapped with accompanying text and target notes. Report No 9 (St Abbs Head) is not available.

46. COOPER, E.A. 1988. Vegetation maps of British sea cliffs and cliff-tops. 2. Cape Cornwall, Cornwall: Gribba Point to Loe Warren. Nature Conservancy Council & University of Lancaster. (Unpublished report).
47. COOPER, E.A. 1988. Vegetation maps of British sea cliffs and cliff-tops. 3. Lizard, Cornwall: Lizard Point to Gew Graze. Nature Conservancy Council & University of Lancaster. (Unpublished report).
48. COOPER, E.A. 1988. Vegetation maps of British sea cliffs and cliff-tops. 4. Purbeck, Dorset: Dancing Ledge to Chapman's Pool. Nature Conservancy Council & University of Lancaster. (Unpublished report).
49. COOPER, E.A. 1988. Vegetation maps of British sea cliffs and cliff-tops. 5. Stackpole, Pembrokeshire: Bullslaughter Bay to Barafundle Bay. Nature Conservancy Council & University of Lancaster. (Unpublished report).
50. COOPER, E.A. 1988. Vegetation maps of British sea cliffs and cliff-tops. 6. Strumble Head, Pembrokeshire: Aber Back to Strumble Head. Nature Conservancy Council & University of Lancaster. (Unpublished report).
51. COOPER, E.A. 1988. Vegetation maps of British sea cliffs and cliff-tops. 7. Trimingham, Norfolk: Sidestrand to Little Marl Point. Nature Conservancy Council & University of Lancaster. (Unpublished report).

Vegetation

52. COOPER, E.A. 1988. Vegetation maps of British sea cliffs and cliff-tops. 8. Robin Hood's Bay, North Yorkshire: Robin Hood's Bay to Beast Cliff. Nature Conservancy Council & University of Lancaster. (Unpublished report).
53. COOPER, E.A. 1988. Vegetation maps of British sea cliffs and cliff-tops. 10. Fowls Heugh, Kincardineshire: Strathlothan bay to Henry's Scorth. Nature Conservancy Council & University of Lancaster. (Unpublished report).
54. COOPER, E.A. 1988. Vegetation maps of British sea cliffs and cliff-tops. 11. Troup Head, Aberdeenshire - Banffshire: Crovie to Pennan Bay. Nature Conservancy Council & University of Lancaster. (Unpublished report).
55. COOPER, E.A. 1988. Vegetation maps of British sea cliffs and cliff-tops. 12. Duncansby Head, Highlands: Robert's Haven to Striding Man. Nature Conservancy Council & University of Lancaster. (Unpublished report).
56. COOPER, E.A. 1988. Vegetation maps of British sea cliffs and cliff-tops. 13. Yesnaby, mainland Orkney Isles: Neban Point to Row Head. Nature Conservancy Council & University of Lancaster. (Unpublished report).
57. CRAMPTON, C.B. 1911. The vegetation of Caithness considered in relation to the geology. Cambridge, The Committee for the Survey and Study of British Vegetation.

A splendid early account with a section devoted to plant formations of the rocky sea cliffs.
58. CURRIE, A. 1979. The vegetation of the Outer Hebrides. Proceedings of the Royal Society of Edinburgh Section B, 77, 219-265.
59. CURRIE, A., & MURRAY, C. 1983. Flora and vegetation of the Inner Hebrides. Proceedings of the Royal Society of Edinburgh Section B, 83, 293-318.
60. DAVEY, F.H. 1909. Flora of Cornwall. Penryn, Chegidden.
61. DAVIES, T.A.W. 1970. Plants of Pembrokeshire. Haverfordwest, West Wales Naturalists' Trust.
62. DIMBLEBY, G.W., GREIG, J.R.A., & SCAIFE, R.G. 1981. Vegetational history of the Isles of Scilly. In: Environmental aspects of coasts and islands, Ed. by G.W. Dimbleby & D. Brothwell, pp. 127-144. Oxford, British Archaeological Reports (International Series 94). Symposia of the Association for Environmental Archaeology, 1.

Vegetation

63. DOODY, P., CHARMAN, K., & DEADMAN, A. 1986. Surveying coastal vegetation. With a section listing monitoring and other research projects in National Nature Reserves. Nature Conservancy Council. (Unpublished report, Coastal Habitat Network paper No 1).
64. ELIAS, D.O. 1981. A provisional account of the flowering plants and ferns of Oxwich. Nature Conservancy Council, South Wales region. (Unpublished report, Rep NC 214E).
65. FERREIRA, R.E.C. 1967. Community description in field survey of vegetation map of the Isle of Rhum. Nature Conservancy Council, Edinburgh. (Unpublished report).
66. FERREIRA, R.E.C. 1970. Vegetation map of the Isle of Rhum. Nature Conservancy Council, Edinburgh. (Unpublished report).
67. FERREIRA, R.E.C. 1978. North-West Sutherland vegetation survey: interim report. Nature Conservancy Council, North-West Scotland region. (Unpublished report).
68. FERREIRA, R.E.C. 1979. Observations on the vegetation of coastal ravines between Kintadwell (East Sutherland) and Ousdale (Caithness). Nature Conservancy Council, North-West Scotland region. (Unpublished report).
69. FERREIRA, R.E.C. 1980. Sutherland vegetation survey: summary of 1977-1979 surveys. Nature Conservancy Council, North-West Scotland region. (Unpublished report).
70. FERREIRA, R.E.C. 1981. North-west Sutherland vegetation survey: summary of 1980 field survey. Nature Conservancy Council, North-West Scotland region. (Unpublished report).
71. FERREIRA, R.E.C. 1982. Sutherland vegetation survey: summary of 1981 field survey. Nature Conservancy Council, North-West Scotland region. (Unpublished report).
72. FERREIRA, R.E.C. 1983. Sutherland vegetation survey: summary of 1982 field survey. Nature Conservancy Council, North-West Scotland region. (Unpublished report).
73. FERREIRA, R.E.C. 1984. Sutherland vegetation survey: summary of 1983 field survey. Nature Conservancy Council, North-West Scotland region. (Unpublished report).
74. FERREIRA, R.E.C. 1985. Sutherland vegetation survey: summary of 1984 field survey. Nature Conservancy Council, North-West Scotland region. (Unpublished report, Rep NC 228b).
75. FERREIRA, R.E.C. 1986. Sutherland vegetation survey: summary of 1985 field survey. Nature Conservancy Council, North-West Scotland region. (Unpublished report, Rep NC 228).

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76. FERREIRA, R.E.C. 1987. Sutherland vegetation survey: summary of 1986 field survey. Nature Conservancy Council, North-West Scotland region. (Unpublished report, Rep NC 234a).
77. FROST, L.C. 1967. Some uncommon and critical plant species at the Lizard. The Lizard, 3:3, 1-5.
78. FROST, L.C. 1968. The rare plants of the Lizard District. The Lizard, 3:4, 3-9.
79. FROST, L.C., & HOPKINS, J.J. 1979. Types of species distribution at the Lizard District, Cornwall. Journal of the Lizard Field Studies Club, 6:3, 12-13.
80. GABBUTT, P.D. 1952. A study of the vegetation of the coastal slopes of Lundy. Annual Report of the Lundy Field Society, 6, 36-49.
81. GILBERT, O.L., HOLLIGAN, P.M., & HOLLIGAN, M.S. 1972. The flora of North Rona. Transactions and Proceedings of the Botanical Society of Edinburgh, 42, 43-68.

The island (and neighbouring Sula Sgeir) was declared an NNR in 1956 on account of large breeding grey seal populations and sea-bird colonies. The vegetation of North Rona is extremely species-poor when compared with other British islands. Maritime Festuca rubra grassland covers the main mass of the island and no part of the island carries halophobic vegetation - high salt content of the soils appears to be the most important factor limiting diversity. Annual plant communities flourish on the low lying peninsulas (especially Atriplex and Stellaria) and these are the product of biotic pressures; seals, gulls, puffins and sheep. Similar communities occur in the seal breeding grounds on the Farne Islands and the herring gull colonies of the Isle of May. This type of community is regarded as temporary and associated with extreme vertebrate pressure; soil erosion is expected eventually to produce a bare rocky platform.

82. GILLHAM, M.E. 1953. An ecological account of the vegetation of Grassholm island, Pembrokeshire. Journal of Ecology, 41, 84-99.

An unusual type of maritime grassland is described which consists primarily of a dense mat of Festuca rubra with robust plants of Holcus lanatus in moist sheltered hollows and only ten other angiosperms present (NVC MC8, Festuca rubra - Armeria maritima maritime grassland, typical sub-community). The controlling factors leading to this grassland are excessive exposure to salt spray, large input of sea-bird guano (from 9000 breeding pairs of gannets) and the absence of grazing mammals.

Vegetation

83. GIMINGHAM, C.H. 1972. The maritime zone: maritime and sub-maritime communities. In: The vegetation of Scotland, Ed. by J.H. Burnett, pp. 67-142. Edinburgh, Oliver & Boyd.
84. GOLDSMITH, F.B. 1973. The vegetation of exposed sea-cliffs at South Stack, Anglesey. I. The multivariate approach. Journal of Ecology, 61, 787-818.

The vegetation was analysed using association analysis and ordination. The overriding importance of salinity as the major environmental factor is clearly demonstrated. Salinity acts indirectly on the maritime species through interspecific competition. The competitive ability of inland species is reduced by salt spray and a saline soil so providing an environment for the growth of sea-cliff halophytes. The importance of grazing and the influence of sea-birds is discussed.

85. GOLDSMITH, F.B. 1975. The sea-cliff vegetation of Shetland. Journal of Biogeography, 2, 297-308.

Eighty-three species-lists are classified in a traditional Continental manner. Three species are ubiquitous; Armeria maritima, Festuca rubra and Plantago maritima. A number of maritime cliff communities are described. Shetland lacks several southern and common species (Crithmum maritimum, Daucus carota) but possesses arctic-alpine and northern elements (Rhodiola rosea, Saxifraga oppositifolia, Silene acaulis, Ligusticum scoticum).

86. GOODE, D. 1974. The flora and vegetation of Shetland. In: The natural environment of Shetland, Ed. by R. Goodier, pp. 50-72. Edinburgh, Nature Conservancy Council.
87. GRIFFITH, J.E. 1895. Flora of Anglesey and Carnarvonshire. Bangor.
88. HAWKSWORTH, D.L. 1969. Notes on the flora and vegetation of Foula, Shetland (VC 112). Proceedings of the Botanical Society of the British Isles, 7, 537-547.
89. HAYWARD, J. 1979. Present-day flora of West Glamorgan commonland. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
90. HEARN, K.A. 1979. The National Trust Biological Survey: The Lizard peninsula, Cornwall. Cirencester, National Trust. (Unpublished report).
91. HEPBURN, I. 1943. A study of the vegetation of sea-cliffs in North Cornwall. Journal of Ecology, 31, 30-39.

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The vegetation zonation is described. It is noted that the majority of cliff species are also typical of salt-marshes. Only Limonium binervosum, Spergularia rupicola and Crithmum maritimum are virtually exclusively cliff plants, although the two former species are represented by closely-related species in salt-marshes etc. Thus, only Crithmum is a species peculiar to the cliff habitat (see also ref 385).

92. HESLOP HARRISON, J.W., & HESLOP HARRISON, J. 1949. A contribution to our knowledge of the flora of the Isles of Lewis, Harris, Killegray and Ensay. Transactions and Proceedings of the Botanical Society of Edinburgh, 35, 132-156.
93. HESLOP HARRISON, J.W., & HESLOP HARRISON, J. 1950. Further observations on the vascular plants of the Outer and Inner Hebrides. Transactions and Proceedings of the Botanical Society of Edinburgh, 35, 415-426.
94. HOPKINS, J.J. 1978. The conservation status of the inland heathlands and other vegetation types and their associated rare and uncommon species at the Lizard District, Cornwall. University of Bristol and Nature Conservancy Council, South-West England region. (Unpublished report).
95. HOPKINS, J.J. 1979. The conservation status of the coastal vegetation types and their associated rare and uncommon species at the Lizard peninsula, Cornwall. University of Bristol and Nature Conservancy Council, South-West England region. (Unpublished report).
96. HOPKINS, J.J. 1980. Report on the floristic, phytosociological and historical features of the vegetation of the Lizard peninsula, Cornwall. University of Bristol and Nature Conservancy Council, South-West England region. (Unpublished report).
97. HOPKINS, J.J. 1983. Studies of the historical ecology, vegetation and flora of the Lizard District, Cornwall. 2 vols. PhD thesis, University of Bristol.
98. HORE, W.S. 1845. A day's botanizing at the Lizard. The Phytologist, 2, 235-239.
99. HUBBARD, J.C.E., & GRIMES, B.H. 1972. The analysis of coastal vegetation through the medium of aerial photography. Medical and Biological Illustration, 22, 182-190.
100. HUMPHRIES, E.A., & SMITH, I. 1986. A botanical survey and evaluation of the unscheduled areas of Castlemartin RAC ranges, South Pembrokeshire, Dyfed. Nature Conservancy Council, Wales Field Unit. (Unpublished report, Rep NC 210).
101. ING, E.G. 1962. Notes on the Lizard flora: plants of the rocks and cliffs. The Lizard, 2:2, 2-4.

Vegetation

102. INSTITUTE OF TERRESTRIAL ECOLOGY. 1975. Some aspects of the ecology of Shetland. Nature Conservancy Council. (Unpublished report, CSD reports Nos 14-26).

Includes a brief account of the sea-cliff vegetation (CSD Report No 20). 90% of the perimeter of Shetland (c. 1450 km) is hard cliff and few inland areas are more than 5 km from the coast - the vegetation is very much influenced by salt spray. Vegetation is apparently unaffected by geology, except where this affects substrate stability. Sea-bird influence produces a characteristic assemblage. The biogeography of Shetland is discussed by comparison with mainland coastal sites and archipelagos in south-west England, Wales and Scotland. The absence of southern elements and presence of arctic-alpine and northern elements are the main characteristics of Shetland (and other sites in north Scotland and beyond). Conservation status for Shetland should not be based on flora alone since this is neither outstanding nor independent of cliff formations and sea-birds, all of which would be affected by development.

103. JAMES, P., CRUMP, R., LEACH, S., HOLDEN, P., & DYKE, J. 1979. Stackpole Warren - Report 2. Lichen Survey - Preliminary report. National Trust, Nature Conservancy Council, Field Studies Council. (Unpublished report, CSD report No 361b. See also refs 108 & 109).
104. JERMY, A.C., & CRABBE, J.A. (Ed). 1978. The island of Mull: a survey of its flora and environment. London, The British Museum (Natural History).

Includes a brief discussion of maritime cliff and rock communities.

105. JOHNSTONE, J.L. 1974. Shetland habitats: An outline ecological framework. In: The natural environment of Shetland, Ed. by R. Goodier, pp. 33-49. Edinburgh, Nature Conservancy Council.
106. KEATINGE, T.H., & DICKSON, J.H. 1979. Mid-Flandrian changes in vegetation on Mainland Orkney. New Phytologist, 82, 585-612.
107. KNOX, R.B. 1958. Flora of the Isle of Jura. I. Flowering plants and ferns. Transactions and Proceedings of the Botanical Society of Edinburgh, 37, 251-256.
108. LEACH, S.J. 1980. Stackpole: Stackpole Warren (South Pembrokeshire NNR). National Trust, Nature Conservancy Council, Field Studies Council. (Unpublished report, CSD report No 361).

The maritime cliff communities are described.

Vegetation

109. LEACH, S.J., & DYKE, J. 1978. Stackpole Warren - Report 1. Classification and mapping of the plant communities. National Trust, Nature Conservancy Council, Field Studies Council. (Unpublished report, CSD report No 361A. See also ref 103).
110. LEWIS, A. 1977. Phytosociological studies in the Northern Isles of Shetland. PhD thesis, University of Durham.
111. LODER, J.V. 1935. Colonsay and Oronsay in the Isles of Argyll. Their history, flora, fauna and topography. Edinburgh and London, Oliver & Boyd.
112. LUSBY, P. 1983. A preliminary survey of the main areas of cliff coast in Wester Ross. Nature Conservancy Council, North-West Scotland region. (Unpublished report, Rep NC 228h).
113. MACKINTOSH, J. 1983. Handbook of Scottish rare species. Nature Conservancy Council, South-East Scotland region. (Unpublished report, Rep NC 222a).

Methods for monitoring plant populations are described, and all Scottish Red Data Book species are listed, with an indication of how well each species has been recorded.

114. MACKINTOSH, J. 1985. Report of a vegetation survey of the Caithness cliffs. Nature Conservancy Council, Scottish Field Unit, Edinburgh. (Unpublished report, Rep NC 231C).

A survey of the plant communities of Berriedale Cliffs SSSI, Scaps Geo - Dunbeath SSSI and Castle of Old Wick - Craig Hammel SSSI. The plant communities are classified using the National Vegetation Classification and mapped and described with target notes.

115. MALLOCH, A.J.C. 1971. Vegetation of the maritime cliff tops of the Lizard and Land's End peninsulas, West Cornwall. New Phytologist, 70, 1155-1197.

The following major sea-cliff vegetation associations are described: (1) Crithmo - Spergularietum rupicolae (maritime rock-crevice communities); (2) Atriplici - Betetum perennis (association of bird-influenced cliffs); (3) Festuco - Armerietum rupestris (ungrazed maritime grasslands); (4) Festuco - Dactyletum maritimae (Holcus - Dactylis grassland showing links with the Arrhenatheretalia); (5) the grazed maritime grasslands (Festuca rubra - Plantago coronopus grassland); (6) Endymio - Armerietum maritimae (cliff bluebell communities); (7) Calluno - Scilletum vernae (the maritime heaths); (8) Thero - Sedetum anglici (maritime therophyte association); (9) Geranietum sanguinei maritimi (Geranium sanguineum communities); (10) the cliff scrub nodum. A strong relationship between percentage of maritime

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species per nodum and the Na:organic matter ratio in the substrate is noted. The communities form the basis for the maritime cliff communities description in the National Vegetation Classification (see ref 139).

116. MALLOCH, A.J.C., BAMIDELE, J.F., & SCOTT, A.M. 1985. The phytosociology of British sea-cliff vegetation with special reference to the ecophysiology of some maritime cliff plants. Vegetatio, 62, 309-317.

The seeds of maritime cliff species germinate in higher salinities than closely related inland species. Relative growth rates of the maritime species are stimulated at low salinities, compared with non-saline conditions, and are reduced less at higher salinities than for inland relations. Increasing salinity reduces both photosynthesis and dark respiration in Lavatera arborea. Mesophyll and stomatal resistances are increased while transpiration is reduced.

