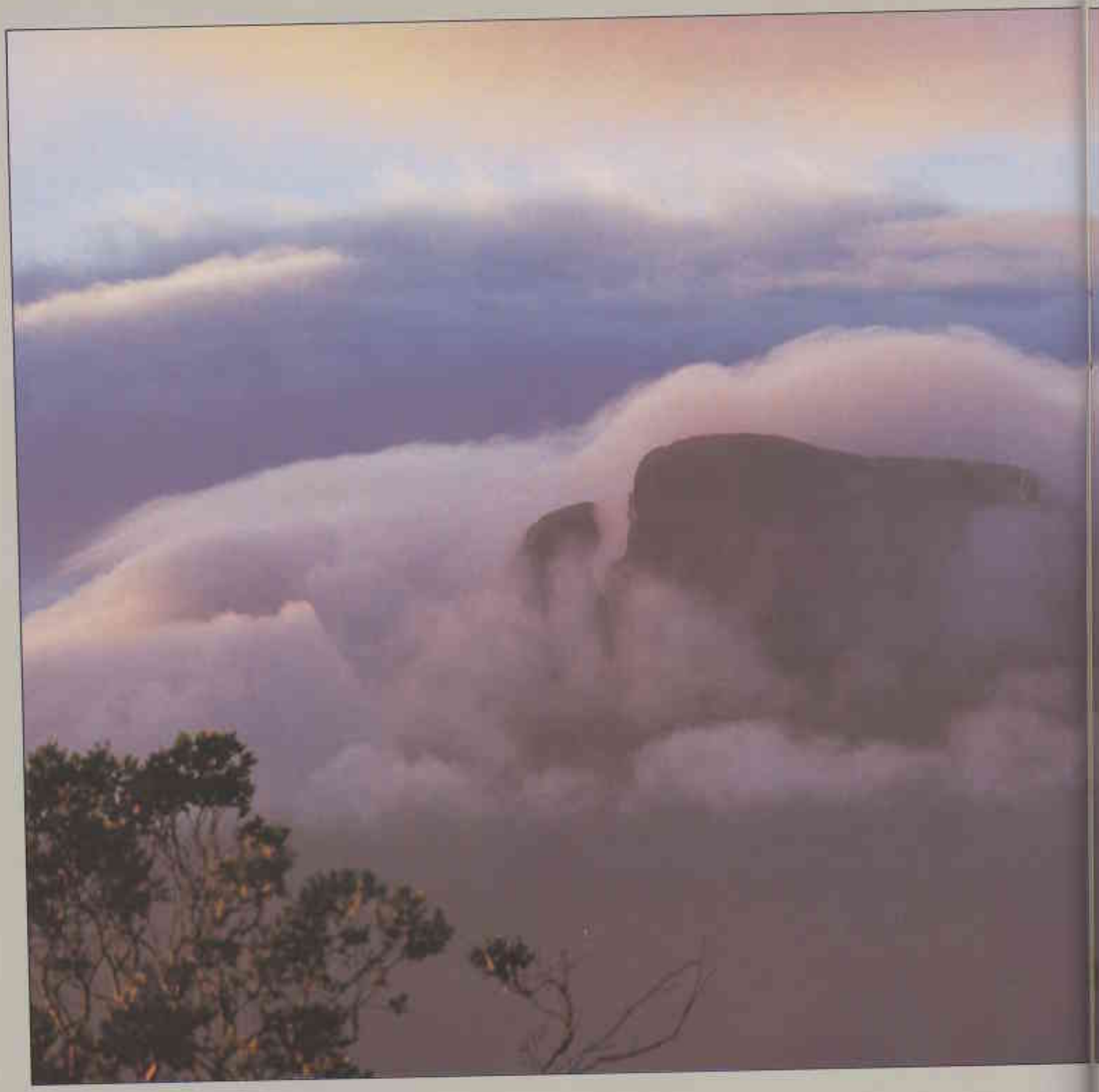
