between 34 and 40°F, dying when it rises above 66° or drops below 23°.

Limited by cold

Haddock are less adaptable, being limited to roughly 32° to 50°F and most numerous between 30° and 45°.

The cold edge of the Arctic current limits their northern range. Hake prefer even warmer water than either of the previous fish. The Pacific salmon is limited to a surface ocean summer temperature below 59°F rather than by near freezing.

The significance off Peru is that on the west coast of South America cold waters from the polar south intrude into sub-tropical seas and are encountered as far north as latitude 5 deg. S, hence the vastly different fishery compared with Liberia on the West coast of Africa, which is in the same latitude.

For maximum productivity, the surface waters of tropical and sub-tropical ocean regions require a certain amount of cold water mixture, either brought by currents from the cold polar regions, like the Labrador Current meeting the Gulf Stream off the Great Banks of Newfoundland, or by upwelling from cold, deep sub-Antarctic or Arctic waters.

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APPROACHES TO CONSERVATION

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In response to the interest in conservation expressed by a number of resolutions submitted to the preceding ANZAAS meeting in Canberra, the organizing committee for the Hobart congress decided to make conservation a major feature of its program. An all-day symposium was held in the Hobart Town Hall as a joint meeting of eight of the sixteen sections (C, D, F, H, K, L, M, and P), and later in the week Professor J.S. Turner (University of Melbourne) lectured on conservation at an evening meeting open to the public. Section programs also included lectures and symposia dealing with problems relevant to the conservation theme.

Conservation is a very broad subject. Professor Turner defined it as "the wisest possible use, over a long term, of all our natural resources, applied for the benefit of man". At the symposium, eight contributors illustrated some of the problems that arise in attempting to practise this, in fields ranging from architecture to zoology. Mr. Dirk Bolt, a Canberra architect, outlined the proposals made by Unesco in 1962 for the maintenance of scenic values in natural rural and urban areas throughout the world, and considered these in terms of the Australian environment. Australians, he said, care little for the visual impact of their landscapes, accepting man-made ugliness as inevitable, if it is noticed at all; they tolerate such evils as pollution of rivers and lakes, dumping of rubbish in the countryside, and wanton destruction of natural vegetation and wildlife. The Unesco proposals call not only for the preservation of scenery in National Parks, but also for a program of public education and legislation to ensure the conservation of landscape and amenity throughout the countryside, and if possible to repair some of the damage that has already been done. Outside the Australian Capital Territory (where these matters are the responsibility of the National Capital Development Commission) adequate steps have not yet been taken to ensure the conservation of Australia's varied landscapes.

In terms of biological resources, which are self-renewing if properly treated, conservation is something more than preservation. This point was developed by Dr. J.M. Gilbert, of the Tasmanian Forestry Commission, who described methods of forest management in relation to the conservation of wildlife and scenery. Management procedures include the strategic use of fire, which is often the only effective way of ensuring regeneration of Tasmanian eucalypt forests, as well as being a means of reducing the risk of widespread devastation by accidental bushfires. Modern forestry practices seek to create a mosaic of forest types at various stages of maturity in order to provide a sustained yield of timber; the result is a landscape that can remain varied and interesting, with a wide range of wildlife habitats.

In recent years it has been recognized that wetlands (shallow inland water areas, including lakes, rivers and swamps) are of considerable economic, as well as ecological significance. They produce fish and fowl, they harbour a flora and fauna of scientific and educational interest and they provide opportunities for a variety of recreational activities, such as sailing, duck shooting and angling. In western Europe the International Union for the Conservation of Nature has recently completed Project MAR, an inventory

of wetland resources, as a basis for a conservation program for these areas. Dr. A.H. Weatherley, of the Australian National University, discussed wetlands in Australia, and outlined some of the biological consequences of human interference - the draining of swamps, the damming of streams, and the pollution of rivers and lakes. It is possible that losses and modifications of natural wetlands are made good by the creation of artificial lakes and farm dams, particularly if these are managed in such a way as to maintain the values of natural ecosystems, but at present we know little of Australia's wetland resources and a comprehensive survey is necessary as a basis for a national policy of wetland conservation. Some of the physiographic and ecological problems posed by this kind of area were discussed by Dr. G.R. Cochrane and Dr. G. Robinson, of the University of Melbourne, in a paper on the Hattah Lakes National Park in Victoria, an area where ecological conditions are determined by recurrent natural flooding from the River Murray.