117. MARGETTS, L.J. 1987. The difficult and critical plants of the Lizard District of Cornwall. Bristol, Grenfell.
118. MARGETTS, L.J., & DAVID, R.W. 1981. A review of the Cornish flora, 1980. Redrush.
119. McCALLUM WEBSTER, M., & MARLER, P. 1952. A contribution to the flora of West Sutherland. Watsonia, 2, 163-179.
120. McLEAN, R.C. 1935. An ungrazed grassland on limestone in Wales, with a note on plant 'dominions'. Journal of Ecology, 23, 436-442.

The vegetation and soils of Worm's Head on the Gower peninsula are described. The tall species-poor Festuca rubra "mattress" (NVC MC8, Festuca rubra - Armeria maritima maritime grassland, typical sub-community) of the ungrazed hills is contrasted with the short species-rich limestone grassland (NVC MC9, Festuca rubra - Holcus lanatus maritime grassland, Achillea millefolium sub-community) of the sheep grazed hills.

121. McVEAN, D.N. 1961. Flora and vegetation of the islands of St Kilda and North Rona in 1958. Journal of Ecology, 49, 39-54.

The most significant change in the vegetation since the departure of man in 1930 has been the increase of Calluna vulgaris in the Moliniето - Callunetum of the Village Bay area. The present Plantago sward (NVC MC10, Festuca rubra - Plantago spp. maritime grassland) originated with the onset of Atlantic times due to increased gale frequency and salt spray inundation of headlands. Differences between the dwarf shrub and Agrostis-Festuca vegetation of Hirta and the

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Festuca rubra dominated vegetation of North Rona are probably due to the greater influence of salt spray and bird and mammalian life on North Rona.

122. MURRAY, C.W. 1970. Isle of Raasay, Inverness-shire 28 June - 5 July. Watsonia, 8, 190-191.
123. MYLOTTE, V.J. 1986. Vegetation monitoring at Stackpole Warren, Stackpole NNR 1986. Nature Conservancy Council. (Unpublished report).
124. NATIONAL TRUST. 1979-Present. National Trust Biological Survey Reports. Cirencester. (Unpublished reports).

Reports covering a large number of coastal properties have been compiled by the National Trust Biological Survey Team. Further details and a full list is provided in the indexes.

125. NATURE CONSERVANCY COUNCIL. 1972. Report of the sea-cliff vegetation study group. Peterborough. (Unpublished report).
126. NATURE CONSERVANCY COUNCIL. 1980. South Gower coast cliff and grassland survey: interim report. Bangor, Wales Field Unit. (Unpublished report, Rep NC 203C).

Vegetation data from 254 1 sq m stratified random quadrats collected from two areas of the South Gower Coast NCR Grade 1 site in 1979 are classified by Indicator Species Analysis and used to produce a map of vegetation types. The work is the first part of a two year programme by the WFU to establish a baseline for vegetation monitoring on the site.

127. NATURE CONSERVANCY COUNCIL. 1981. Vegetation survey and monitoring on the hard coast areas of the South Gower Coast N.N.R. site, West Glamorgan. Bangor, Wales Field Unit. (Unpublished report, Rep NC 203H).

Floristic data from quadrats distributed across the site were used to produce a vegetation classification by means of Indicator Species Analysis and TWINSpan. The classification was used as a basis for the production of a series of vegetation maps of the site. A number of permanent quadrats were established in each of the major plant communities which were recognised. Floristic data were recorded from these, and a photographic record of each quadrat and the vegetation around it was made. A variety of methods were employed for the accurate recording of quadrat positions; quadrats themselves being marked using buried metal markers. A system for the storage of permanent quadrat records was developed. Guidelines for the interpretation of data from the permanent quadrats (which will be re-recorded) are presented.

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128. NATURE CONSERVANCY COUNCIL. 1981. A vegetation survey of Pembrokeshire heaths. Bangor, Wales Field Unit, Project No W79/8. (Unpublished report, Rep NC 203F).
129. NATURE CONSERVANCY COUNCIL. 1987. Phase 1 land-use and habitat survey of Devon. Compiled by S. Butler. (Unpublished report, Rep NC 229f).

Areas of all semi-natural habitats and other land-use categories were measured from field observation and base maps in 1983/4 and presented as tables, maps and pie-diagrams. Total area of the county is 672 621 ha and 21% (141 012 ha) of this is recorded as semi-natural habitat. Of this 30.4% (42 891 ha) is semi-improved and unimproved grassland, 35.9% (50 643 ha) heath and bracken and 5.3% (7757 ha) coastal. Of the coastal habitats, 15% (1198 ha) is cliff and scree, 64% (4940 ha) intertidal, 13% (1017 ha) dunes, 4% (325 ha) salt-marsh and 1% (77 ha) other. Total habitat areas are broken down into twelve regions and major cliff and scree areas are East Devon (40% - 483 ha) and South Hams (38% - 453 ha) with just 7% (86.6 ha) in North Devon and 6% (75.7 ha) in the Exmoor National Park. In East Devon there are fine sandstone and limestone cliffs from Exmouth to the Dorset border with rich grassland on cliff-tops and ledges. Landslips, notably the well wooded Axmouth - Lyme Regis undercliffs, are an important ecological and geological feature. The coastal scenery of the South Hams District is one of great contrast, due to river valleys which have cut through the cliff line to become flooded valleys. The geology of the area is largely east-west trending Devonian shales, sandstones and slates. Along the coast between Bolt Tail and Start Point very hard metamorphic hornblende and mica schists form the highest part of the South Hams coast. The soils are very thin and maritime crevice, grassland and heathland communities may be well developed, though in some areas these have been virtually eliminated by ploughing to the cliff edge. At Berry Head the sheer cliffs are of thick, bedded, massive Devonian limestone with a characteristic limestone flora complementing the maritime elements. In North Devon the much-folded Carboniferous rocks found between the Cornish border to Clovelly form dramatic, high hogsback cliffs. From Clovelly to Westward Ho! the cliffs are lower with well developed woodland and scrub. From Morte Point to the Somerset border the high, multi-folded Devonian cliffs are once again extensively wooded.

130. ORANGE, A. 1984. Stackpole NNR, comparison of permanent quadrats 1977-1984 Stackpole Warren. Nature Conservancy Council. (Unpublished report).
131. PEMBROKESHIRE COAST NATIONAL PARK. 1985. Section 43 Wildlife & Countryside Act 1981 Map of moor and heath. Haverfordwest, National Park Authority.

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132. PERRING, F.H., & RANDALL, R.E. 1972. An annotated flora of the Monach Isles National Nature Reserve, Invernesshire. Transactions and Proceedings of the Botanical Society of Edinburgh, 41, 431-444.
133. PETCH, C.P. 1933. The vegetation of St Kilda. Journal of Ecology, 21, 92-100.

The ecological interest of Hirta in the St Kilda group lies in the changes following the removal of grazing and cultivation [26 August 1930]. These have not yet had time to take effect [1931] but an increase in Calluna vulgaris and associates is predicted in the formerly grazed areas. In the formerly cultivated area there is little difference between areas abandoned two and fifty years ago, so no rapid changes can be expected. The maritime communities are described including vegetation of puffin burrows (especially on the island of Dun). See also ref 134.

134. POORE, M.E.D., & ROBERTSON, V.C. 1949. The vegetation of St Kilda in 1948. Journal of Ecology, 37, 82-99.

On Hirta the grazing factor [domestic blackfaces] was active until 1930 when it was removed. From 1930 grazing by Soay sheep increased. On Dun the effect of grazing was never great and absent since 1930. Rabbits have never been introduced on St Kilda. The formerly cultivated land, which was dominated by rank Holcus lanatus in 1931 (see ref 133), is now an Agrostis-Festuca grassland invaded by Anthoxanthum odoratum. Bracken increased between 1931 and 1948 but only became dominant in extremely favourable localities. The maritime grassland ("Plantago sward," NVC MC10, Festuca rubra - Plantago spp. maritime grassland) was favoured by the Soay sheep and the vegetation showed little difference from that recorded by Petch in 1931. The transition from Plantago sward to Molinietum often occurred within a one metre band. The Plantago sward occurred on a deep peat and it is suggested that the peat is actively formed by this community and is not an old Sphagnum or sedge peat. A possible succession to the Plantago sward is outlined. The ungrazed maritime grassland on Dun is a Festuca rubra mattress (NVC MC8, Festuca rubra - Armeria maritima maritime grassland, Typical sub-community), Plantago sward occurs only on north-facing slopes in the middle of the island. Vegetation of puffin burrows on sloping grassland is either Festucetum or Rumicetum, and the evidence suggests that the Rumicetum may represent a colonization of bare ground left after vigorous puffin activity.

135. PROCTOR, M.C.F. 1975. Notes on the vegetation of Alderney. Phytocoenologia, 2, 301-311.

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136. RANDALL, R.E. 1972. Vegetation in a maritime environment: the Monach Isles. PhD thesis, University of Cambridge.
137. RANDALL, R.E. 1974. Airborne salt deposition and its effect upon coastal plant distribution: the Monarch Isles National Nature Reserve, Outer Hebrides. Transactions and Proceedings of the Botanical Society of Edinburgh, 42, 153-162.

Maritime species are found where salt deposition is over 200 microgrammes NaCl/sq cm/day. The highest readings are found on coastal rocks and in maritime heaths. Species with short growth-forms are not salt-damaged but those with parts projecting above the general level of the vegetation may be damaged. Heaviest falls of salt occur during winter when most plants are dormant. Summer periods of high wind speed may represent the major influence on species distribution.

138. ROBERTSON, E.T. 1951. Contributions to the maritime ecology of St. Cyrus, Kincardineshire. Part I. The Cliffs. Transactions and Proceedings of the Botanical Society of Edinburgh, 35, 370-414.

The distribution of species on the cliffs and stacks is related to three factors: (a) shelter - a richer flora of southern species occurs towards the south part of the cliff and in bays sheltered by promontories in the north; (b) moisture content - this varies with the amount of wind-blown sand in the soil. Numerous dune species occur on drier places along the whole length and especially in the middle region covered by sand. A less xeromorphic flora occurs in damp bays in the north, (c) exposure to salt - related to force and direction of wind and moisture content of the soil. The flora of the northern cliffs and stacks is restricted and includes a larger proportion of halophytes than the less exposed southern cliffs.

139. RODWELL, J. (Ed). 1982-89. National Vegetation Classification. Nature Conservancy Council. (Unpublished report).

Draft chapters, include: maritime cliff communities, heaths, mires, scrub, calcicolous grasslands, mesotrophic grasslands, calcifugous grasslands.

140. RUSSELL, G. 1967. Note on the maritime heath vegetation at the south of the Isle of Man. Report of the Marine Biology Station Port Erin, 79, 37-41.
141. SCARTH, G.W. 1911. The grasslands of Orkney: an oecological analysis. Transactions and Proceedings of the Botanical Society of Edinburgh, 24, 143-163.

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142. SLATER, P. 1986. Bracken on Skomer Island, its history, distribution and management proposals. Nature Conservancy Council. (Unpublished report).
143. SMITH, I.R. 1979. Methods of survey and evaluation of commons. In: Problems of common land: the example of West Glamorgan Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
144. SMITH, R. 1900. Botanical survey of Scotland. I. Edinburgh district. II. North Perthshire district. Scottish Geographical Magazine, 16, 385-416 & 441-467.
145. SOBEY, D.G. 1976. The effect of herring gulls on the vegetation of the Isle of May. Transactions and Proceedings of the Botanical Society of Edinburgh, 42, 469-485.

The numbers of herring gulls increased from a single pair in 1907 to about 39,000 birds in 1972. Accompanying vegetation changes have been the decline in "Armeria heath" and "fescue sward" (NVC MC8, Festuca rubra - Armeria maritima maritime grasslands) and replacement by Holcus lanatus and Stellaria media- dominated communities (probably NVC MC6/MC7, Atriplex hastata - Beta vulgaris maritima / Stellaria media - Rumex acetosa sea-bird cliff communities). The gulls have since been culled by the Nature Conservancy Council and possible further vegetation changes are discussed.

146. SOBEY, D.G., & KENWORTHY, J.B. 1979. The relationship between herring gulls and the vegetation of their breeding colonies. Journal of Ecology, 67, 469-496.

The vegetation of eleven gull sites along the Aberdeenshire coast and the Isle of May is described, and consists of a seasonal, species-poor community with predominant annual and ruderal species (NVC MC6/7, see ref 145). Four gull activities principally affect the vegetation: treading, scrape digging and nest material collection, boundary clashes and defecation. The detailed distribution of plant species within colonies is apparently determined by soil nutrient status, sea-spray deposition and interspecific competition.

147. SPENCE, D.H.N. 1957. The flora of Unst, Shetland, in relation to the geology. Transactions and Proceedings of the Botanical Society of Edinburgh, 37, 163-173.
148. SPENCE, D.H.N. 1958. Studies on the vegetation of Shetland. I. The serpentine debris vegetation in Unst. Journal of Ecology, 45, 917-945.
149. SPENCE, D.H.N. 1959. Studies on the vegetation of Shetland. II. Reasons for the restriction of the exclusive pioneers to serpentine debris. Journal of Ecology, 47, 641-649.

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150. SPENCE, D.H.N. 1970. Scottish serpentine vegetation. Oikos, 21, 22-31.
151. SPENCE, D.H.N. 1974. Sub-arctic debris and scrub vegetation of Shetland. In: The natural environment of Shetland, Ed. by R. Goodier, pp. 73-88. Edinburgh, Nature Conservancy Council.
152. SPENCE, D.H.N., & MILLAR, E.A. 1963. An experimental study of the infertility of a Shetland serpentine soil. Journal of Ecology, 51, 333-343.
153. TANSLEY, A.G. 1939. The British Islands and their vegetation. Cambridge, Cambridge University Press.
154. THOMAS, A.S. 1960. Changes in vegetation since the advent of myxomatosis. Journal of Ecology, 48, 287-306.

Classic paper which includes data from Skomer Island, Pembrokeshire.
155. THURSTON, E., & VIGURS, C.C. 1922. A supplement to the Flora of Cornwall. Truro.
156. TURRILL, W. 1927. The Flora of St. Kilda. Botanical Exchange Club Report, 428.
157. URQUART, U.H. & GIMINGHAM, C.H. 1980. Maritime heath in north Scotland. Nature Conservancy Council & Aberdeen University. (Unpublished report, CSD report No 312).

Maritime heath in northern Scotland can be recognised as a mixture of both cliff-top species, e.g. Plantago maritima and Scilla verna, and heathland species, e.g. Calluna vulgaris, Erica tetralix, Empetrum nigrum and Salix repens. Carex flacca and C. panicea are usually present along with Festuca spp. and Agrostis spp. A notable rarity is Primula scotica which also occurs in adjacent maritime grasslands. Maritime heath occurs on moderately sloping ground on high cliff-tops on exposed coasts where there is moderate grazing. The soils are generally shallow brown earths derived from Middle Old Red Sandstone pH 5.2-5.9. Maritime heath may occur at the cliff edge itself or in a narrow strip inland from Armeria or Plantago - sward (NVC MC8/MC10, Festuca rubra - Armeria maritima / F. rubra - Plantago spp. maritime grasslands). Inland, maritime heath may grade into lichen heath or Blanket bog. Vegetation data are analysed by Indicator Species Analysis into 9 variants and 7 "satellite groups" and a key is provided. Maritime heath in northern Scotland occupies a very small proportion of the coastline, and many sites are only 0.1 ha in size. As grazing pressure increases and fertilisers are applied, maritime heath may disappear from the cliff-tops altogether.

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158. USHER, M.B., & PRIEST, S.N. 1977. Survey of the National Trust Properties in Yorkshire for their Wildlife Conservation Importance. Department of Botany, University of York. (Unpublished report).
159. VEVERS, H.G. 1936. The land vegetation of Ailsa Craig. I. *Journal of Ecology*, 24, 424-445.
- Bird cliff vegetation with Lavatera arborea is described (probably a form of NVC MC6, Atriplex hastata - Beta vulgaris maritima bird cliff vegetation). There is apparently no significant difference between the floras of bird-inhabited and uninhabited cliffs.
160. WALTON, C.L. 1951. Flora of the St David's peninsula. Haverfordwest.
161. WEST, W. 1912. Notes on the flora of Shetland with some ecological observations. Journal of Botany London, 1, 265-275 & 297-306.
162. WHITE, D.J.B. 1961. Some observations on the vegetation of Blakeney Point, Norfolk, following the disappearance of rabbits in 1954. Journal of Ecology, 49, 113-118.
163. WILLIAMSON, C. 1969. A survey of the vegetation of the cliff area and moor on a small part of the Lizard coast, Cornwall. Nature Conservancy Council. (Unpublished report).

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164. AITCHISON, J.W., HUGUES, E.J., & JONES, G. 1986. Llyn peninsula: an assessment of the Heritage Coast and AONB. Pwllheli, Gwynedd, Countryside Commission and J.M. Jones, Cyngor Dosbarth Dwyfor.
165. ANDERSON, P. 1985. Habitat and landscape conservation. Current strategies in the National Parks. Ecus, 6, 18-24.
166. BAUGH, I., & GOODIER, R. 1980. Revised compendium of ecological studies of the Scottish coastline relevant to development planning. Nature Conservancy Council, Scottish Field Survey Unit, Report No 80/3. (Unpublished report, Rep NC 204B).

Outline description of all ecological projects or surveys by region, environment or habitat, project leader and address, promoting grant-aid dates and details of published or unpublished reports.

167. BOYD, J.M. 1967. Land-use planning for wildlife and natural resources in the North-West Highlands. In: The biotic effects of public pressures on the environment, Ed. by E. Duffey, pp. 54-68. Natural Environment Research Council.
168. BRISTOL UNIVERSITY LIZARD PROJECT. 1981. An investigation of tourist induced erosion problems at Gunwalloe Church Cove and restoration management techniques. Report No 1. (Unpublished report).
169. BRISTOL UNIVERSITY LIZARD PROJECT. 1982. Natural history interest, amenity value and conservation management recommendations for the National Trust Cadgwith to Enys Head property. Report No 3. (Unpublished report).
170. BRISTOL UNIVERSITY LIZARD PROJECT. 1982. A total population estimate of the Land Quillwort (Isoetes histrix) at the Lizard District and recommendations for its conservation. Report No 4. (Unpublished report).
171. BRISTOL UNIVERSITY LIZARD PROJECT. 1982. Erosion, tourist pressure and conservation management recommendations at Poldhu Cove. Report No 5. (Unpublished report).
172. BRISTOL UNIVERSITY LIZARD PROJECT. 1982. The experimental introduction of the Gew Graze prostrate junipers to the Mullion Cliffs National Nature Reserve. Restricted Report No 1. (Unpublished report).
173. BRISTOL UNIVERSITY LIZARD PROJECT. 1982. Proposals for scheduling a Predannack Wollas SSSI or NNR. Restricted Report No 2. (Unpublished report).