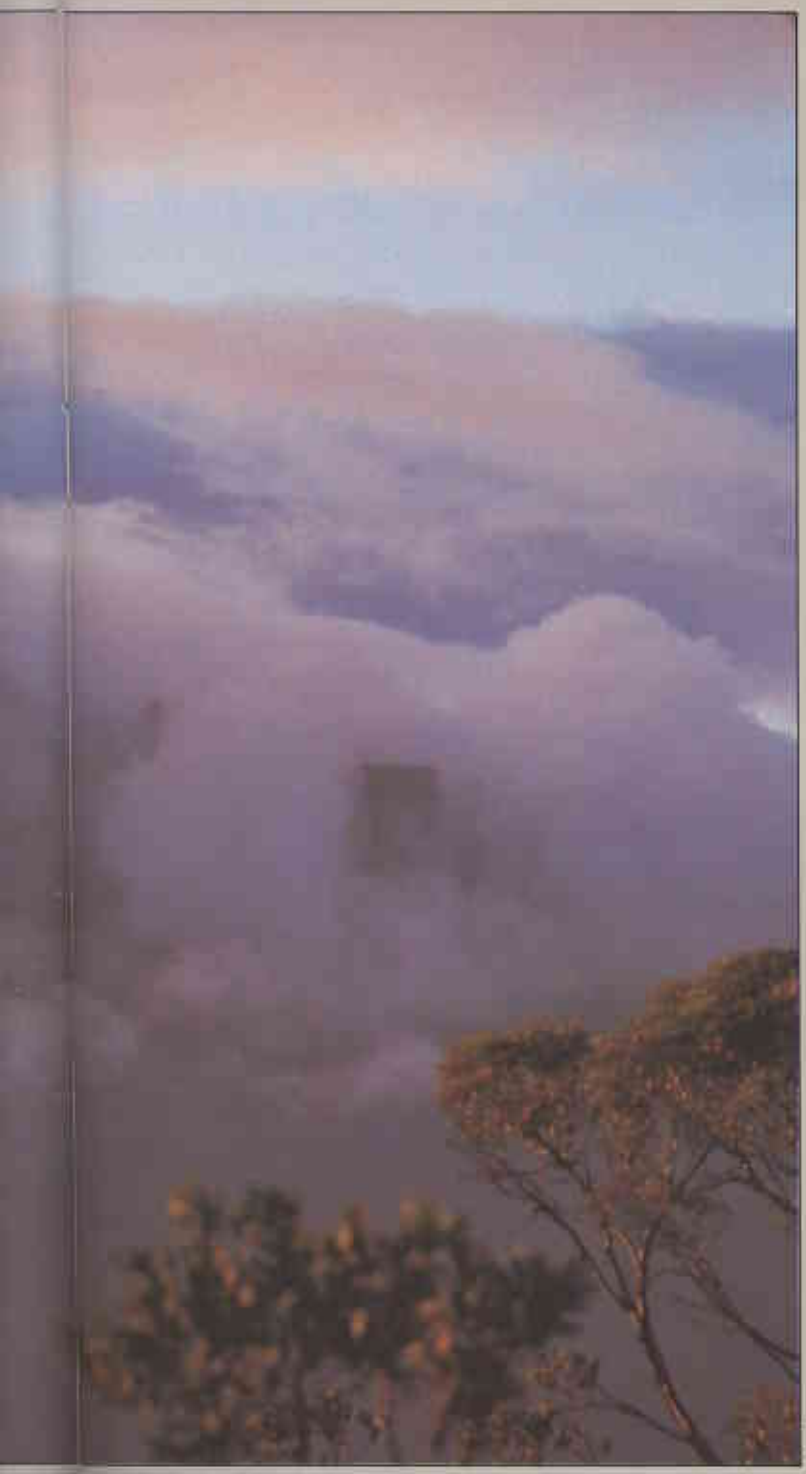


