

Woods as 'Islands'

Norman Moore

How valuable as a nature reserve is a small wood? How much more valuable is a bigger wood, and why? The author shows how ecological considerations and the requirements of different species affect the value of particular areas and should be taken into account in selecting nature reserves.

Islands have had a special significance to biologists since the days of Charles Darwin. Their role in producing species is widely recognised. Recently they have been the subject of much theoretical study, and mathematical models have been constructed in order to account for the different degrees of impoverishment in their flora and fauna.

Geographical islands are an extreme form of a much more general situation, for many ecosystems, such as freshwater lakes, oases and mountain tops are scarcely less isolated than geographical islands. Man has greatly added to the number of these ecological islands by reclaiming much of what was once continuous forest and leaving woods as 'islands' in an agricultural 'sea'.

I first became interested in this problem when studying heathland in Dorset. The Egdon Heath of Thomas Hardy's novels was once virtually continuous, but is now much reduced and broken up into numerous fragments. I found that species such as the Dartford warbler tended to disappear from the smaller more isolated fragments. More recently Dr Max Hooper and I have studied the numbers of woodland bird species in relation to the areas of the woods they inhabit.* Thanks to the work of the British Trust for Ornithology, much is known about the bird fauna of large woods, but ornithologists tend to ignore very small woods unless they form part of Common Bird Census areas, so first we had to make numerous surveys of small woods.

We examined data collected over eight years. As was to be expected, the larger the wood the larger the number of species it contained. But we found that this was not simply due to all woods having a similar relationship between species and numbers of individuals, and thus larger woods being merely larger samples and so containing more individuals and hence more species. Nor were numbers of species related to woodland edge rather than to area. We found that woods behaved like geographical islands: multiplication of the area by a constant multiplied the number of species by a constant. In practice a tenfold increase in area approximately doubled the number of species.

The situation in these 'islands' has been interpreted in terms of dispersal, population sizes, extinction rates and distances between them. Nearly all British woods are less than $1\frac{1}{2}$ km from the next wood, and since birds are very mobile it is difficult to believe that extinction and subsequent failure to colonise can alone account for the relationship found. Many of the larger woods are remnants of the original forest, and, however much modified, are very much richer in plant species than are plantations of the same area. On the other hand most small woods were planted in the eighteenth or nineteenth centuries and so contain very few plant species. Thus ecological consider-

* Moore N. W. and Hooper M. D. 1975. On the number of bird species in British woods. *Biol. Conserv.* **8** 239-250

ations at least reinforce differences due to area alone. Behaviour must also be an important factor. A lone thorn bush can provide a suitable nesting place for a blackbird, because this species is only dependent on a 'wood' for its nesting requirements: it can feed in the surrounding open country. On the other hand species such as blackcap and spotted flycatcher depend on woods both for nesting sites and for feeding. In fact these species appear to require 'woods' which are not less than 300 and 600 square metres respectively. The same situation occurs among birds dependent on water. Moorhens will nest in minute ponds of 10 square metres or less, and get their food on the land, whereas the closely related coot, which is largely dependent on waterweed for food, needs a much larger area of water. The smallest pond found to contain breeding coots was 1050 square metres.

The relative importance of behaviour, ecology and isolation can only be determined by future research on different habitats of different areas. Even so, this preliminary study is relevant to the conservationist. It emphasises the importance of area as a criterion in selecting nature reserves. Other things being equal it shows that a large wood will be much more valuable than an equivalent area made up of several smaller woods. Of course this does not mean that farmers should be discouraged from retaining small woods or from planting corner plantations, but it does mean that if a farmer has a choice between keeping (or planting) one large wood or several small ones of approximately similar type, it is usually better to retain (or plant) the large one.

So far most of the evidence is from woods and birds, but other studies suggest that the same rules apply to other habitats and other organisms. However, the significance of a particular area size differs greatly between taxonomic groups. For example a one-hectare wood cannot have great conservation importance for birds, but a one-hectare meadow may support viable populations of flowering plants and insects for many years and so could be of considerable conservation importance.

As human populations increase the total amount of wildlife habitat will decrease and so the number of ecological islands will increase. Therefore it will become increasingly necessary to understand the effects of area and isolation on communities of plants and animals. Studies of both geographical and ecological islands will become essential in order to conserve species for the future as well as to understand evolution in the past.

continued from page 453

little effect. In 1973 55 tamaraw, including four neonates, were counted, and two mature bulls died of natural causes. The population on the study area was estimated at 70–80 with some scattered animals elsewhere on the refuge.

The tamaraw remains critically endangered, but the increase at Mt Iglit is a great success for the Philippine Government's conservation efforts. If these continue the tamaraw has a very good chance for survival.

Literature Cited

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3. HARRISSON, T. 1969. The tamaraw and Philippine conservation. Biol. Cons. 1(4): 317–8.
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SNOW LEOPARD *Panthera uncia* photographed by George Schaller in the mountains of Chitral, in Pakistan, where numbers have decreased so seriously even since 1970 that the species is now seriously threatened, as he described in *Oryx*, July 1976. On page 355 of that article, the area over which Dr Schaller censused snow leopards should have been 3000 sq km (not 300). The reference to Schaller and Kahn 1975 in *Biol. Cons.* was 7.3: 185–198.

Ivory Coast Park Studies

Thorough inventories of the fauna and flora of two Ivory Coast national parks and one coastal reserve are being made as part of a two-year project by a team of German scientists, led by Professor J. Harald H. Roth. This is part of a Technical Aid Agreement between the two governments to assist the Ivory Coast's newly formed Ministry of Nature Protection. The three areas are the Tai (3300 sq km) and Comoé (12,500 sq km) national parks and the Asagny reserve, the only protected stretch of a coast that is being rapidly developed. The team will also advise on management and tourism plans. The Tai park in the south-west (declared in 1972) includes one of West Africa's last extensive primary rain forests, and among the large mammals there are western red colobus *C. badius*, as well as black-and-white and olive colobus, Diana and lesser white-nose monkeys *Cercopithecus dianas* and *petaurista*, grey mangabey *Cercocebus torquatus atys*, two genets *pardina* and *villiersi*, probably manatee *Trichechus senegalensis*, pygmy hippo *Choeropsis liberiensis*, several forest duikers, *jentinki*, *niger*, *zebra* and *ogilbyi*, and the tiny royal antelope *Neotragus pygmaeus*.

Primates for Research

Primates needed for medical research in the UK should be provided by specialised commercial breeders, says a report of the Medical Research Council's Laboratory Animals Centre. The authors, Keith Hobbs, former primate officer to the Laboratory Animals Centre, and John Bleby, LAC director, made their survey in 1969–71, during which time 10,000 non-human primates were used annually – 1 per cent from the UK, 99 per cent from the wild and 94 per cent of seven species. Supplies are now limited by export bans coupled with a shortage of wild animals, but wild animals also pose disease hazards. The report is obtainable free from MRC Laboratory Animals Centre, Medical Research Council Laboratories, Woodmansterne Road, Carshalton, Surrey SM5 4EF. (See page 449 of this issue for a report on primate ranching.)