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174. BRISTOL UNIVERSITY LIZARD PROJECT. 1982. Problems of access and tourist pressure at the Lizard Point and conservation management suggestions. Restricted Report No 3. (Unpublished report).
175. BRISTOL UNIVERSITY LIZARD PROJECT. 1982-5. Annual Reports No 1-4. (Unpublished report).
176. BRISTOL UNIVERSITY LIZARD PROJECT. 1983. The conservation of Polycarpon tetraphyllum, Deschampsia setacea and Huperzia selago in the Lizard District. Restricted Report No 6. (Unpublished report).
177. BRISTOL UNIVERSITY LIZARD PROJECT. 1984. The critical plants of the Lizard District and management recommendations. Report No 15. (Unpublished report).
178. BRISTOL UNIVERSITY LIZARD PROJECT. 1984. Edaphic analysis of burnt Festuca grassland at Castle Island, Tintagel, and recommendations for turf establishment. Special Report. (Unpublished report).
179. BRISTOL UNIVERSITY LIZARD PROJECT. 1985. Suggestions for visitor management and for remedial action in eroded areas in the National Trust property at Kynance Cove. Restricted Report No 10. (Unpublished report).
180. BRISTOL UNIVERSITY LIZARD PROJECT. 1987. The alien Hottentot-Fig (Carpobrotus edulis) in Britain - a threat to the native flora and its conservation control. Report No 22. (Unpublished report).
181. CAMPAIGN FOR THE PRESERVATION OF RURAL ENGLAND. 1930. Cornwall: a survey. London, University of London Press.
182. CAMPAIGN FOR THE PRESERVATION OF RURAL ENGLAND. 1932. Devon: a survey. London, University of London Press.
183. CAMPAIGN FOR THE PRESERVATION OF RURAL ENGLAND. 1936. The English Coast: its development and preservation, incorporating notes on the Northumberland coast. London, Campaign for the Preservation of Rural England.
184. CLAYDEN, P.A. 1979. The case for preservation of common land. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
185. COUNTRYSIDE COMMISSION. 1969. Nature conservation at the coast. 2 vols. Cheltenham. Volume two contains the report of the Nature Conservancy.
186. COUNTRYSIDE COMMISSION. 1970. The planning of the coastline: coastal preservation and development. London, HMSO.
187. COUNTRYSIDE COMMISSION. 1970. The coastal heritage. A conservation policy for coasts of high quality scenery. London, HMSO.

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188. COUNTRYSIDE COMMISSION. 1972. The planning of the undeveloped coast. DOE Circular 12/72 23 February, Welsh Office Circular 36/72. (Unpublished report).
189. COUNTRYSIDE COMMISSION. 1973. Approaches to the experimental restoration of heavily visited areas of the countryside: Kynance Cove. Cheltenham.
190. COUNTRYSIDE COMMISSION. 1979. Kynance Cove: a restoration project. Cheltenham (CCP 128). A report compiled by the Countryside Commission from a project carried out by F.B. O'Connor, F.B. Goldsmith & M. Macrae.

Covers the natural resource of Kynance Cove, visitor use, experimental restoration of severely eroded areas and monitoring.

191. COUNTRYSIDE COMMISSION. 1982. An evaluation of the Heritage Coast programme in England and Wales. Cheltenham (CCP 155).
192. COUNTRYSIDE COMMISSION. 1985. Bibliography No 7: National Parks. Cheltenham (CCP 200).
193. DOODY, J.P. Undated. Nature conservation and Heritage Coasts - the role of the Nature Conservancy Council. In: Heritage Coasts, Ed. by J. Edwards, pp. 11-17. Recreation Ecology Research Group Report No 10. Account of a meeting held in Swanage, September 1984.

Discusses the need to integrate recreational use of Heritage Coast with other land management, particularly that concerned with nature conservation.

194. DORSET COUNTY COUNCIL. 1977. Purbeck Heritage Coast: report and proposals. Dorset County Council, Planning Department. (Unpublished report).
195. EDWARDS, J. (Ed). Undated. Heritage coasts. Recreation Ecology Research Group Report No 1. Account of a meeting held in Swanage, on 7-9 September 1984.

Copies available from RERG, Wye College, University of London, Wye, Kent TN25 5AH. Includes papers on Nature Conservation and Heritage Coasts: the role of the Nature Conservancy Council (see ref 193), National Trust Heritage Coasts, and papers discussing the Heritage Coasts of South Cornwall, Dorset, Flamborough, Gower and the Pembrokeshire Coast National Park.

196. EGGELING, W.J. 1960. The Isle of May. A Scottish Nature reserve. Edinburgh, Oliver & Boyd.

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197. EGGELING, W.J. 1964. A nature reserve management plan for the Island of Rhum, Inner Hebrides. Journal of Applied Ecology, 1, 405-419.
198. ETHERINGTON, J.R., & CLARKE, E. 1987. Impact of agriculture on the cliff vegetation of South Gower, West Glamorgan. Nature Conservancy Council. (Unpublished report, CSD report No 731).

Describes the effects of eutrophication from fertilizer run-off on the vegetation of maritime cliff-tops.

199. FARINO, T. 1986. A draft management plan for the National Trust property of Crowlink, Michel Dene and Went Hill, incorporating an analysis of the vegetation types present. 3 vols. MSc thesis, University College, London, Ecology & Conservation Unit.
200. FIRTH, J.N.M., & CAINE, C.V. 1977. Environmental bibliography of Wales 1900-1976. Cardiff, HMSO.
201. FOWLES, A.P. 1987. A review of the representation of habitats within the Ceredigion SSSI schedule. Nature Conservancy Council. (Unpublished report).
202. FROST, L.C. 1974. Torrey Canyon disaster: the persistent toxic effects of detergents on the cliff-edge vegetation at the Lizard peninsula, Cornwall. Cornish Studies, 2, 5-14.

On the west coast of the Lizard nineteen contaminated sites were investigated, 450 sq m of vegetation had been killed including some of considerable scientific importance. The detergents behaved as powerful herbicides and as persistent soil poisons; 7 yr after contamination toxic effects persisted. Recolonization of the killed areas varied according to degree of exposure. Dead areas in exposed grazed maritime grasslands were recolonized directly by seedlings of Armeria maritima, whereas in the species-rich heaths Carex flacca invaded vigorously from the margins. Soil erosion was largely prevented by the dead vegetation mat and plant roots which remained undecayed for several years.

203. GOLDSMITH, F.B., MUNTON, R.J.C., & WARREN, A. 1970. The impact of recreation on the ecology and amenity of semi-natural areas: methods of investigation used in the Isles of Scilly. Biological Journal of the Linnean Society, 2, 287-306.
204. GOODIER, R. 1975. Conservation of the natural environment of Orkney. In: The natural environment of Orkney, Ed. by R. Goodier, pp. 153-161. Edinburgh, Nature Conservancy Council.
205. GUBBAY, S. 1986. Nature conservation in the coastal zone of Great Britain. Journal of Shoreline Management, 2, 241-257.

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206. HEARN, K.A., & GILBERT, M.G. 1977. The effects of the 1976 drought on sites of nature conservation interest in England and Wales. Nature Conservancy Council. (Unpublished report, CSD report No 123).

In England and Wales in 1976 rainfall was less than 50% of the monthly average (1916-1950) in April, June, July and August. In Scotland the values were less than 80% in April, June and July, and less than 50% in August. In September 1976 rainfall was over 200% of the monthly average in England and Wales and about 150% in October. In Scotland rainfall was 110 and 120% of the monthly average in September and October respectively. An attempt is made to assess the effects of the summer drought and wet autumn on NNR's and SSSI's by site visits and/or discussion with Regional NCC and LNT Staff. It is suggested that few nature conservation sites have received permanent damage, but formulation of conclusions was limited by lack of quantitative baseline data and the short-term nature of the study. The most severe effects of the drought were the severity of fire in 1976 and the damage resulting from fire fighting. There were no serious fires in coastal sites in 1976, but heavy public pressure caused increased erosion. There were other significant detrimental effects and some beneficial. In heathlands, scrub invasion may have been temporarily halted (*Crataegus* was especially sensitive), but invasion of *Ulex europaeus* may be accelerated by increased vigour following burning and ideal conditions for seed germination and seedling establishment in the wet autumn. On grasslands, overgrazing, erosion and poaching were severe. Some cliff species less affected by water shortage were remarkably prolific in 1976 [see ref 319 for discussion of post-drought increases of rare annual *Trifolium* species at the Lizard District, Cornwall]. Many butterfly and moth species showed population explosions in 1976. Recommendations are outlined for monitoring and coordination of research on nature conservation sites.

207. HERBERT, A.T., MARTIN, G.H.G., & DORLE, G.G. 1965. Some management problems of Skomer Island NNR. Nature Conservancy Council. (Unpublished report).

Including useful relocatable black and white photographs.

208. HMSO. 1967/68. A study of the coastline of England and Wales. London.

Reports of Regional Coastal Preservation and Development Conferences, individual reports covering: The coasts of Kent and Sussex, Hampshire and the Isle of Wight, South-West England, South Wales and the Severn Estuary, North Wales, North-West England, North-East England, Yorkshire and Lincolnshire, East Anglia.

Conservation & management

209. HOPKINS, J.J. 1979. The alien Carpobrotus edulis - a threat to the Lizard flora. The Lizard, 6:3, 14-15.
210. INSTITUTE OF TERRESTRIAL ECOLOGY. 1975. Management information system for Shetland: initial report. Nature Conservancy Council. (Unpublished report, CSD report No 3).
211. INSTITUTE OF TERRESTRIAL ECOLOGY. 1979. Report on the large blue butterfly in 1978. Nature Conservancy Council. (Unpublished report, CSD report No 229).

This is a restricted report, ref 441 gives an account of the ecology and demise of this species in Britain.

212. JARVIS, M.C., & DUNCAN, H.J. 1974. The colonization of islands by bracken (Pteridium aquilinum (L.) Kuhn. Transactions and Proceedings of the Botanical Society of Edinburgh, 42, 201-204.
213. JOLIFFE, I.P. 1971. Research for coastal conservation. Geographical Magazine, 43, 403-408.
214. JONES, C. 1973. The conservation of chalk grassland in Dorset. Dorset County Council. (Unpublished report).
215. JONES, D.O. 1979. Anglesey, a bibliography. Caernarfon, Gwynedd County Council, Library Services.
216. KERR, A.J., & BOYD, J.M. 1983. Nature conservation in the Inner Hebrides. Proceedings of the Royal Society of Edinburgh Section B, 83, 627-648.
217. LAKE, W.G. 1976. Report of historical, biogeographical survey of the Lizard peninsula to identify heathland changes. Nature Conservancy Council, South-West England region. (Unpublished report, Rep NC 227d).

The maximum amount of cultivation in the Lizard peninsula took place in 1320-1340 and the moorland area was at a minimum during this period. In the time since detailed records have been available, the heathlands of West Lizard and Goonhilly have remained quite constant since the late 17th Century with minor alterations in shape. However, the heathlands of Crousa are steadily decreasing and fragmenting and these are in danger of elimination.

218. MEEK, E. 1984. The case for habitat conservation in Orkney. The Orcadian, 16 February.
219. MILES, D. (Ed). 1973. The Pembrokeshire Coast National Park. London, HMSO. Published for the Countryside Commission.

Conservation & management

220. MILNER, C., & GOODIER, R. 1974. The natural environment in countryside planning. In: The natural environment of Shetland, Ed. by R. Goodier, pp. 164-171. Edinburgh, Nature Conservancy Council.
221. MITCHLEY, J. 1988. Weed control and vegetation management of British sea-cliff vegetation. Aspects of Applied Biology, 16, 403-406.

A brief discussion of the control of bracken, gorse and the alien Carpobrotus edulis in the sea-cliff landscape.

222. NATIONAL PARKS COMMITTEE. 1967-68. A study of the coastline of England and Wales. London, HMSO.

Reports of Regional Coastal Preservation and Development Conferences, individual reports covering: The coasts of Kent and Sussex, Hampshire and the Isle of Wight, South-West England, South Wales and the Severn Estuary, North Wales, North-West England, North-East England, Yorkshire and Lincolnshire, East Anglia.

223. NATIONAL TRUST. 1986. Environmentally Sensitive Areas in the United Kingdom. Citation for Proposed Area of West Penwith. Lanhydrock, Cornwall. (Unpublished report).
224. NATURE CONSERVANCY COUNCIL. 1974. Isle of Rhum National Nature Reserve: reserve handbook. (Unpublished report, Rep NC 176a).
225. NATURE CONSERVANCY COUNCIL. 1977. The nature conservation interest of Bardsey Island (Ynys Enlli) and the Gwylan Islands, Gwynedd. North Wales region, Bangor. (Unpublished report, Rep NC 209c, In strict confidence).
226. NATURE CONSERVANCY COUNCIL. 1978. Fire fighting equipment used on the Purbeck group of National nature reserves, Dorset. South-West England region. (Unpublished report, Rep NC 173k).
227. NATURE CONSERVANCY COUNCIL. 1980. Nature conservation and the Lizard peninsula. South-West England region. (Unpublished report, Rep NC 227E).

The Lizard peninsula, Cornwall, is of international nature conservation importance for its geology, soils and botany. The combination of complex geology, mild oceanic climate and southerly location has led to the development of a range of unique heathland types. The peninsula also contains at least fifteen rare British plant species.

228. NATURE CONSERVANCY COUNCIL. 1982. Conservation of coastal cliffs and scarps. Shrewsbury, Interpretative Branch.

Conservation & management

229. NATURE CONSERVANCY COUNCIL (and others). Environmentally Sensitive Areas in Scotland. Report by a Joint Working Party of Officials from Department of Agriculture for Scotland, Scottish Development Department, Countryside Commission for Scotland and Nature Conservancy Council. (Unpublished report).

Includes a report on Orkney and a discussion of the cliff-tops and maritime heaths. The international importance of Orkney's cliff-nesting sea bird colonies is well known but these are of little direct relevance to agriculture. However, the cliff-tops are of great botanical value, supporting maritime plant communities including maritime heaths and semi-natural grassland. The former comprise a mixture of plants characteristic of both heath and "cliff-top salt-marsh". It is in these areas that the rare Scottish primrose (Primula scotica) is found. There is a need to reduce sheep grazing levels on moorlands and lowland heaths and on coastal grasslands and maritime heaths. Management objectives, prescriptions and incentives are set out for these areas.

230. O'CONNOR, F.B., & GOLDSMITH, F.B. 1973. Experimental restoration progress report (Kynance Cove). Countryside Commission, Cheltenham. (Unpublished report, see also ref 190).
231. PEMBROKESHIRE COAST NATIONAL PARK. 1972. Pembrokeshire Coast National Park Plan 1977-1982. Haverfordwest, National Park Committee.
232. PEMBROKESHIRE COAST NATIONAL PARK. 1985. Pembrokeshire Coast National Park Plan. First Review and Policies for 1982-1987. Haverfordwest, National Park Committee.
233. PRITCHARD, T. 1975. An assessment of the coast of Wales in terms of nature conservation. Nature Conservancy Council. (Unpublished report).
234. RATCLIFFE, D.A. (Ed). 1972. A nature conservation review. 2 vols. Cambridge, Cambridge University Press.
235. REES, D.I. 1979. Nature conservation and the commons of West Glamorgan. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
236. ROYAL SOCIETY FOR THE PROTECTION OF BIRDS. 1985. Environmentally sensitive areas in the United Kingdom. citation for proposed area No 2, Orkney. Sandy, Conservation Planning Department. (Unpublished report).
237. SCOTT, E. 1985. Orkney could become a conservation desert. The Orcadian, 18 October.

Conservation & management

238. SHEAIL, J. 1975. The concept of National Parks in Great Britain 1900-1950. Transactions of the Institute of British Geographers, 66, 41-56.
- With maps showing the areas nominated as National and Regional Parks by J. Dower (1943) and National Parks and Conservation Areas by the Hobhouse Committee (1947) and National Parks and Areas of Outstanding Natural Beauty by the National Parks Committee and the Countryside Commission 1950-1975.
239. SHEAIL, J. 1976. Coasts and planning in Great Britain before 1950. The Geographical Journal, 142, 257-273.
240. SHEAIL, J. 1976. Nature in trust: the history of nature conservation in Britain. London, Blackie.
241. STEERS, J.A. 1976. The coastal properties of the National Trust: some problems of physiography. National Trust Year Book, 1, 56-61.
242. THOMAS, G.J. 1972. A review of gull damage and management methods at nature reserves. Biological Conservation, 4, 117-127.
243. THOMPSON, W.H. 1930. Cornwall: a survey. London, University of London Press.
244. TOPHAM, M.R. 1985. Sheep numbers and heather conservation on common land in the north of England. University of Newcastle upon Tyne, Department of Agricultural Economics & Agricultural Marketing, Discussion Paper No 9. (Unpublished report).
245. TORBAY CITY BOROUGH. 1973. Berry Head management: a descriptive assessment of the Conservation Needs and Site Potential With Recommendations. City Borough of Torbay. (Unpublished report).
246. WARMAN, S., & HELLAWELL, C. 1981. Skokholm Nature Reserve Management Plan. West Wales Naturalists' Trust. (Unpublished report).
247. WARREN, A., & HARRISON, C.M. 1974. A proposed nature conservation plan for Shetland. University College, London, Ecology & Conservation Unit. Discussion Papers in Conservation No 7. (Unpublished report).
248. WELLS, D. 1979. Nature conservation on British Commons. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
249. WILLIAMS, A.T., & HOWDEN, J.C. 1979. The search for a coastal method: a case study of one of Great Britain's Heritage Coastlines. Shore and Beach, 47, 17-21.

Conservation & management

- * 250. WORRALL, D., & PALMER, C. 1988. The use of mowing and herbicides for vegetation management on the Isle of Flat Holm. Aspects of Applied Biology, 16, 393-402.

See also: 10, 11, 24, 26-32, 35-37, 90, 94-97, 124, 142, 157, 158.