Conservation of wildlife seeks to maintain a balance of plant and animal species in a community without impoverishing their habitat; it aims to avoid the risk of species extinction on the one hand and multiplication to pest proportions on the other. Dr. H.J. Frith, of the C.S.I.R.O. Division of Wildlife, took up this theme in relation to the conservation of kangaroos in mainland Australia. Recent surveys of kangaroos in various habitats suggest that their numbers are being generally maintained, and in some areas where the kangaroo population has become excessive and apparently in direct conflict with agricultural interests, the need for control has led to harvesting of kangaroos for meat and hides. Dr. Frith presented preliminary results on the extent to which sheep and kangaroos are really in competition, and suggested that the adverse effects of kangaroo grazing on production from sheep have been exaggerated. Controlled management and harvesting in rural areas, coupled with protection in wildlife reserves, can ensure the survival of kangaroo species, most of which are still abundant. There is evidence, however, of a decline in the population of the red kangaroo, and there should now be some restraint on the harvesting of this species.

The difficulties of preventing species extinction were illustrated by Mr. K.H. Miers, of the New Zealand Wildlife Branch, with reference to several "threatened species" of birds, some of which survive only in very small numbers on an island off the New Zealand coast. Repeated surveys are necessary to ensure that these do not die out, particularly in islands invaded by predators, notably rats. The Wildlife

Branch has transferred rare birds to rat-free islands which have been acquired as reserves, and attempts are also being made to perpetuate rare species by breeding them in captivity.

Dr. A. Mitchell, of the Soil Conservation Authority of Victoria, dealt with the management of grazing country as an example of the effort to secure a sustained yield from natural resources. Grazing potential is determined largely by the inherent capacity of land: overgrazing impoverishes pastures and initiates soil erosion, whereas undergrazing allows scrub and forest vegetation to invade pastureland. An ecological approach aims to adjust grazing to the pattern of ecosystems in a particular area; the land may be divided into natural sites, with assessed grazing potential and erosion hazard, and grazing can be managed in terms of these rather than abritrary paddock divisions.

Finally, Dr. J.G. Mosley, of the University of Newcastle, gave an account of the Tasmanian National Park System. Tasmania has a number of large National Parks, representative of most of the natural landscape types, and so far little modified by man, largely because of difficulties of access. It is likely that, as visitor numbers increase, demands will be made for the extension of tourist roads and the provision of recreational facilities in National Parks, and development of hydro-electric projects and timber exploitation will also be advocated. Dr. Mosley doubted if the existing administration will be equal to the task of maintaining the National Park system in the face of such pressures, without improved legislation to protect these areas, and a professional National Park service to administer them. Careful planning will be necessary to ensure that development does not destroy the existing character of the National Parks, and that adequate attention is given to designating wilderness areas, managed wildlife reserves, and natural scenic areas, as well as providing facilities for public use.

The symposium showed that conservation has many facets. The underlying theme was the desire to maintain, and if possible enrich, the quality, productivity and cultural and scientific interest of man's environment. Soil conservation, water conservation, the conservation of mineral resources biological conservation, landscape conservation, and conservation applied in forestry and agriculture were all seen to be aspects of the broad problem of achieving a balanced, long-term utilization of natural resources. In Australia, progress is being made in terms of soil and water conservation, and efforts have been made towards the conservation of wildlife

and scenery, but misuse and exploitation are still rampant, notably in the semi-arid interior of the continent. We are still without an adequate and representative series of Australian National Parks and Wildlife Reserves; and those we have are not yet properly staffed and managed. We have still to learn how to implement conservation, in its various forms, in the Australian landscape generally, and especially around our coasts. We need to develop a more positive approach to the problems posed by the growing demand for facilities for outdoor recreation. Some of these themes are likely to be taken up by the newly-established Australian Conservation Foundation, which hopes to stimulate and encourage the surveys, research projects, management programs, and educational effort needed if conservation is to become widely understood in Australia, and practised as the only rational approach to the utilization of our natural resources.

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