Recreation

251. BARRETT, J.H. 1974. The Pembrokeshire coast path. London, HMSO. Published for the Countryside Commission.
252. BRISTOL UNIVERSITY LIZARD PROJECT. 1984. Public attitude surveys at Cadgwith and Poltesco. Report No 11. (Unpublished report).
253. BRISTOL UNIVERSITY LIZARD PROJECT. 1985. Public attitude survey at the Museum in Lizard Village - 1984. Report No 17. (Unpublished report).
254. BRISTOL UNIVERSITY LIZARD PROJECT. 1985. Public attitude survey at Coverack in 1984. Report No 20. (Unpublished report).
255. COUNTRYSIDE COMMISSION. 1986. The Peddars Way and Norfolk coast path. Cheltenham.
256. GREENOUGH, A.P. 1979. The amenity value of commons. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
257. GUNNELL, C. 1981. Somerset and North Devon coast path. London, HMSO. Published for the Countryside Commission.
258. JACKMAN, B. 1979. Dorset coast path. London, HMSO. Published for the Countryside Commission.
259. JENNETT, S. 1984. South Downs Way. London, HMSO. Published for the Countryside Commission.
260. LAMBERT, J.W. 1939. The Penguin Guide to Cornwall. Harmondsworth, Penguin Books.
261. LE MESSURIER, B. 1980. South Devon coast path. London, HMSO. Published for the Countryside Commission.
262. MARREN, P.R. 1973. The ecological impact of visitors on the maritime cliff-tops of the Lizard peninsula and Land's End. MSc thesis, University College, London, Ecology & Conservation Unit.
263. PYATT, E.C. 1971. Coastal paths of the South-West. Newton Abbot, David & Charles.
264. PYATT, E.C. 1976. Cornwall coast path. London, HMSO. Published for the Countryside Commission.
265. ROBINSON, A., & MILLWARD, R. 1983. The Shell book of the British coast. Newton Abbot, David & Charles.

See also: 30, 34, 168, 169, 171, 174, 179, 189, 190, 203, 219.

Agriculture and land-use

266. BAUGH, I. 1984. Land-use change in Orkney. Nature Conservancy Council, Scottish Field Survey Unit report No 80/3. (Unpublished report, Rep NC 204B).
267. BISSET, D.R., & FLET, J. 1950. Land reclamation in Orkney. Scottish Agriculture, Winter.
268. CAIRD, J.B. 1979. Land-use in the Uists since 1800. Proceedings of the Royal Society of Edinburgh Section B, 77, 505-526.
269. CALDER, A. 1952. Orkney's changing agriculture. Scottish Agriculture, Summer, 37-41.
270. COULL, J.R. 1968. Crofter's common grazings in Scotland. Agricultural History Review, 16, 142-154.
271. DARLING, F.F. 1944. Island farm. London, G. Bell.
272. DARLING, F.F. 1968. Ecology of land-use in the Highlands and Islands. In: The future of the Highlands and Islands, Ed. by D.C. Thompson & I. Grimble, pp. 37-56. London, Routledge & Kegan Paul.
273. DAWSON, J.L. 1949. Grass and grazings in the north of Scotland. Journal of the British Grassland Society, 4, 183-192.
274. DELANEY, M.J., & COPLAND, W.O. 1964. The effects of depopulation on the island of South Rona. Glasgow Naturalist, 18, 351-362.
275. DRY, F.T., & ROBERTSON, J.S. 1982. Soil and land capability for agriculture. Orkney and Shetland. Craigiebuckler, Aberdeen, Macaulay Institute for Soil Research, Soil Survey of Scotland.
276. ENNEW, J. 1977. The changing croft. New Society, 40, 546-548.
277. EVANS, I.R. 1979. Agricultural use of upland commons. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
278. GOLD, J.R., & GOLD, M.M. 1979. The crofting system: a selected bibliography. Oxford Polytechnic, Discussion Papers in Geography No 1. (Unpublished report, contains 408 references).
279. GRANT, J.W., & MACLEOD, A. 1983. Agriculture in the Inner hebrides. Proceedings of the Royal Society of Edinburgh Section B, 83, 567-575.
280. HARRIS, E.K. 1979. The legal status of common land. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.

Agriculture & land-use

281. HENDERSON, J. 1812. General view of the agriculture of the county of Sutherland with observations on the means of its improvement. London, Bow Street, B. McMillan.
282. HIGHLANDS AND ISLANDS DEVELOPMENT BOARD. 1976. Development opportunities for crofters. Inverness.
283. HOSKINS, W.G., & STAMP, L.D. 1963. The common lands of England and Wales. London, Collins.
284. HOWELL, D.W. 1979. The historical development of commonland in Wales. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
285. HOWELLS, R. 1961. Cliffs of freedom. The story of Skomer Island and the last man to farm it. Llandysul, Gomerian Press.
286. HOWELLS, R. (Ed). 1964. Stackpole and The Bennions. Llandysul, Gomerian Press.
287. HOWELLS, R. 1976. The sands between. Tenby, H.G. Walters.
288. KING, G.A.D. 1979. The planners view of common land in West Glamorgan. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
289. MATHER, A.S. 1979. Land-use changes in the Highlands and Islands. 1946-75: a statistical review. Scottish Geographical Magazine, 95, 114-122.
290. MATHER, A.S., & ARDERN, R.J. 1981. An annotated bibliography of rural land-use in the Highlands and Islands of Scotland. O'Dell Memorial Monograph No 9, University of Aberdeen, Department of Geography.

About 1300 references: ecology and land improvement agriculture, crofting (see also ref 278), recreation and conservation.

291. MOIRA, R., & MOIRA, B.L.C. 1960. County survey of Orkney. Kirkwall, Orkney Islands Council.
292. MOONEY, J. 1931. Notes on agricultural progress in Orkney. Part 2. Journal of the Orkney Agricultural Discussion Society, 6, 40-49.

The beginnings of the use of fertilisers and grass-seed mixtures are reported.

Agriculture & land-use

293. MORGAN, F.S. 1979. The case for a "Commons Management" Act. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Dept. Geography.
294. MORGAN, J.P. 1979. Land evaluation of common lands. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
295. NORTH SCOTLAND COLLEGE OF AGRICULTURE. 1983. Orkney agriculture. Kirkwall, Orkney. (Unpublished report).
296. PATERSON, D. 1949. Land reclamation in Orkney. Scottish Agriculture, Autumn.
297. RAEBURN, J.R. 1985. Orkney agriculture - a case for development and conservation. Farm Management Review. (North Scotland College of Agriculture, Aberdeen), 20 (June), 51-63.
298. ROBERTS, C.G. 1879. Sutherland reclamation. Journal of the Royal Agricultural Society of England Series 2, 15, 397-487.
299. ROBINSON, R. 1979. The commoners view of commons. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
300. ROWLANDS, A. 1979. Agricultural improvement of common lands. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
301. SCOTT, E. 1985. Land-use in Orkney (Abstract). The Linnean, February, 8-11.
302. SHELLARD, G. 1979. Ownership and management of commons: some of the benefits and problems. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
303. SHIRREFF, J. 1814. General view of the agriculture of the Orkney and Shetland Isles, with report on minerology by Rev John Flemming. Edinburgh, Board of Agriculture.
304. SINCLAIR, J. 1795. General view of the agriculture of northern counties and islands of Scotland. London, Board of Agriculture.
305. STAMP, L.D. (Ed). 1937-1946. The land of Britain. London, Geographical Publications.
- Covering all the counties of Britain in 92 parts in nine volumes: Scotland vols 1-30, England & Wales vols 31-90.
306. STAMP, L.D. 1962. The land of Britain: its use and misuse. London, Longmans.

Agriculture & land-use

307. STEAD, J. 1985. EEC aid for islands. The Guardian, 16 December.
308. STEVENS, J. 1977. A Cornish Farmer's Diary. Penzance, P.A.S. Pool.
- James Stevens (1847-1918) spent his whole life in the Penwith or Land's End peninsula of Cornwall, at Zennor until 1897 and thereafter at Sancreed, serving both Parishes as Churchwarden. He kept a diary in 1877 and continuously from 1892 to 1912, thus leaving a simple and unpretentious daily record of life in family, farm, church, parish and market town. The entries for some years are printed in full, in other years the editor has made a selection, and has also added a long introduction setting the diary in its social, historical and topographical setting.
309. STORRIE, M.C. 1983. Land-use and settlement history of the southern Inner Hebrides. Proceedings of the Royal Society of Edinburgh Section B, 83, 549-566.
310. SWAN, W.B., & SENIOR, W.H. 1972. Survey of agriculture in Caithness, Orkney and Shetland. Inverness, Highlands and Islands Development Board.
311. TAIT, E.S.R. (Ed). 1925. The Statistical Account of Shetland 1791-1799. Lerwick, Manson.
312. TAIT, J.B. 1936. Farming in a bygone day. Journal of the Orkney Agricultural Discussion Society, 11, 13-18.
313. THOMPSON, D.C., & GRIMBLE, I. (Ed). 1968. The future of the Highlands and Islands. London, Routledge & Kegan Paul.
314. WATSON, J.A.S. 1932. The rise and development of the sheep industry in the Highlands and north of Scotland. Transactions of the Highland Agricultural Society of Scotland, 43.
315. WHEELER, P.T. 1966. Landownership and the crofting system in Sutherland since 1800. Agricultural History Review, 14, 45-56.

See also: 37, 89, 129, 143, 167, 184, 198, 217, 218, 256.

Grazing

316. APPLETON, M.E. 1973. Grazing effects by wild populations of the European rabbit (*Oryctolagus cuniculus cuniculus*) on island vegetation. University College, Cardiff. (Unpublished report).
317. BALL, M.E. 1974. Floristic changes on grasslands and heaths on the Isle of Rhum after a reduction or exclusion of grazing. Journal of Environmental Management, 2, 299-318.
318. BOYD, J.M., DONEY, J.M., GUNN, R.G., & JEWELL, P.A. 1964. The Soay sheep of the Island of Hirta, St Kilda. A study of a feral population. Proceedings of the Zoological Society of London, 142, 129-163.
319. BRISTOL UNIVERSITY LIZARD PROJECT. 1983. The effects of the cessation of grazing and of drought on the grasslands in Caerthillian Valley. Report No 9. (Unpublished report).
320. GILLHAM, M.E. 1955. Ecology of the Pembrokeshire Islands. III. The effect of grazing on the vegetation. Journal of Ecology, 43, 172-206.

The biotic sub-climax of Armerietum maritimae (NVC MC8, Festuca rubra - Armeria maritima maritime grassland, Armeria-dominated sub-community) which occupies the most inhospitable habitats is regarded as a pioneer flora of the secondary plagiosere. With the elimination of grazing it passes to Festucetum rubrae (MC8, typical sub-community). With the elimination of exposure and maintenance of heavy grazing it proceeds through Plantago coronopus (MC8, Plantago coronopus sub-community) to Holcus or Agrostis grassland and so to Pteridietum. With the abatement of both grazing and exposure the postulated succession is from Armeria to pasture grasses, then to meadow grasses and finally to Calluna vulgaris with a possible advance to larger woody species.

321. GILLHAM, M.E. 1955. Some effects of the larger mammals on the flora of Lundy. Transactions of the Devonshire Association for the Advancement of Science Literature and Art, 87, 205-229.

On exposed cliffs the localisation of either grazing (rabbits) or burrowing (puffins) leads to dominance by Armeria maritima (NVC MC8, Festuca rubra - Armeria maritima maritime grassland, Armeria dominated sub-community). Manuring in the vicinity of gulls' and shags' nests leads to dominance by Holcus lanatus and a sea-bird cliff flora (NVC MC6/MC7, Atriplex hastata - Beta vulgaris maritima / Stellaria media - Rumex acetosa sea-bird cliff communities).

Grazing

322. GILLHAM, M.E. 1955. Some possible consequences if rabbits should be excluded by myxomatosis on Skokholm Island, Pembrokeshire. North Wales Naturalist, March, 30-34.
323. GWYNNE, D.C. & BOYD, J.M. 1970. Relationships between numbers of Soay sheep and pastures at St. Kilda. In: Animal populations in relation to their food resources. Ed by A. Watson, pp. 289-302. Oxford, Blackwell Scientific Publications. 10th Symposium of the British Ecological Society.
324. RYDER, M.L. 1968. The evolution of Scottish breeds of sheep. Scottish Studies, 12, 127-167.
325. SCARTH, R. 1929. Sheep farming in Orkney. Journal of the Orkney Agricultural Discussion Society, 4, 11-14.
326. SJOGREN, E. 1971. The influence of sheep grazing on limestone heath vegetation on the Baltic island of Oland. In: The scientific management of animal and plant communities for nature conservation, Ed. by E.A. Duffey & A.S. Watt, pp. 497-515. Oxford, Blackwell Scientific Publications.
327. TRIBE, D.E. & TRIBE, E.M. North Ronaldsay sheep. Scottish Agriculture, 29, 1-4.

See also: 154, 162, 244, 270, 273, 314.

Plant ecology and physiology

328. AHMAD, I., LARHER, F., & STEWART, G.R. 1979. Sorbitol, a compatible osmotic solute in Plantago maritima. New Phytologist, 82, 671-678.

Plantago maritima grown under saline conditions accumulates large quantities of NaCl. Salinity reduces tissue concentrations of K, Ca and Mg and several enzymes are salt sensitive. In contrast to other higher plant halophytes, P.maritima shows no accumulation of amino acids or methylated onium compounds. High levels of Sorbitol are accumulated and its role as a cytoplasmic solute is discussed.

329. AHMAD, I., & WAINWRIGHT, S.J. 1976. Ecotype differences in leaf surface properties of Agrostis stolonifera from salt-marsh, spray zone and inland habitats. New Phytologist, 76, 361-366.

Maritime ecotypes retained less salt than inland types after submersion in salt water. Retention of salt after spraying was least for the spray zone ecotype. Differences in retention are due to differences in wettability, in turn due to differences in the character of extracuticular waxes.

330. AHMAD, I., & WAINWRIGHT, S.J. 1977. Tolerance to salt, partial anaerobiosis and osmotic stress in Agrostis stolonifera. New Phytologist, 79, 605-612.

Plants from salt-marsh, spray zone and inland localities were tested for salt tolerance by the rooting technique and growth analysis. The order of tolerance was salt-marsh > spray zone > inland. Salt-marsh plants were most resistant to low dissolved oxygen concentrations in the culture solution.

331. AHMAD, I., WAINWRIGHT, S.J., & STEWART, G.R. 1981. The solute and water relations of Agrostis stolonifera ecotypes differing in their salt tolerance. New Phytologist, 87, 615-629.

Major components of salt tolerance in tolerant ecotypes of A.stolonifera are salt exclusion coupled with synthesis of organic solutes. Salt sensitivity of non-tolerant ecotypes is due to excessive ion accumulation resulting in osmotic imbalance and water loss.

332. AKEROYD, J.R., & PRESTON, C.D. 1984. Halimione portulacoides (L.) Aellen on coastal rocks and cliffs. Watsonia, 15, 95-103.

Ecology & physiology

333. AKEROYD, J.R., & PRESTON, C.D. 1987. Additional records of Halimione portulacoides (L.) Aellen on coastal rocks and cliffs. Watsonia, 16, 427-437.
334. BANNISTER, P. 1965. Biological Flora of the British Isles. Erica cinerea L. Journal of Ecology, 53, 527-542.
335. BANNISTER, P. 1966. Biological Flora of the British Isles. Erica tetralix L. Journal of Ecology, 54, 795-813.
336. BELL, J.N.B. & TALLIS, J.H. 1973. Biological Flora of the British Isles. Empetrum nigrum L. Journal of Ecology, 61, 289-305.
337. BERNSTEIN, L., & HAYWOOD, H.E. 1958. Physiology of salt tolerance. Annual Review of Plant Physiology, 9, 25-46.
338. BRISTOL UNIVERSITY LIZARD PROJECT. 1982. The Heathers of the Lizard District of Cornwall. Report No 2. (Unpublished report).
339. BRISTOL UNIVERSITY LIZARD PROJECT. 1983. The sedges of the Lizard District of Cornwall. Report No 10. (Unpublished report).
340. BULLARD, E.R., SHEARER, H.D.H., DAY, J.D., & CRAWFORD, R.M.M. 1987. Survival and flowering of Primula scotica Hook. Journal of Ecology, 75, 589-602.

Primula scotica risks extinction in many of its remaining sites. It is successful only in a small range of habitats within a limited area. Even where it is abundant flowering frequency can be very low and population numbers can decline in unfavourable years. A population study on Mainland Orkney showed that mild winters were beneficial, and increased snow fall, snow-lie and gales were deleterious to population sizes. The current cooling trend in the North Atlantic may be a serious risk to the maintenance of viable populations of P.scotica and management for long-term habitat stability is urgently needed.

341. BURT, R. 1986. The range, distribution and numbers of the early spider orchid, Ophrys sphegodes, in Dorset in 1986. Dorset County Council. (Unpublished report).
342. CLAPHAM, A.R., PEARSALL, W.H., & RICHARDS, P.W. 1942. Biological Flora of the British Isles. Aster tripolium L. Journal of Ecology, 30, 385-395.
343. COOMBE, D.E. 1961. Trifolium occidentale, a new species related to T.repens L. Watsonia, 5, 68-87.
344. COOMBE, D.E., & MORISSET, P. 1967. Further observations on Trifolium occidentale. Watsonia, 6, 271-275.

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345. DODDS, J.G. 1953. Biological Flora of the British Isles. Plantago coronopus L. Journal of Ecology, 41, 487.
346. DOWLING, R.E. 1933. Reproduction of Plantago coronopus. Annals of Botany London, 47, 861.
347. EDLIN, H.L. 1943. A salt storm on the south coast. Quarterly Journal of Forestry, 37, 24-26.

Continuous high winds off the sea (especially May 28) deposited a film of saline moisture from the atmosphere which in the absence of rain was not washed off the leaf surface but accumulated. Continuous sunshine concentrated the salt until damage occurred. Observations were made in Dorset, West Hants and South Wilts. Within 15 miles of the coast the seaward face of nearly every wood or windbreak registered damage. Further inland incidence was less frequent but trees were damaged over 30 miles inland (Heytesbury, Wilts) and 800 feet above sea-level (Milton Abbas, Dorset). Trees still in bud and those with hard leaf surface escaped damage, e.g. holly, holm oak, evergreen conifers, oak. On the other hand, larch, beech, elm, sycamore and birch were all damaged. No damage was observed to herbaceous plants. See also refs 348 & 353.

348. EDLIN, H.L. 1957. Saltburn following a summer gale in south-east England. Quarterly Journal of Forestry, 51, 46-50.

Describes a south-westerly gale in which winds gusted to 85 mph. Observations of trees in Kent, Sussex, Surrey, Hampshire and Wiltshire showed the following susceptibilities: Almost immune; holm oak. Highly resistant; tamarisk, Monterey cypress and pine. Resistant; Corsican pine, Austrian pine, privet, Escallonia. Susceptible; common oak, sycamore, birch, grey poplar, lime, willow, elm, ash, hawthorn, apple, blackthorn, lilac, Scots pine, Norway spruce, European larch. Very susceptible; beech, elder. Salt damage could be observed up to 50 miles inland and 750 ft above sea-level. Some trees near the coast put on new foliage and even flowers. See also refs 347 & 353.

349. EDWARDS, R.S., & CLAXTON, S.M. 1964. The distribution of air-borne salt of marine origin in the Aberystwyth area. Journal of Applied Ecology, 1, 253-263.

Salt deposition on a hedge 1.5 km from the sea 130 m altitude after gale force winds (30 Jan 1961) was 404.8 microgram/sq cm outline area of twigs on the windward side and 93.2 microgram on the leeward side. Deposition on grassland 10 cm tall, 1 km from the sea, 100 m altitude and gradient 10% after two gales was 14.3 microgram/sq cm grassland area (12 January 1960) and 26.4 microgram (22 January), these values

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are equivalent to 1.5 and 3 kg/ha respectively. Significantly less salt was deposited 1.5 km inland than 3 km but between 3 and 6 km there was no significant further decline (see also refs 350 & 376).

350. EDWARDS, R.S., & HOLMES, G.D. 1968. Studies of airborne salt deposition in some North Wales forests. Forestry, 51, 155-174.

Quantity of salt deposited decreased rapidly with distance from the sea and increased with height above ground. There is good negative correlation between salt measured at a site and tree height.

351. ETHERINGTON, J.R. 1981. Limestone heaths in south-west Britain: their soils and the maintenance of their calcicole-calcifuge mixtures. Journal of Ecology, 69, 277-294.

352. ETHERINGTON, J.R. 1988. Limestone heaths in Britain. Plants Today, 1, 177-182.

353. EVISON, J.R.B. 1957. A summer gale. Journal of the Royal Horticultural Society, 82, 88-91.

Lists salt/wind damage to trees and other plants during a summer gale in Sussex (July 28 1956). The following were seriously damaged (more than half of most leaves dead): Acer pseudoplatanus, Betula pendula, Ligustrum ovalifolium, Lavatera trimestris, Populus alba, Prunus spinosa, Sambucus nigra, Taxus baccata, Ulmus procera etc. The following were damaged (less than half of most leaves dead): Hippophae rhamnoides, Ilex aquifolium, Pinus sylvestris, Quercus ilex, Sorbus aucuparia, Tamarix hispida aestivalis, T.tetrandra. The following were unharmed on exposed sites: Atriplex halimus, Mesembryanthemum roseum, Santolina chamaecyparissus, Ulex europaeus. See also refs 347 & 348.

354. FERREIRA, R.E.C., & GRANT, R.J. 1957. Saxifraga hypnoides L. on the coast of Banffshire. Transactions and Proceedings of the Botanical Society of Edinburgh, 36, 133-136.

355. FERREIRA, R.E.C., & WORMWELL, P. 1971. Fertilizer responses of vegetation on ultrabasic terraces on Rhum. Transactions and Proceedings of the Botanical Society of Edinburgh, 41, 149-154.

Fertilizer application to sparse vegetation of extreme exposure resulted in a marked increase of vegetation cover and a change in species composition. Nutrient deficiency appears to be the major factor limiting the development of closed plant communities.

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356. FLOWERS, T.J., TROKE, P.F., & YEO, A.R. 1977. The mechanism of salt tolerance in halophytes. Annual Review of Plant Physiology, 28, 89-121.
357. FROST, L.C. 1964. Distribution of the ciliate rupterwort (Herniaria ciliolata Melderis). The Lizard, 2:4, 1-4.
358. FROST, L.C. 1965. The growth of gorse at the Lizard. The Lizard, 3:1, 1-4.
359. FROST, L.C. 1966. Trifolium molinerii at the Lizard. The Lizard, 3:2, 1-3.
360. FROST, L.C. 1979. Records for Trifolium molinerii Balb. at the Lizard, Cornwall. Journal of the Lizard Field Studies Club, 5:3, 12-14.
361. GILLHAM, M.E. 1956. Ecology of the Pembrokeshire Islands. IV. Effects of treading and burrowing by birds and mammals. Journal of Ecology, 44, 51-82.

Like grazing and wind action, trampling restricts the number of species and favours low-growing forms. The four characteristic species of paths are Agrostis tenuis, Plantago coronopus, Festuca rubra and Poa annua. In contrast, burrowing forms centres of erosion and leads to the characteristic hummocky nature of the Armerieta. The presence of burrows in all the more exposed areas leads to a preponderance of deep rooted species, e.g. Rumex acetosa, R. acetosella, Armeria maritima. All these species are replaced by Festuca rubra when grazing is eliminated but can persist in the absence of grazing where burrowing is at all heavy.

362. GILLHAM, M.E. 1956. Ecology of the Pembrokeshire Islands. V. Manuring by colonial seabirds and mammals, with a note on seed distribution by gulls. Journal of Ecology, 44, 429-454.

Deposition of guano is a profound habitat factor in bird colonies and leads to common vegetation types in diverse areas. Guano contains N, P, K and Ca, feathers and food remains also add to soil nutrient content. Soil nitrate varies from the equivalent of 0-2.5 kg/ha to over 112 kg/ha in uninhabited and inhabited areas respectively. Mammals increased soil nitrate 20-40 fold, birds 100 fold. Amounts in nesting colonies decreased by 50% six weeks after autumn migration. Soil phosphate content varies from 0.02% to 0.7% in uninhabited and inhabited areas and guano contained nearly 13% and rabbit dung 0.5%. The stimulatory effect on vegetation is seen in areas free from the counteractive effects of trampling, burrowing, grazing and scorching. Under the latter conditions Plantago coronopus is the most characteristic nitrophile. In more favourable environments

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Silene maritima and Rumex acetosa are typical. The most favourable habitats show rank growth of Umbilicus, Cochlearia, Atriplex, Beta, Rumex and Matricaria, the burrow entrances of Stellaria and Poa. Armerietum previously occupied by gulls has changed through Senecionetum to a Holcus - Rumex community (in NVC terms various forms of eutrophicated MC8/9, Festuca rubra - Armeria maritima / F. rubra - Holcus lanatus maritime grasslands and the true sea-bird cliff communities (MC6/MC7 Atriplex hastata - Beta vulgaris maritima / Stellaria media - Rumex acetosa communities).

363. GILLHAM, M.E. 1970. Ecological notes on the vegetation of six islets near Herm. La Societe Guernesiaise Report and Transactions, 18, 503-513.
364. GIMMINGHAM, C.H. 1960. Biological Flora of the British Isles. Calluna Salisb. Journal of Ecology, 48, 455-483.
365. GLADING, P.R. 1983. Ecological studies upon Carboniferous limestone vegetation in South Wales. PhD thesis, University College, Cardiff.
366. GOLDSMITH, F.B. 1973. The vegetation of exposed sea-cliffs at South Stack, Anglesey. II. Experimental studies. Journal of Ecology, 61, 819-829.

Salt deposition was strongly correlated with strong westerly winds, especially those over 30 knots. The amount of salt deposited depended primarily on height or distance from the sea and secondarily on local topographic features providing shelter or increasing exposure. Vegetational differences within the site were considered to be due to the pattern of salt deposition and to differential rates of evaporation. The relationship between competition and salinity for maritime and inland species was investigated. The maritime species, Armeria maritima, had the competitive advantage under saline conditions but the inland species, Festuca rubra, had the advantage under non-saline conditions. Both species produced the same yield when grown alone under both treatments. Maritime species have no salt requirement but, because they are slow growing and of low stature, they require an environment of low competitive intensity. Competition from inland species is reduced on exposed cliffs by high levels of soil salinity and foliar salt damage during gales.

367. GOLDSMITH, F.B. 1978. Interaction (competition) studies as a step towards the synthesis of sea-cliff vegetation. Journal of Ecology, 66, 921-931.

Interspecific competition between thirteen populations of eight sea-cliff species was studied for 3-yr. The most

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competitive species were Festuca rubra, Armeria maritima and Agrostis stolonifera. A similar study examined ecotypes of one species, Armeria maritima. Inland lowland and montane populations from Donegal and shingle populations from Norfolk performed the best while sea-cliff populations from Caithness and Skye and salt-marsh populations from Norfolk were least vigorous. The eight species studies are shown to have high ecological combining abilities while the eight populations of Armeria have low ecological combining ability. The former have apparently adapted to coexist or to utilize more fully the environmental resources while the latter have adapted to local conditions.

368. GOODMAN, G.T., & GILLHAM, M.E. 1954. Ecology of the Pembrokeshire Islands. II. Skokholm, environment and vegetation. Journal of Ecology, 42, 296-327.

The major plant communities are classified according to their exposure to winds (most to least): Bare rock > Festucetum rubrae (NVC MC8, Festuca rubra - Armeria maritima maritime grassland, typical sub-community) = Armerietum (MC8, A.maritima - dominated sub-community) > Holcetum (Festuca rubra - Holcus lanatus maritime grassland) > Pteridietum (including some MC12, Festuca rubra - Hyacinthoides non-scripta maritime grassland).

369. HART, A. 1978. The report of an ecological study of the Isle of Noss National Nature Reserve Bressay Parish Shetland Isles. Nature Conservancy Council, North-East Scotland region. (Unpublished report, Rep NC 182D).
370. HUMPHREYS, M.O. 1981. Response to salt spray in red fescue and perennial rye grass. In: Proceedings of the IVth International Turfgrass Conference, Ed. by R.W. Sheard, pp. 47-54. The International Turfgrass Society.
371. HUMPHREYS, M.O. 1982. The genetic basis of tolerance to salt spray in populations of Festuca rubra L. New Phytologist, 91, 287-296.
372. JEFFERIES, R.L., & DAVY, A.J. (Ed). 1979. Ecological processes in coastal environments. Oxford, Blackwell Scientific Publications. The First European Ecological Symposium and the 19th Symposium of the British Ecological Society.
373. LA HAYE, P.A., & EPSTEIN, E. 1969. Salt toleration by plants. Enhancement with calcium. Science, 166, 395-396.
374. LEACH, S.J. 1983. Lotus subbiflorus and L.angustissimus in south-west England. Botanical Society of the British Isles News, 35, 22.

Documents the appearance and rapid spread of these two quite scarce legumes on cliffs at Rickham Common, South Devon

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within three years of a fire which destroyed an area of Ulex europaeus scrub. L. angustissimus is now extinct on the site and L. hispidus occurs only along the cliff-top path. Initial colonization was probably from the buried seed bank, and persistence is dependent upon intermittent disturbance, e.g. by fire.

375. MACLEOD, A.M. 1949. Some aspects of the plant ecology of the Island of Barra. Transactions and Proceedings of the Botanical Society of Edinburgh, 35, 67-81.
376. MALLOCH, A.J.C. 1972. Salt-spray deposition on the maritime cliffs of the Lizard peninsula. Journal of Ecology, 60, 103-112.

The salt deposited is almost the same ionic composition as sea-water. The quantity of salt deposited is closely correlated with frequency of winds greater than 14 m/sec. the quantity of salt deposited falls off very rapidly in the first 500 m inland from the sea and very little reduction occurs after 2 km. The vegetation type of the cliff appears to be correlated with the quantity of salt deposited. The soil is in equilibrium with salt deposition, and deposition appears to be equal to loss by rainwash.

377. MALLOCH, A.J.C., & OKUSANYA, O.T. 1979. An experimental investigation into the ecology of some maritime cliff species. I. Field observations. Journal of Ecology, 67, 283-292.

The phytosociological, edaphic and climatic relationships of six species with maritime distributions in GB are described. Crithmum maritimum, Spergularia rupicola and Inula crithmoides are found in maritime rock crevice communities in southern Britain. Ligusticum scoticum is found in the equivalent communities in Scotland. Lavatera arborea occurs in maritime rubbish dumps and bird-influenced cliffs in southern Britain. Daucus carota gummifer occurs in maritime grasslands and heaths in southern Britain. From soil analyses five of the species should be tolerant of high salinities whilst Daucus should tolerate moderate salinities. Inula is found on soils of high Ca content. The maritime climate is characterized by smaller temperature range and fewer frosts than inland together with much higher frequency of gales. It is suggested that the six species may be restricted to sea-cliffs, not because of a requirement for a saline environment, but because they are more tolerant of salinity than are their inland competitors whilst being frost-sensitive.

378. MARTIN, M.H., & FROST, L.C. 1980. Autecological studies of Trifolium molinerii at the Lizard peninsula, Cornwall. New Phytologist, 86, 329-344.

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This strongly maritime plant grows in head deposits on schistose cliffs in the Thero-Sedutum anglici community (Malloch 1971, NVC MC5, Armeria maritima - Cerastium diffusum diffusum maritime therophyte community).

379. MILNER, C. 1978. Shetland ecology surveyed. Geographical Magazine, 50, 730-753.
380. MITCHELL, N.D., & RICHARDS, A.J. 1979. Biological Flora of the British Isles. Brassica oleracea L. Journal of Ecology, 67, 1087-1096.
381. OKUSANYA, O.T. 1977. The effect of sea water and temperature on the germination behaviour of Crithmum maritimum. Physiologia Plantarum, 41, 265-267.
382. OKUSANYA, O.T. 1978. The effect of acid soil on the germination and early growth of some maritime cliff species. Oikos, 30, 549-554.

Acid soil (pH 4) inhibited the germination and seedling growth of Crithmum maritimum, Spergularia rupicola, Daucus carota gummifer and Lavatera arborea. Further retardation occurred when the acid soil was salinised. As with many calcicolous species, acidity, low nutrient concentrations and aluminium toxicity were responsible. The results help to explain the reduced abundance of maritime species on acid soils. Acid soil tolerance was in the order: Spergularia > Crithmum = Lavatera > Daucus.

383. OKUSANYA, O.T. 1979. An experimental investigation into the ecology of some maritime cliff species. II. Germination studies. Journal of Ecology, 67, 293-304.

Seeds of the salt-marsh species, Suaeda maritima, germinated in all salinities up to 100% sea water, seeds of five maritime cliff species (Crithmum maritimum, Daucus carota gummifer, Inula crithmoides, Lavatera arborea, Ligusticum scoticum and Spergularia rupicola) and three inland species (Daucus carota, Inula conyza and Spergularia rubra) failed to germinate in salinities above 50% and 40% sea water respectively. Seeds of the maritime cliff species were more tolerant than inland species of immersion in salinities of 75% or 100% sea water. It is suggested that the response of germination to salinity could not alone be responsible for the absence of inland species from sea-cliffs.

384. OKUSANYA, O.T. 1979. An experimental investigation into the ecology of some maritime cliff species. III. Effects of sea water on growth. Journal of Ecology, 67, 579-590.

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Six maritime cliff species and three inland species (see ref 377) were grown in sand culture at salinities up to 50% sea water. The maritime cliff species showed no requirement for saline conditions, though some stimulation of growth was noted at low salinities. The cliff species were tolerant of 50% sea water. Growth of the inland species was faster than the cliff species in the absence of salt but proportionally much less at higher salinities. NaCl as a salinity agent had a markedly different effect on growth than an equivalent concentration of sea water. Root growth was inhibited by increasing salinity; especially in the inland species. Crithmum maritimum alone showed enhanced root growth with increasing salinity.

385. OKUSANYA, O.T. 1979. An experimental investigation into the ecology of some maritime cliff species. IV. Cold sensitivity and competition studies. Journal of Ecology, 67, 591-600.

Cold sensitivity of maritime species of a southern distribution in GB was greater than for species of a more northern distribution and inland species. Failure of seed maturation due to short growing season may prevent some southern maritime species occurring in northern Britain. Maritime cliff species are at a competitive disadvantage under non-saline conditions, but this decreases with salinity. It is concluded that the distribution of maritime cliff species is governed by a complex series of interactions between their tolerance of salt, low growth rates compared with inland species in non-saline conditions, and sensitivity to cold both in the survival of individual plants and in relation to seed maturation.

386. OKUSANYA, O.T., & FAWOLE, T. 1985. The possible role of phosphate in the salinity tolerance of Lavatera arborea. Journal of Ecology, 73, 317-322.

High salinity reduces root growth more than shoot growth and phosphate is generally unavailable to the plant. Addition of phosphate to the growth medium increases its availability. The restriction of Lavatera arborea to maritime habitats where soil phosphorous concentrations are likely to be high, e.g. bird cliffs and rubbish dumps, could be explained by its increased tolerance in conditions where phosphate is readily available.

387. OKUSANYA, O.T., & UNGAR, I.A. 1984. The growth and mineral composition of three species of Spergularia as affected by salinity and nutrients at high salinity. American Journal of Botany, 71, 439-447.

High salinity decreases the uptake of ions addition of

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nutrients (especially phosphate) enhances salt-tolerance by increasing root growth and ion uptake in seedlings of Spergularia marina and S.rupicola but not S.rubra. The order of salt tolerance was: S.marina (salt-marsh species) > S.rupicola (sea-cliff species) > S.rubra (inland glycophyte).

388. PALIN, M.A. 1988. Biological Flora of the British Isles. Ligusticum scoticum L. Journal of Ecology, 76, 889-902.
389. PARSONS, R.F., & GILL, A.M. 1968. The effects of salt spray on coastal vegetation at Wilson's Promontary, Victoria, Australia. Proceedings of the Royal Society of Victoria, 81, 1-10.
390. PROCTOR, J. 1971. The plant ecology of serpentine. II. Plant responses to serpentine soils. Journal of Ecology, 59, 397-410.
391. PROCTOR, J. 1971. The plant ecology of serpentine. III. The influence of a high Magnesium/Calcium ratio and high Nickel and Chromium levels in some British and Swedish serpentine soils. Journal of Ecology, 59, 827-842.
392. PROCTOR, J., & WOODSELL, S.R.J. 1971. The plant ecology of serpentine. I. Serpentine vegetation of England and Scotland. Journal of Ecology, 59, 375-395.
393. PROCTOR, M.C.F. 1960. Biological flora of the British Isles. Tuberaria guttata, (L.) Fourreau. Journal of Ecology, 48, 243-253.
394. PROCTOR, M.C.F. 1965. The distinguishing characters and geographical distribution of Ulex minor and U.gallii. Watsonia, 6, 177-187.
395. REIMOLD, R.J., & QUEEN, W.H. (ED). 1974. Ecology of halophytes. New York & London, Academic Press.
396. RHEBERGEN, L.J., & NELISSEN, H.J.M. 1985. Ecotypic differentiation within Festuca rubra L. occurring in a heterogenous coastal environment. Vegetatio, 61, 197-203.
397. RITCHIE, J.C. 1954. Biological Flora of the British Isles. Primula scotica Hook. Journal of Ecology, 42, 623-628.
398. ROBINSON, J.B. 1971. Salinity and the whole plant. In: Salinity and water use, Ed. by T. Talsma & J.R. Phillip, pp. 193-206. London, Macmillan.
399. ROZEMA, J. 1975. The influence of salinity, inundation and temperature on the germination of some halophytes. Oecologia Plantarum, 10, 341-353.
400. ROZEMA, J. 1979. Population dynamics and ecophysiological adaptations of some coastal members of the Juncaceae and Graminae. In: Ecological Processes in Coastal Environments, Ed. by R.L.

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Jefferies & A.J. Davy, pp. 229-241. Oxford, Blackwell Scientific Publications. The First European Ecological Symposium and the 19th Symposium of the British Ecological Society.

401. ROZEMA, J., ROZEMA-DIJST, E., FRIESON, A.H.J., & HUBER, J.J.L. 1978. Population differentiation within Festuca rubra L. with regard to soil salinity and soil water. Oecologia Paris, 34, 329-341.
402. SEED, R., & BOADEN, P.J.S. 1985. Coastal Ecology. London, Blackie.
403. SHEEHY SKEFFINGTON, M.J., & JEFFREY, D.W. 1985. Growth performance of an inland population of Plantago maritima in response to nitrogen and salinity. Vegetatio, 61, 265-272.

A low nitrogen supply resulted in very low dry matter production but with increased nitrogen plant growth increased even in 50% seawater. Some inland plants survived 100% seawater but growth was much reduced. The high salinity tolerance of this inland population is discussed.

404. SPENCE, D.H.N. 1979. Shetland's living landscape: a study in island plant ecology. Sandwick, The Thule Press.
405. STEWART, G.R., LARHER, F., AHMAD, I., & LEE, J.A. 1979. Nitrogen metabolism and salt-tolerance in higher plant halophytes. In: Ecological Processes in Coastal Environments, Ed. by R.L. Jefferies & A.J. Davy, pp. 211-227. Oxford, Blackwell Scientific Publications. The First European Ecological Symposium and the 19th Symposium of the British Ecological Society.

The role of amino acids and methylated onium compounds in salt-tolerance is discussed. There are three basic patterns of nitrogen metabolism under saline and non-saline conditions. (1) species exhibiting a constitutive capacity for the accumulation of inorganic ions and organic solute; under non-saline conditions these species accumulate high levels of potassium and nitrate. (2) Species exhibiting an adaptive accumulation of inorganic ions and osmotic solute. (3) Species able to regulate the accumulation of inorganic ions; the NaCl content of such species remains relatively constant over a wide range of external NaCl concentrations. Some species have the capacity to accumulate more than one source of compatible osmotic solute and the ecological and physiological significance of this phenomenon is discussed.

406. STEWART, G.R., & LEE, J.A. 1974. The role of proline accumulation in halophytes. Planta (Berlin), 120, 279-289.
407. TALSMA, T., & PHILLIP, J.R. (Eds). 1971. Salinity and water use. London, Macmillan.

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408. TIKU, B.L., & SNAYDON, R.W. 1971. Salinity tolerance within the grass species Agrostis stolonifera L. Plant and Soil, 35, 421-431.

NaCl had less effect on dry weight yield of maritime ecotypes than inland ones. The percentage reduction in dry weight was negatively correlated with Na content of soil of origin. The effect of NaCl on root elongation was not correlated with salinity tolerance and is thus not a good measure of tolerance in this species. Populations from soils with low Na content contained more Na in the shoots and had higher Na:K than those from soils with higher Na content at all Na concentrations.

409. VENABLES, A.V., & WILKINS, D.A. 1978. Salt tolerance in pasture grasses. New Phytologist, 80, 613-622.

Salt tolerance was highly heritable in Festuca rubra.

410. WAISEL, Y. 1972. Biology of halophytes. London, Academic Press.

411. WAITE, S., & HUTCHINGS, M.J. 1978. The effects of sowing density, salinity and substrate upon the germination of seeds of Plantago coronopus L. New Phytologist, 81, 341-348.

412. WATT, T.A. 1979. Grass growth on two areas of Lundy in June 1978. Annual Report of the Lundy Field Society, 30, 37-38.

413. WATT, T.A. 1983. The effects of salt water and soil type upon the germination, establishment and vegetative growth of Holcus lanatus L. and Lolium perenne L. New Phytologist, 94, 275-291.

Under salt spray native "Lundy" Holcus lanatus had the highest tillering ability and yield was unaffected by salt spray compared with Lolium perenne (S23) and an agricultural cultivar of H. lanatus ("Massey"). On peat soil the "Massey" H. lanatus was more productive than L. perenne. It was also at least as productive as "Lundy" H. lanatus when grown on peat with a high level of salt in the soil solution. When immersed in artificial sea water leaves of L. perenne retained about 17 times more salt than either of the H. lanatus varieties. Seeds of both L. perenne and "Massey" H. lanatus germinated readily in 40% artificial sea water but this was much reduced for "Lundy" H. lanatus. The establishment of "Lundy" H. lanatus was much slower than for the other two grasses.

414. WELLS, B.W., & SHUNK, I.V. 1938. Salt spray: an important factor in coastal ecology. Bulletin of the Torrey Botanical Club, 65, 485-492.

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415. WINTER, K. 1979. Photosynthetic and water relationships of higher plants in a saline environment. In: Ecological Processes in Coastal Environments, Ed. by R.L. Jefferies & A.J. Davy, pp. 297-320. The First European Ecological Symposium and the 19th Symposium of the British Ecological Society.

Halophytes respond to increasing soil salinity with a net solute increase in their cells, avoiding reduction in turgor, and a reduction in transpiration. The combined effects of reduced transpiration and salt-stimulated growth result in a high water use efficiency. On a chlorophyll basis, net carbon dioxide fixation may increase, especially at salt levels which stimulate growth. Although most halophytes are succulent CAM does not play a major role in the salt tolerance adaptation.

416. WU, L. 1981. The potential for evolution of salinity tolerance in Agrostis stolonifera L. and Agrostis tenuis Sibth. New Phytologist, 89, 471-486.

See also: 31, 79, 80, 82, 84, 97, 102, 104, 116, 124, 136, 137, 153, 170, 176, 177, 180, 202, 206, 212, 262, 319-322, 618.

Fauna

417. BLOOMFIELD, E.N. 1904. Diptera from the Shetlands and Orkneys. Entomological Monthly Magazine, 15, 88.
418. BRADSHAW, C.W. 1977. A zoological bibliography of Skomer Island. Nature Conservancy Council, Wales, Dyfed Powys region. (Unpublished report, Rep NC 167G).
419. BRISTOL UNIVERSITY LIZARD PROJECT. 1983. The birds of Predannack Airfield. Restricted Report No 4. (Unpublished report).
420. BRISTOL UNIVERSITY LIZARD PROJECT. 1985. Atlas of the breeding birds of the Lizard District of Cornwall. Report No 16. (Unpublished report).
421. BRISTOL UNIVERSITY LIZARD PROJECT. 1985. Breeding records of rare birds in the Lizard District. Restricted Report No 9. (Unpublished report).
423. BRISTOWE, W.S. 1931. The spiders of the Orkney and Shetland Islands. Proceedings of the Zoological Society of London, Volume unknown, 931-956.
424. BULLOCK, I.D. 1980. Some aspects of the ecology of the Chough (Pyrrhocorax pyrrhocorax) at South Stack, Anglesey November 1978 - October 1979. MSc thesis, University of Wales.
425. CARPENTER, R.M. 1962. On the invertebrate fauna of Fair Isle. Scottish Naturalist, 70, 91-95.
426. DELANY, M.J. 1956. The animal communities of three areas of pioneer heath in south-west England. Journal of Animal Ecology, 25, 112-126.
427. DUNNET, G.M. 1974. Impact of the oil industry on Scotland's coasts and birds. Scottish Birds, 8, 3-16.
428. FONSECA, E.A. 1977. Diptera on the Gower. Nature Conservancy Council, South Wales region. (Unpublished report, Rep NC 1401).
429. FOWLES, A.P. 1986. The butterflies of Ceredigion. Nature in Wales, 3, 25-43.
430. FOWLES, A.P. 1988. The moths of Ceredigion. Nature Conservancy Council, Aberystwyth. Research and Survey in Nature Conservation. (Unpublished report).
431. HARDING, P.T., & SUTTON, S.L. 1985. Woodlice in Britain and Ireland: distribution and habitat. Huntingdon, Institute of Terrestrial Ecology.

Includes a brief account of some coastal woodlice.

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432. HARVEY, P.H. 1971. Cepaea nemoralis in Brittany, Cornwall and Pembrokeshire. Heredity, 26, 365-372.

Shell colour and banding are similar in the three areas. There is a striking increase in effectively banded morph frequency from north to south in each area which suggests that similar selective forces are operating. No evidence for climatic influence on morph frequency was found.

433. HARVEY, P.H. 1972. Cepaea nemoralis on cliff-tops in south-west England. Proceedings of the Royal Society of London Series B, 181, 375-393.

An increase in five-banded morph frequency from north- to south-facing coasts at the expense of mid-banded, suggests that visual selection as a force affecting morph frequency is overridden by climatic selection on the more exposed cliffs of North Cornwall. Unusual distributions of snail populations on cliff-tops are discussed in relation to invasion by populations from contiguous habitats.

434. LACK, D. 1931. Coleoptera on St Kilda in 1931. Entomological Monthly Magazine, 67, 276-279.

435. LACK, D. 1932. Further notes on insects from St Kilda in 1931. Entomological Monthly Magazine, 68, 139-145.

436. LACK, D. 1932. Notes on the Diptera of St Kilda. Entomological Monthly Magazine, 68, 262-266.

437. LORIMER, R.I. 1975. Lepidoptera in Orkney. In: The natural environment of Orkney, Ed. by R. Goodier, pp. 57-79. Edinburgh, Nature Conservancy Council.

438. RUNDLE, A.J. 1977. Invertebrate survey of the Lizard, June 1977. Nature Conservancy Council, South-West England region. (Unpublished report).

439. THOMAS, J.A. 1976. Ecology and conservation of the large blue butterfly, Maculinea arion. Institute of Terrestrial Ecology. (Unpublished report).

440. THOMAS, J.A. 1977. Ecology and Conservation of the large blue butterfly, Maculinea arion: second report. Institute of Terrestrial Ecology. (Unpublished report).

441. THOMAS, J.A. 1980. Why did the large blue become extinct in Britain?. Oryx, 15, 243-247.

Maculinea arion lays its eggs on thyme (Thymus praecox) on which the young larvae feed while the older larvae are carried to the nests of red ants (Myrmica sabuleti) where

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they feed on ant grubs. Detailed studies of the life-history of M.arion show that extinction was due to a decline in the ant (M.sabuleti) populations which is the only suitable host. The decline in M.sabuleti was in turn due to changes in land-use; essentially a decline in sheep grazing and an increase in turf height to which the ants are extremely sensitive. The food plant T.praecox is less sensitive and may persist over a wider range of grazing conditions than the ant, although it too eventually declines on ungrazed sites. However, the last British colony of M.arion became extinct for other reasons. The small size of the breeding area led to colony overcrowding and the droughts of 1975 and 1976 saw this final population off, despite last minute attempts to increase the breeding area in 1976. The butterfly could probably have been saved if the conservation measures had been implemented just five years earlier. The need for full-time research into the biology of scarce and declining species for their effective conservation is emphasized.

442. WORMELL, P. 1982. The entomology of the Isle of Rhum nature reserve. Biological Journal of the Linnean Society, 18, 1-111.

See also: 7, 8, 19, 111, 124, 145, 146, 211, 242, 361, 362.

History, including palaeontology and archaeology

443. CHANTER, J.R. 1877. Lundy Island. A monograph descriptive and historical. London, Cassell.
444. CHARLESWORTH, J.K. 1955. The late-glacial history of the Highlands and Islands of Scotland. Transactions of the Royal Society of Edinburgh, 61, 769-927.
445. FIRTH, J. 1974. Reminiscences of an Orkney Parish. Stromness, Orkney Natural History Society.
446. GODWIN, H. 1975. History of the British flora. 2nd ed. Cambridge, Cambridge University Press.
447. GRIMES, W.F. 1951. The prehistory of Wales. Cardiff.
448. HOPKINS, J.J. 1980. Turf huts in the Lizard District: an alternative suggestion for their interpretation. Journal of the Royal Institution of Cornwall, 8, 247-249.
449. HUGHES, M.G.B., & FROST, L.C. 1984. Observations on 'turf huts' at the Lizard District in 1983. Proceedings of the Lizard Field Studies Club, 7, 8-10.
450. KAY, Q.O.N. 1979. Post-glacial history of commonland in West Glamorgan. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
451. LAING, L. 1974. Orkney and Shetland. An archaeological guide. Newton Abbot, David & Charles.
452. LINKLATER, E. 1965. Orkney and Shetland. A historical, geographical, social and scenic survey. London, Hale.
453. LOYD, L.R.W. 1925. Lundy. Its history and natural history. London, Longmans.
454. MACAULAY, K. 1764. The history of St Kilda. London.
455. NICOLSON, J.R. 1978. Traditional life in Shetland. London, Hale.
456. O'DELL, A.C. 1939. The historical geography of the Shetland Isles. Lerwick, Manson.
457. RENFREW, C. (Ed). 1985. The prehistory of Orkney BC 4000 - 1000 AD. Edinburgh, Edinburgh University Press.
458. RUSSELL, V. 1971. West Penwith Survey. Cornwall Archaeological Society, Truro. (Unpublished report).
459. SETON, G. 1878. St Kilda past and present. Edinburgh, W.Blackwood.

History

460. SISSONS, J.B. 1974. The Quaternary in Scotland: a review. Scottish Journal of Geology, 10, 311-337.
461. STEEL, T. 1975. The life and death of St Kilda. London, Fontana.
462. TUDOR, J.R. 1883. The Orkneys and Shetland: their past and present state. London, Stanford.
463. WATT, G. 1951. The Farne Islands, their history and wildlife. London, Country Life Books.

See also: 12, 13, 37, 62, 96, 106, 111, 124, 142, 217, 268, 284-287, 309, 311, 315.

Natural history

464. BAILEY, P. 1971. Orkney. Newton Abbot, David & Charles.
465. BALDWIN, J.R. (Ed). 1978. Scandinavian Shetland. Edinburgh, Scottish Society for Northern Studies.
466. BERRY, R.J. (Ed). 1985. The natural history of Orkney. London, Collins.
467. BERRY, R.J. (Ed). 1985. The people of Orkney. Stromness, Orkney Press.
468. BERRY, R.J., & JOHNSON, L. (Ed.) 1986. The natural history of Shetland. London, Collins.
469. BIRSE, E. 1974. The bioclimatic characteristics of Shetland. In: The natural environment of Shetland, Ed. by R. Goodier, pp. 24-32. Edinburgh, Nature Conservancy Council.
470. BORLASE, W. 1758. The natural history of Cornwall. Oxford, Jackson.
471. BOYD, J.M. (Ed). 1979. The natural environment of the Outer Hebrides. Edinburgh, Edinburgh University Press. Reprinted from: Proceedings of the Royal Society of Edinburgh Section B, 77, 1-561.

A symposium. See under individual authors: J.M. Boyd (Natural environment, ref 472), G. Manley, (Climatic environment, ref 511), D.I. Smith & D.J. Fettes (Geological framework, ref 625), R. Glentworth (Soils, ref 584), A. Currie (Vegetation, ref 58), J.B. Caird (Land-use since 1800, ref 268).

472. BOYD, J.M. 1979. The natural environment of the Outer Hebrides. Proceedings of the Royal Society of Edinburgh Section B, 77, 1-19.
473. BOYD, J.M. 1983. Natural environment of the Inner Hebrides - an introduction. Edinburgh, Edinburgh University Press. Proceedings of the Royal Society of Edinburgh Section B, 83, 3-22.
474. BOYD, J.M. 1986. Fraser Darling's Islands. Edinburgh, Edinburgh University Press.
475. BOYD, J.M., & BOWES, D.R. (Ed). 1983. The natural environment of the Inner Hebrides. Reprinted from: Proceedings of the Royal Society of Edinburgh Section B, 83, 1-648.

A symposium. See under individual authors: J.M. Boyd (Introduction, ref 473), D.R. Bowes (Geological framework, ref 550), G. Hudson & D.J. Henderson (Soils, ref 591), F.H.W. Green & R.J. Harding (Climate, ref 494), H.J.B. Birks & W.

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Williams (Late-Quaternary vegetational history, ref 13), A. Currie & C. Murray (Flora and vegetation, ref 59), M.C. Storrie (Land-use and settlement history, ref 309), J.W. Grant (Agriculture, ref 279), A.J. Kerr & J.M. Boyd (Nature conservation, ref 216).

476. BROTHWELL, D., & DIMBLEBY, G. (Ed). 1981. Environmental aspects of coasts and islands. Oxford, British Archaeological Reports International Series 94. (Symposia for the Association of Environmental Archaeology, 1).
477. BURROWS, R. 1971. The Naturalist in Devon and Cornwall. Newton Abbot, David & Charles.
478. BURTON, S.H. 1954. The South Devon Coast. Werner Laurie.
479. BURTON, S.H. 1955. The coasts of Cornwall. Werner Laurie.
480. BUXTON, J., & LOCKLEY, R.M. 1950. Island of Skomer. London, Staples Press.
481. CLUNESS, A.T. 1951. The Shetland Isles. London, Hales.
482. CLUNESS, A.T. (Ed). 1967. The Shetland Book. Lerwick, Zetland Education Committee.
483. CLUTTON-BROCK, T., & BALL, M.E. (Ed). 1987. Rhum: the natural history of an island. Edinburgh, Edinburgh University Press.
484. COMONT, J. 1980. A natural history bibliography of Pembrokeshire. Pembrokeshire Biological Records Centre. (Unpublished report).
485. CONDRY, W. 1982. The Natural History of Wales. London, Collins.
486. DARLING, F.F. 1939. A naturalist on Rona. Essays of a biologist in isolation. Oxford, Clarendon Press.
487. DARLING, F.F. 1946. Island years. London, G. Bell.
488. DARLING, F.F. 1947. Natural history in the Highlands and Islands. London, Collins.
489. DARLING, F.F., & BOYD, J.M. 1964. The highlands and islands. London, Collins.
490. FENTON, E.W. 1978. The Northern Isles: Orkney and Shetland. Edinburgh, Donald.
491. GILLHAM, M.E. 1977. The Natural History of Gower. Cowbridge, D. Brown.
492. GOODIER, R. (Ed). 1974. The natural environment of Shetland. Edinburgh, Nature Conservancy Council.

Natural history

A symposium. See under individual authors: W. Mykura (Geology, ref 607), D. Flinn (Coastline, ref 580), E. Birse (Bioclimatic characteristics, ref 469), J.L. Johnstone (Habitats - an outline ecological framework, ref 105), D. Goode (Flora and vegetation, ref 86), D.H.N. Spence (Sub-arctic debris and scrub vegetation, ref 151), C. Milner & R. Goodier (Natural environment in countryside planning, ref 220).

493. GOODIER, R. (Ed). 1975. The natural environment of Orkney. Edinburgh, Nature Conservancy Council.

A symposium. See under individual authors: W. Mykura (Geology, ref 608), A.S. Mather, W. Ritchie & J.S. Smith (Coastline morphology, ref 603), E.R. Bullard (Habitats - an outline ecological framework, ref 39), E.R. Bullard & D.A. Goode (Vegetation, ref 40), R.I. Lorimer (Lepidoptera, ref 437), R. Goodier (Conservation, ref 204).

494. GREEN, F.H.W., & HARDING, R.J. 1983. Climate of the Inner Hebrides. Proceedings of the Royal Society of Edinburgh Section B, 83, 121-140.
495. GUNN, J. (Ed). 1909. The Orkney book. London & Edinburgh, Nelson.
496. HEPBURN, I. 1972. Flowers of the coast. London, Collins.
497. HOLBOURN, I.B.S. 1938. The Isle of Foula. Lerwick, Manson.
498. JOHNS, C.A. 1848. A Week at the Lizard. London, SPCK.
499. KENNETH ALLSOP TRUST. 1978. Steep Holm. A case history in the study of evolution. Sherborne, Kenneth Allsop Trust & John Fowles.
500. KNOWLTON, D. 1974. The naturalist in Scotland. Newton Abbot, David & Charles.
501. LOCKLEY, R.M. 1938. I know an island. London, George Harrap.
502. LOCKLEY, R.M. 1950. The island of Skomer. Staples Press.
503. LOCKLEY, R.M. 1957. Pembrokeshire. London, R. Hale.
504. LOCKLEY, R.M. 1966. Wales. Batsford.
505. LOCKLEY, R.M. 1969. The Island. Harmandsworth, Penguin.
506. LOCKLEY, R.M. 1970. The naturalist in Wales. Newton Abbot, David & Charles.
507. LOCKLEY, R.M., & SAUNDERS, D.R. 1961. Middleholm (Midland Isle) Pembrokeshire. Nature in Wales, 10, 146.

Natural history

508. MACCULLOCH, J. 1824. The Highlands and Western Isles of Scotland. London.
509. MACNAB, P.A. 1987. Mull and Iona. Newton Abbot, David & Charles.
510. MALLOCH, A.J.C., & HALLIDAY, G. (Ed). 1981. Wild flowers: their habitats in Britain and Northern Europe. Glasgow, Peter Lowe & Collins.
511. MANLEY, G. 1979. The climatic environment of the Outer Hebrides. Proceedings of the Royal Society of Edinburgh Section B, 77, 47-59.
512. MARREN, P. (Ed). 1980. The natural history of St. Cyrus National Nature Reserve. Edinburgh, Nature Conservancy Council.
513. McCORMICK, D. 1974. Islands of England and Wales. Reading, Osprey.
514. McCORMICK, D. 1974. Islands of Scotland. Reading, Osprey.
515. MILLER, R. 1976. Orkney. London, Batsford.
516. NICOLSON, J.R. 1972. Shetland. Newton Abbot, David & Charles.
517. OMAND, D. (Ed). 1972. The Caithness book. Inverness, Highland Printers.
518. OMAND, D. (Ed). 1982. The Sutherland book. Golspie, The Northern Times.
519. PERRY, A.H. 1979. Climatic variation in West Glamorgan. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
520. QUINE, D.A. 1982. St Kilda revisited. Frome, Dowland Press.
521. RAVENSDALE, J. 1971. Cornwall. London, Collins.
522. ROYAL SOCIETY FOR THE PROTECTION OF BIRDS. 1977. A photographic survey of some Orkney sea-cliffs. Nature Conservancy Council. (Unpublished report).
523. SAUNDERS, D. (Ed). 1987. The Nature of West Wales. The wildlife and ecology of the county of Dyfed. Buckingham, Baracuda Books.

Including a chapter on the sea coast by S.B. Evans.

524. SHAW, F.J. 1980. The Northern and Western Islands of Scotland. Edinburgh, Donald.
525. SHEA, M. 1981. The Country Life book of Britain's offshore islands. Surrey, Country Life Books.

Natural history

526. SHEARER, J., GROUNDWATER, W., & MACKAY, J.D. 1966. The new Orkney book. London, Nelson.
527. SOOTHILL, E., & THOMAS, M.J. 1987. The natural history of Britain's coasts. Blandford.
528. THOMPSON, F. 1970. St Kilda and other Hebridean outliers. Newton Abbot, David & Charles.
529. THOMPSON, F. 1974. The Uists and Barra. Newton Abbot, David & Charles.
530. THOMPSON, F. 1987. Harris and Lewis. Outer Hebrides. Newton Abbot, David & Charles.
531. THOMPSON, G. 1980. The other Orkney book. Edinburgh, Northabout.
532. TURK, F.A., & TURK, S.M. 1979. A handbook to the natural history of the Lizard peninsula. Exeter, University of Exeter.
533. WAINWRIGHT, F.T. (Ed). 1962. The Northern Isles. Edinburgh & London, Nelson.
534. WATERSTON, G. 1946. Fair Isle. Scottish Geographical Magazine, 62, 111-116.
535. WILLIAMSON, K., & BOYD, J.M. 1960. St Kilda summer. London, Hutchinson.
536. WILLY, M. 1955. The South Hams. Robert Hale.

See also: 24, 26-30, 32, 34, 35, 37, 39, 124, 169, 271, 272, 274, 285, 287, 404, 443, 452, 453, 455, 459, 461-463.

Geology and soils

537. ARBER, M.A. 1940. The coastal landslips of South-East Devon. Proceedings of the Geologists' Association, 51, 258-271.

The landslips from Branscombe to Lyme Regis occur in connection with the unconformity between the Cretaceous and underlying Keuper, Rhaetic and Lias beds. The primary factors controlling landslipping are: (a) the relation of sands and clays to one another, and to sea level, in the cliff section, (b) the coherence of the overlying beds, (c) the low degree of dip.

538. ARBER, M.A. 1940. Outline of south-west England in relation to wave attack. Nature, 146, 27-28.

The south coast of the peninsula is divided into large bays by the headlands of Land's End, Lizard Point, Dodman Point, Start Point and Portland Bill. In each of these bays the western side (facing east) is much indented into minor bays, divided by angular promontories while the eastern side (facing south-west) is relatively smooth with blunted headlands. The smoother eastern side faces the dominant waves approaching from the nearest part of the Atlantic. The form of the bay is directly controlled by the superior resistance to erosion of the rocks of the major headlands, i.e. the Land's End granite, and the igneous and metamorphic rocks of the Lizard, Dodman and Start Points.

539. ARBER, M.A. 1941. The coastal landslips of West Dorset. Proceedings of the Geological Association, 52, 273-282.

Whereas in South-East Devon there is a single plane of weakness which undercuts the massive beds above and allows them to slide forward periodically in unbroken blocks, in West Dorset the rapid variation in lithology produces a series of water-bearing horizons, above each of which the beds may be washed away, the subsidences exhibiting every gradation from continuous mud flow to an occasional mass of strata moving bodily. This process has led to the remarkable terraced profile of the West Dorset landslips.

540. ARBER, M.A. 1949. Cliff profiles in Devon and Cornwall. Geographical Journal, 114, 191-197.

Where sedimentary rocks dip inland and are protected from major wave attack, subaerial erosion is dominant and a hog's-back cliff develops as a long straight escarpment slope above a low wave-cut base. Where the rocks dip steeply seawards, a hog's-back cliff may develop as a subaerial dip-

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slope. As the rocks in the north of the region dip mainly north or south, and as wave attack is predominantly westerly, hog's-back cliffs are principally found on north-facing slopes. Where marine erosion outstrips subaerial erosion, and where there are no structural planes to control the slope of the cliff, there results a vertical wave-cut cliff with a flat top. Such cliffs usually cut across the dip and strike at high angles and thus face the main wave attack from the west. Where marine and subaerial erosion are more nearly balanced, a bevelled cliff results, having a vertical wave-cut face below and the normal convex curve of a hill-top eroded by rain-wash and soil-creep above. Where rocks have horizontal joint planes on which scree accumulates, the slope of the bevel, instead of being convex, may be straight or concave, conforming to the angle of rest of the debris. The sea-cut face of the bevelled cliffs may be tentatively considered to antedate the end of the Riss glaciation; the subaerial hog's-back slopes have not been attacked by the sea since the Riss-Wurm interglacial. Active marine erosion has produced the flat-topped cliffs since that period.

541. BALCHIN, W.G.V. 1937. The erosion surfaces of North Cornwall. Geographical Journal, 90, 52-63.
542. BALCHIN, W.G.V. 1946. The geomorphology of the North Cornish coast. Transactions of the Royal Geological Society Cornwall Geographical Journal, 17, 317-344.
543. BARNES, R.S.K. (Ed). 1977. The coastline. London, John Wiley.
544. BARROW, G. 1906. The geology of the Isles of Scilly. London, HMSO. Memoirs of the British Geological Survey.
545. BARTON, R.M. 1964. An introduction to the geology of Cornwall. Truro, D. Bradford Barton.
546. BASSETT, D.A., & BASSETT, M.G. (Ed). 1971. Geological excursions in South Wales and the Forest of Dean. Cardiff, Geologists' Association, South Wales Group.
547. BASSETT, M.G. (Ed). 1982. Geological excursions in Dyfed, South-West Wales. Cardiff, Geologists' Association, South Wales Group.
548. BIRD, E.C.F. 1969. Coasts. London, MIT Press.
549. BIRD, E.C.F. 1985. Coastline changes: a global review. Chichester, John Wiley.
550. BOWES, D.R. 1983. Geological framework of the Inner Hebrides. Proceedings of the Royal Society of Edinburgh Section B, 83, 25-29.

Geology

551. BRITISH GEOLOGICAL SURVEY. British Regional Geology. London, HMSO. Institute of Geological Sciences.
- England and Wales: Northern England. B.J. Taylor et al. 1971. North Wales. T.N. George. 1961. South Wales. T.N. George. 1970. East Anglia and adjoining areas. C.P. Chatwin. 1961. South-West England by E.A. Edmonds, M.C. McKeown & M. Williams. 1975. The Hampshire Basin and adjoining areas. R.V. Melville & E.C. Freshney. 1982. The Wealden District. R.W. Gallois. 1965. Scotland: The Northern Highlands. J. Phemister. 1936 (new edition in prep). Grampian Highlands. G.S. Johnstone. 1966. The South of Scotland. D.C. Greig, et al. 1971. Orkney & Shetland. W.E. Mykura. 1976. The Tertiary Volcanic District. J.E. Richey. 1961. A full list of publications is available from HMSO, PO Box 276, London SW8 5DT.
552. BRUMHEAD, D. 1979. Geology explained in the Yorkshire Dales and on the Yorkshire coast. Newton Abbot, David & Charles.
553. CAIRD, J.B., & MOISLEY, H.A. 1965. The Outer Hebrides. In: Field studies in the British Isles, Ed. by J.A. Steers, pp. 374-390. London and Edinburgh, Thomas Nelson.
554. CARRUTHERS, R.G., BURNETT, G.A., & MADEN, J. 1927. The geology of Belford, Holy Island and the Farne Islands. London, HMSO. Memoirs of the British Geological Survey.
555. CHALLINOR, J. 1931. Some coastal features of North Cardiganshire. Geological Magazine, 68, 1111.
556. CHALLINOR, J., & BATES, D. 1973. Geology explained in North Wales. Newton Abbot, David & Charles.
557. CHATWIN, C.P. 1961. British Regional Geology. East Anglia and adjoining areas. 4th ed. London, HMSO. Institute of Geological Sciences.
558. CLARKE, B.B. 1953-1954. The coastal morphology of the Padstow peninsula. Transactions of the Royal Geological Society Cornwall. 19, 220.
559. COCKBURN, A.M. 1935. The geology of St Kilda. Transactions of the Royal Society of Edinburgh, 58, 511-547.
560. COOMBE, D.E., & FROST, L.C. 1956. The nature and origin of the soils over the Cornish Serpentine. Journal of Ecology, 44, 605-615.
561. COTTON, C.A. 1951. Atlantic gulfs, estuaries and cliffs. Geological Magazine, 88, 113-128.

Geology

562. COX, A.H. 1930. Preliminary note on the geological structure of Pen Caer and Strumble Head, Pembrokeshire. Proceedings of the Geologists' Association, 41, 274-289.
563. COX, A.H., GREEN, J.F.N., JONES, O.T., & PRINGLE, J. 1930. The geology of the St David's District, Pembrokeshire. Proceedings of the Geologists' Association, 41, 241-273.
564. CRAIG, G.E. (Ed). 1965. The geology of Scotland. Edinburgh, Oliver & Boyd.
565. CRAMPTON, C.B., & CARRUTHERS, R.G. 1914. The geology of Caithness. London, HMSO. Memoirs of the Geological Survey of Great Britain.
566. DAVIES, A. 1965. The south-west peninsula of England. In: Field studies in the British Isles, Ed. by J.A. Steers, pp. 14-25. London and Edinburgh, Thomas Nelson.
567. DERBYSHIRE, E., COOPER, R.G., & PAGE, L.W.F. 1979. Recent movements on the cliff at St. Mary's Bay, Brixham, Devon. Geographical Journal, 145, 86-96.
568. DOLLAR, A.T. 1914. The Lundy complex: its petrology and tectonics. Quarterly Journal of the Geological Society, 97, 39.
569. DRY, F.T. (Ed). 1985. The soils of Orkney. Craigiebuckler, Aberdeen, Macaulay Institute for Soil Research, Soil Survey of Scotland.
570. EDMONDS, E.A., McKEOWN, M.C., & WILLIAMS, M. 1975. British Regional Geology. South-West England. 4th ed. London, HMSO. Institute of Geological Sciences.
571. ELLIS-GRUFFYDD, D. 1977. Coastal scenery of the Pembrokeshire Coast National Park. Greencroft Books.
572. EVANS, D.E. 1973. Pembrokeshire coast scenery. Cardiff, National Museum of Wales.
573. EVANS, R., & JOHN, B.S. 1973. The Pembrokeshire landscape: a portrait in words and pictures. Tenby, Five Arches Press.
574. FIELDING, M. 1979. Geology and landforms of West Glamorgan. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
575. FINLAY, T.M. 1926. The Old Red Sandstone of Shetland. Part I: South-eastern area. Transactions of the Royal Society Edinburgh, 54, 553-572.
576. FINLAY, T.M. 1930. The Old Red Sandstone of Shetland. Part II: North-western area. Transactions of the Royal Society Edinburgh, 56, 671-694.

Geology

577. FLETT, J.S. 1897. The Old Red Sandstone of the Orkneys. Transactions of the Royal Society Edinburgh, 39, 383-424.
578. FLETT, J.S. 1947. Geology of the Lizard and Meneage. 2nd ed. London, HMSO. Memoirs of the British Geological Survey, Sheet 359.
579. FLINN, D. 1969. On the development of coastal profiles in the north of Scotland, Orkney and Shetland. Scottish Journal of Geology, 5, 393-399.
580. FLINN, D. 1974. The coastline of Shetland. In: The natural environment of Shetland, Ed. by R. Goodier, pp. 13-23. Edinburgh, Nature Conservancy Council.
581. FLINN, D. 1977. The erosion history of Shetland: a review. Proceedings of the Geological Association, 88, 129-146.
582. GALLOIS, R.W., & EDMUNDS, F.H. 1965. British Regional Geology. The Wealden District. 4th ed. London, HMSO. Institute of Geological Sciences.
583. GEORGE, T.N. 1970. British Regional Geology. South Wales. 3rd ed. London, HMSO. Institute of Geological Sciences.
584. GLENTWORTH, R. 1979. Observations on the soils of the Outer Hebrides. Proceedings of the Royal Society of Edinburgh Section B, 77, 123-137.
585. GREENLY, E. 1919. The geology of Anglesey. 2 vols. London, HMSO. Institute of Geological Sciences.
586. GRESSWELL, R.K. 1965. The western coast of Britain: Wales to the Lake District. In: Field studies in the British Isles, Ed. by J.A. Steers, pp. 247-263. London and Edinburgh, Thomas Nelson.
587. HEWETT, D.G. 1973. Human pressures on soils in coastal areas. Welsh Soils Discussion Group Report, 14, 50-62.
588. HOPLEY, D. 1963. The coastal geomorphology of Anglesey. MSc thesis, University of Manchester.
589. HOPPE, G. 1974. The glacial history of the Shetland Islands. Transactions of the Institute of British Geography Special Publications, 7, 197-210.
590. HOSKING, K.F.G., & SHRIMPTON, G.J. (Ed). 1964. Present views of some aspects of the geology of Cornwall and Devon. Penzance, Royal Geological Society of Cornwall.
591. HUDSON, F.H., & HENDERSON, D.J. 1983. Soils of the Inner Hebrides. Proceedings of the Royal Society of Edinburgh Section B, 83, 107-119.

Geology

592. JOHN, B. 1973. The geology of Pembrokeshire. Llanychaer, Pembrokeshire Handbooks.
593. JOHN, B., & EVANS, R. 1973. The Pembrokeshire Landscape. Tenby, Five Arches Press.
594. JOHNSTONE, G.S. 1966. British Regional Geology. The Grampian Highlands. 3rd ed. London, HMSO. Institute of Geological Sciences.
595. KENT, P. 1980. British Regional Geology. Eastern England from the Tees to the Wash. 2nd ed. London, HMSO. Institute of Geological Sciences.
596. KIDSON, C. 1965. The coasts of south and south-west England. In: Field studies in the British Isles, Ed. by J.A. Steers, pp. 26-42. London and Edinburgh, Thomas Nelson.
597. KING, C.A.M. 1972. Beaches and coasts. 2nd ed. London, Arnold.
598. KING, C.A.M., & WHEELER, P.T. 1963. The raised beaches of the north coast of Sutherland, Scotland. Geological Magazine, 100, 228-320.
599. LAING, S. 1877. Glacial geology of Orkney and Shetland. Nature London, 16, 418-419.
600. LEACH, A.L. 1933. The geology and scenery of Tenby and the South Pembrokeshire coast. Proceedings of the Geological Association, 44, 187-216.
601. LEWIS, C.A. (Ed). 1970. The glaciations of Wales and adjoining regions. London, Longmans.
602. MACFADYEN, W.A. 1970. Geological highlights of the West Country. London, Butterworth.
603. MATHER, A.S., RITCHIE, W., & SMITH, J.S. 1975. An introduction to the morphology of the Orkney coastline. In: The natural environment of Orkney, Ed. by R. Goodier, pp. 10-18. Edinburgh, Nature Conservancy Council.
604. MAY, V.J. 1971. The retreat of chalk cliffs. Geographical Journal, 137, 203-206.

Chalk and Coombe rock cliffs at Birling Gap Sussex were surveyed in 1950 and 1962. The size and frequency of cliff-top retreat shows great variations, but of 3624 sq m lost, over 3160 sq m were lost during winter. 42% of cliff-top land was lost in two winters. Combined effects of marine action, frost and rain cause most change.

Geology

605. MELVILLE, R.V., & FRESHNEY, E.C. 1982. British Regional Geology. The Hampshire Basin and adjoining areas. 4th ed. London, HMSO. Institute of Geological Sciences.
606. MILLER, R. 1965. The geography of the Scottish Highlands. In: Field studies in the British Isles, Ed. by J.A. Steers, pp. 360-373. London and Edinburgh, Thomas Nelson.
607. MYKURA, W. 1974. The geological basis of the Shetland environment. In: The natural environment of Shetland, Ed. by R. Goodier, pp. 1-12. Edinburgh, Nature Conservancy Council.
608. MYKURA, W. 1975. The geological basis of the Orkney environment. In: The natural environment of Orkney, Ed. by R. Goodier, pp. 1-9. Edinburgh, Nature Conservancy Council.
609. MYKURA, W. 1976. British Regional Geology. Orkney and Shetland. Edinburgh, HMSO. Institute of Geological Sciences.
610. O'DELL, A.C. 1939. The historical geography of the Shetland Isles. Lerwick, Manson.
611. O'DELL, A.C. 1965. The Northern Isles of Scotland. In: Field studies in the British Isles, Ed. by J.A. Steers, pp. 406-409. London and Edinburgh, Thomas Nelson.
612. OSBORNE WHITE, H.J. 1921. A short account of the geology of the Isle of Wight. London, HMSO. District Memoirs of the British Geological Survey.
613. OWEN, T.R. 1973. Geology explained in South Wales. Newton Abbot, David & Charles.
614. PAGE, J.L.W. 1895. The coasts of Devon and Lundy Island. Cox.
615. PERKINS, J.W. 1971. Geology explained in South and East Devon. Newton Abbot, David & Charles.
616. PRINGLE, J. 1930. The geology of Ramsey Island. Proceedings of the Geological Society, 41, 1.
617. PRINGLE, J., & NEVILLE, G.T. 1948. British Regional Geology. South Wales. London, HMSO. Institute of Geological Sciences.
618. PROCTOR, J., & WOODSELL, S.R.J. 1975. The ecology of serpentine soils. Advances in Ecological Research, 9, 255-366.
619. REID, C., BARROW, G., & DEWEY, H. 1910. The geology of the country around Padstow and Camelford. London, HMSO. Memoirs of the British Geological Survey.
620. REID, C., & FLETT, J.S. 1907. The geology of the Land's End District. London, HMSO. Memoirs of the British Geological Survey.

Geology

621. RICHIE, J.E. 1961. British Regional Geology. The Tertiary Volcanic Districts of Scotland. 3rd Ed. London, HMSO. Institute of Geological Sciences.
622. ROLLIN, K.E. 1986. Geophysical surveys on the Lizard complex, Cornwall. Journal of the Geological Society, London, 143, 437-446.
623. SINCLAIR, A.H. 1985. The soils of Orkney - soil fertility. Craigiebuckler, Aberdeen, Macaulay Institute for Soil Research, Soil Survey of Scotland.
624. SMITH, B., & GEORGE, T.N. 1961. British Regional Geology. North Wales. 3rd Ed. London, HMSO. Institute of Geological Sciences.
625. SMITH, D.I. 1979. The geological framework of the Outer Hebrides. Proceedings of the Royal Society of Edinburgh Section B, 77, 75-83.
626. SOIL SURVEY OF ENGLAND AND WALES. Regional and county and district surveys. Harpenden, Herts.

List of publications available from the Soil Survey and Land Research Centre, Cranfield Rural Institute, Silsoe, Bedford MK45 4DT.

627. SOIL SURVEY OF ENGLAND AND WALES. 1975. Soil map of England and Wales. Harpenden, Herts.
628. SOIL SURVEY OF SCOTLAND. Maps, memoirs, reports and monographs. Craigiebuckler, Aberdeen.

List of publications available from the Survey at Macaulay Land Use Research Institute, Craigiebuckler, Aberdeen, AB9 2QJ.

629. STAINES, S.J. 1984. Soils in Cornwall. III. The Lizard. Harpenden, Herts, Soil Survey of England and Wales.
630. STEERS, J.A. 1948. A picture book of the whole coast of England and Wales. Cambridge, Cambridge University Press.

A marvellous collection of black & white photographs with an introductory essay by F. Fraser Darling and an essay on the changing coast by J.A. Steers. Includes a map showing the distribution of cliffs over 8 m.

631. STEERS, J.A. 1960. The coast of England and Wales in pictures. 2nd Ed. Cambridge, Cambridge University Press.

Geology

632. STEERS, J.A. 1962. Coastal cliffs: report of a symposium. Geographical Journal, 128, 303-320.

Includes a discussion (pp. 307-319) with contributions by A. Wood, W.H. Ward, D.S. Rawson and M.A. Arber.

633. STEERS, J.A. 1964. The coastline of England and Wales. 2nd ed. Cambridge, Cambridge University Press.

A classic work and major reference text. See also ref 640.

634. STEERS, J.A. (Ed). 1965. Field studies in the British Isles. London and Edinburgh, Thomas Nelson.

A compendium including: C. Kidson, The coasts of south and south-west England, pp. 26-42; A. Davies, The south-west peninsula of England, pp. 14-25; R.K. Gresswell, The western coast of Britain: Wales to the Lake District, pp. 247-263; R. Miller, The geography of the Scottish Highlands, pp. 360-373; J.B. Caird, H.A. Moisley, The Outer Hebrides, pp. 374-390; K. Walton, Aspects of the geomorphology of Scotland; A.C. O'Dell, The Northern Isles of Scotland, pp. 406-409.

635. STEERS, J.A. 1966. The English coast and the coast of Wales. London, Collins.

636. STEERS, J.A. 1969. The sea coast. 4th ed. London, Collins.

637. STEERS, J.A. 1969. Coasts and Beaches. Edinburgh, Oliver & Boyd.

638. STEERS, J.A. (Ed). 1971. Applied coastal geomorphology. London, Macmillan.

639. STEERS, J.A. (Ed). 1971. Introduction to coastline development. London, Macmillan.

640. STEERS, J.A. 1973. The coastline of Scotland. Cambridge, Cambridge University Press.

Companion volume to ref 633, and another major reference text.

641. STEERS, J.A. 1981. Coastal features of England and Wales. Cambridge, The Oleander Press.

642. TAYLOR, B.J., BURGESS, I.C., LAND, D.H., MILLS, D.A.C., SMITH, D.B., & WARREN, P.T. 1971. British Regional Geology. Northern England. 4th ed. London, HMSO. Institute of Geological Sciences.

Geology

643. WALTON, K. 1965. Aspects of the geomorphology of Scotland. In: Field studies in the British Isles, Ed. by J.A. Steers, pp. 391-405. London & Edinburgh, Thomas Nelson.
644. WILLIAMS, W.W. 1960. Coastal changes. London, Routledge & Kegan Paul.
645. WILSON, G. 1952. The influence of rock structures on coastline and cliff development around Tintagel, North Cornwall. Proceedings of the Geological Association, 63, 20.
646. WOOD, A. 1959. The erosional history of the cliffs around Aberystwyth. Liverpool and Manchester Geological Journal, 2, 271.
647. WRIGHT, P.S. 1979. Soils of West Glamorgan commons. In: Problems of common land: the example of West Glamorgan, Ed. by E.M. Bridges. University College, Swansea, Department of Geography.
648. ZIEGLER, A.M., MCKERROW, W.S., BURNE, R.V., & BAKER, P.E. 1969. Correlation and environmental setting of the Skomer Volcanic Group Pembrokeshire. Proceedings of the Geological Association, 80, 409-439.

See also: 57, 124, 129, 147, 152, 178, 241, 275, 444, 452, 456, 534.

Indexes

Bristol University, Lizard Project reports

23-37, 168-180, 252-254, 319, 337-339, 419-421.

Countryside Commission publications

164, 185-192, 229, 230, 251, 255, 257-259, 261, 264.

Nature Conservancy Council reports and publications

6, 11, 18, 21, 39, 40, 45-56, 63-76, 86, 94-96, 100, 102, 103, 105, 108, 109, 112-114, 123, 125-130, 142, 151, 157, 163, 166, 185, 198, 201, 204, 206, 207, 210, 211, 216, 217, 219, 224-229, 233, 234, 266, 369, 418, 428, 430, 437, 438, 469, 492, 493, 512, 522, 580, 603, 607, 608.

National Trust Biological Survey reports (see ref 124)

A large number of National Trust coastal properties have been surveyed and each report follows a standard format: (1) Geology, physiography and soils, (2) Biological description including flora and fauna, (3) Recreational use, (4) References, (5) Summary: Biological evaluation, summary tables and maps, (6) 1:10 000 scale habitat maps, (7) species lists (invertebrates; birds; some including vascular/non-vascular plants).

Reports for the major coastal cliff sites are held at the National Trust Office, Spitalgate Lane, Cirencester GL7 2DE, and copies are held by NCC and the appropriate County Trust or Biological Records Centre.

In the following list numbers in parentheses indicate the date of the survey, Ordnance Survey sheet number and National Grid reference of the site:

Cornwall: Bedruthan (1979, 200, SW850690). Bodigga Cliff (1979, 200, SX274543). Boscastle Harbour (1979, 190, SX100910). Boscregan (1982, 203, SW100910). Chapel Porth (1979, 203, SW697496). Coombe (Fowey) (1979, 200, SX112510). Crackington Haven (1979, 190, SX142968). Cubert (1979, 200, SW7760). Cudden Point (1985, 203, SW549275). The Dizzard (1979, 190, SX160987). The Dodman (1979, 204, SW003397/995407). Duck-pool to Sandymouth (1979, 200, SS118510). Fowey (1979, 200): St Catherine's Point (SS118510), St Savior's Point (SS124506). Godrevy to Portreath (1979, 203, SW6040). The Gribben (1979, 200, SX105505). Gunwalloe Church Cove (1979, 203, SW661204). Gurnards Head (1982, 203, SW433383). Hor Point & Hellesveor Cliff (1979, SW5041). Hendersick (1982, 201, SX239514). Lizard peninsula (1979, 203/204, Grid references as follows); Lowland Point (SW803196), Beagles Point (SW768166), Poltesco & Carleon Cove (SW726157), Bass Point (SW716119), Kynance Cove & Lizard Down (SW690133), Predannack (SW6616), Predannack Wartha (SW660169), Maer Cliff (1979, 1979, SS200077). Mullion Cove & Island (SW666179), Polurrian Cove (SW668184). Mayon & Trevescan Cliffs (1979, 203, SW349259). Morwenstow (1979, 190, SS2015). Nare Head & Veryan Bay (1979, 204, SW916370). Newdown's Head (1982, 203, SW707517). Northcott Mouth (1982, 190, SS202085). Park Head (1979, 200, SW845710). Penberth Cove & Treen Cliff (1979, SW402228/398222). Pencarrow Head, Pendower Beach (1979, 204, SW902385). Pentargon Cliff (1982, 190, SX100917). Lantic Bay & Lantivet Bay (1979, 204, SX1451). Pen Enys Point (1985, 203, SW489411). Pentire Head & Portquin Bay (1979, 200, SW950802). Polperro (1979, 201, SS205506/217509). Porthcothan (1979, 200, SW857722). Pothcurnick (1979, 204, SW880360). Porthminster Point (1979, 203, SW525395). Rinsey Cliff (1979, 203, SW594269). Rosemergy & Trevean Cliff (& Bosigran) (1979, SW415365/425366). Rosemullion Head (1979, 204, SW797278). St Agnes (1979, 203, SW710504). St Anthony-in-Roseland (1979, 204, SW8632). St Just-in-Roseland (1979, 204, SW848353). St Levan Cliffs (1979, 203, SW384218). St Mawes (1979, 204, SW841335). Tintagel (1979, 200, SX0589). Tregardock Beach (1979, 200, SX040840). Tregear Vean (1985, 204, SW845345). Trellugan Cliff, Gerrans Bay (1985, 204, SW890379). Treveal (1979, 203, SW470403). Trevega Wartha (1985,

203, SW474405). Whitesand Bay (1979, 201, SW390525). Zennor (203, SW450395/461398). Zone Point (1985, 204, SW853312).

Devon: Beesands Cliff (1979, 202, SX822415). Bigbury-on-Sea, Clematon Hill (1979, 202, SX655442). Branscombe & Salcombe Regis (1979, 192, SY1688). Clovelly (1979, 190): Beckland Cliffs (SS2826), The Brownshams (SS2627), Fatacott Cliff (SS3124). Coleton Fishacre (1986, 202): Higher Brownstone Farm (SX901505), Sharkham Point (SX931545). Dart Estuary, Little Dartmouth Farm (1979, 202, SX876492). Golden Cove, Berry Narbor (1979, 180, SS565477). The Great Hangman (1979, 180, SS601480). Heddon Valley: Heddon's Mouth (1979, 180, SS6548). Ilfracombe (1979, 180, SS4947). Lee to Croyde (1979 & 1987, 180): Baggy Point (SS420405), Bull Point (SS462468), Damage Cliff (SS470469), Morte Point (SS442455). The Little Hangman (1986, 180, SS583481). Linmouth: Foreland Point (1979, 180, SS7449), Linmouth: Foreland Point (1986, 180, SS773500). Lundy Island (1979 (Biological Survey report in prep, 1986), 180, SS133432/130482). Orcombe Point (1979, 192, SY023797). Salcombe (1979, 202): Bolt Head to Bolt Tail (SX725360/667397), Portlemouth Down (SX745372), Prawle Point & Gammon Head (SX772351/766356). Southdown Cliff, Brixham (1979, 202, SX923540). Wembury Bay & Yealm Estuary (1979, 202, SX530480). Woody bay (1979, 180, SS675487).

Dorset: Belle View Farm (1982, 195, SZ015770). Burton Cliff (1982, 193/4, SY483893). Corfe Castle Estate: Ailwood Down to Old Harry (1982, 195, SY990810-SZ050820). Corfe Castle Estate: Eastington Farm (1982 & 1983, 195, SY990768). Golden Cap Estate 1982, 193, SY350930-422920). South Down farm: Burning Cliff & Whitenotho Cliff (1982, 194, SY765815).

Isle of Wight: Bembridge & Culver Downs (1982, 196, SZ624860). Knowles Farm & St Catherine's Point (1982, 196, SZ495755). Needles Headland (West Wight) (1982, 196, SZ300848). Tennyson Down (West Wight) (1982, 196, SZ330855). West High Down (West Wight) (1982, 196, SZ310851). West Wight: Hanover Point & Sheppard's Chine (1982, 196, SZ378841).

East Sussex: Crowlink & Birling Gap (1987, report in prep., 199, TV540970). Fairlight Estate (1987, 199, TQ883123).

Kent: Dover: Great Farthingloe (1987, report in prep., 179, TR292393). St Margaret's Bay (1987, report in prep., 179, TR3744).

East Anglia: Dunwich Heath (Suffolk) (1986, 156, TM4870). Sheringham (Norfolk) (1987, 133, TG134423).

Yorkshire: (Surveyed in 1987, reports in prep.): Cayton Bay (101, TA063850), Staintondale: Rigg Hall Farm (101, TA005984). Hayburn Wyke (101, NZ010970). Robin Hood's Bay: Bay Ness farm (94, NZ958060), Raven-scar (101, NZ9802). Saltwick Nab (94, NZ914112).

Northumberland, Durham and Tyne & Wear: Beacon Hill (1986, NZ441453). Beadnell (1986, NU231300). Dunstanburgh & Newton (1986, NU258220). The Leas, South Shields (1986, NZ385662).

North Wales: Anglesey: Cemaes (1981, 114, SH371942/373946), Cemlyn

(1981, 114, SH325933), Felin Cafnan (1983, 114, SH3493), Dinas Gynfor (1981, 114, SH392951), Clegir Mawr (1981, 114, SH2990). Llyn peninsula (1981, 123): Aberdaron (SH156285), Braich-y-Pwll (SH136258), Bytilith (SH225264), Dinas Bach & Dinas Fawr (SH1529), Mynydd Bychestyn (SH150245), Penarfynnydd Rhiw (SH218261), Pen-y-Cil (SH157241), Mynydd-y-Craig & Mynydd Bach (SH233272), Mynydd Anefog (SH147267), Porth Llanllawen (SH151274).

South Wales (=West Wales): Cwm Soden, Coybal & Craig yr Adar (1988, 145, SN364586-369579). Dinas Head (1988, 157, SN005405). Good Hope, (1988, 157, SN914408). Llanborth (1981, 145, SN295519), Llanunwas, St Bride's bay (1988, 157, SN790237). Llwynysgaw (1988, 145, SN215522). Lochtyn & Llangrannog (1981, 145, SN315545), Longhouse, Abercastle (1988, 157, SN845339). Lower Treginnis, St Bride's Bay (1988, 157, SN725235). Lydstep Headland (1981, 158, SS090976), Manorbier Cliff (1981, 158, SM065971). Mwnt (1981, 145, 194520). Pachynglas, Ceibwr Bay (1988, 145, SN108458). St Brides Bay (1981, 157): Marloes (SM755090), St David's Head (SM7228), Stackpole (1981, 158, 994943). Ty-hen & Pen-y cwm (1988, 145, SN284519-295520). Ynys Barry (1988, 157, SN805325).

South Wales: Gower peninsula (1981, 159): Report No 5, Rhossili Down & Rhossili Bay (SS420900); Report No 4, Rhossili to Port Eynon coast: Worms Head (SS385877), Pitton Cliff (SS427865), Paviland Cliff (SS437859), Port Eynon Point (SS470846); Report No 7, Oxwich Point (SS850512); Report No 9, Pennard Cliff (SS560869); Report No 10, Gower peninsula, West Glamorgan - Overall evaluation.

Somerset: Brean Down (1982, 182, ST2959). Holnicote Estate (1982, 181, SS8844).

Sea-cliff bibliography reference recording form

Type of publication (underline)

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