RELICS OF A LONG LOST

by A.R. Main (Emeritus Professor of Zoology)
and
B.R. Wilson (Director of Nature Conservation)



Alan Rose

T LAND

We expect 'long, long ago' to be the opening of a fable or fairy story rather than the beginning of an account of a regional natural history. Yet such a beginning is entirely appropriate for a natural history of southern W.A.

The ages of the rocks of the great shield or Darling Plateau of south W.A. are mostly to be measured in thousands of millions of years. The oldest rocks such as granites or dolerites were formed soon after the earth cooled and have been far below the land surface for much of their history. Even the ancient sedimentary rocks of the Stirling Ranges, Mt Barren or Mt Ragged, which rise above the level of the plateau, are more than 1000 million years old. During the whole of this time the land surface appears to have been remarkably stable and there have been no episodes of mountain building.

It is possible to recognise on the south-western plateau remnants of ancient drainage patterns formed at successive stages as long ago as the Permian Period (230 million years). While the land surface has remained stable enough for the old drainage lines to be identifiable, the land has not always been a peninsula of an island continent jutting into the Indian Ocean.

Long ago, in the Mesozoic Era (65-230 million years) the continents were distributed very differently on the surface of the world. Australia was part of a great, lushly vegetated southern continent, Gondwana. But in the Cretaceous Period (65-140 million years ago) Gondwana cracked asunder and huge fragments of it drifted apart to produce the present Indian, African, Australian, New Zealand and South American land masses. The large piece, now known as Antarctica, remaining at the pole has since become ice-bound and almost lifeless.

The drifting land masses carried with them elements of the original fauna and flora of Gondwana.

Since isolation of the Australian land mass many new groups of plants and animals have evolved here, unaffected by evolutionary events on other continents, giving rise to the very distinctive modern Australian flora and fauna. But some of the original Gondwana forms survived, their nearest living relatives, if any exist, being found in those other land masses derived from fragmentation of the ancestral southern continent. Southern Australia, in particular, is richly endowed with Gondwana relics. Some of these relict animals and plants are widespread across the Australian landsape but many are confined to small areas, often in damp cool gullies. In south-western Australia many are confined to swamps associated with the ancient drainage patterns.

At the time of the continental fracturing the living conditions for the flora and fauna were dominated by a warm moist non-seasonal climate, not a seasonally arid one as at present. This is one reason why so many Gondwanaland relics have restricted and patchy distributions in modern times, and why they tend to be confined to damp gullies or swamps. Other factors explaining their patchy distributions relate to events associated with the fracturing and drifting of Gondwana fragments. Some of these events are set out below.

The break-up of Gondwana took a long time. It commenced with a series of faults that developed into rift valleys which separated the present-day continental plates. Before the plates began to move, rocks beneath and adjacent to the faults melted, and the plate margins sagged. When this happened oceans flooded the margins of the new continental masses forming epicontinental seas. In south-western Australia the sea covered the edge of the continent until about 35 million years ago. Marine sediments of Eocene age (37-53 million years), such as the spongolite beds of the Mt Barker area and the Fitzgerald River National Park, are present day evidence of this.

Along the southern coast of W.A. there are a number of peaks rising above the plateau. From west to east there are the Stirling Ranges, Porongorups, West, Middle and East Mt Barren, the Fitzgerald Peaks (Peak Charles and Peak Eleanor), Mt Ragged, Russell Range and Mt Bland. Some of these are surrounded by Eocene marine deposits. Many have a wave-cut platform about 300 m above present sea level representing the position of the shore at that time, formed when the seas were higher at a time of deposition of the spongolite beds.

The peaks above the level of the wave-cut platforms were Eocene islands. But now they are connected across a landscape which became exposed when the epicontinental Eocene seas retreated. Their high gullies have provided refuge for many Gondwana relic species or their descendants since the Cretaceous.

The last time the seas affected the continental margin was during the past two million or so years during the Pleistocene Ice Age. During that Age sea-level fell or rose several times as the polar ice sheets grew and withdrew water from the oceans or melted and returned water to them. The modern islands off the south and west coast, e.g. the Recherche Archipelago, were connected to the mainland when seas were lower, as recently as 10000 years or so ago. At earlier times the seas were higher and many of the granite hills of the south coast would also have been coastal islands. Many modern swamps occupy former marine embayments which would have been rather like Princess Royal Harbour, Wilson, Nornalup and Broke Inlets of today. A good visual impression of this set of archipelagoes can be gained on a cold spring morning when the hills of the south coast emerge from the mists which fill the low-lying swampy areas in the same way that the higher seas did in those earlier times.

The history of the landscape and its biota is thus one which truly began long, long ago.

Very often relict species survive in small isolated populations. Many of them are inconspicuous creatures and we know little about them. Some have not yet been described at all. Such living relics have particular interest for scientists and conservationists. As archives are a source of historic information to the historian, relict species are a source of information to the student of the history of life on earth. They give us insights into the evolutionary histories of the groups to which they belong, for in their body structure, life history and ecology they preserve ancient lifestyles otherwise long since gone. They preserve in a living state, genetic material very different from that of the majority of the modern flora and fauna, and they deserve a special place in our conservation programs.

In this article a few classical examples of Gondwana relics are illustrated. In subsequent articles we will deal with particular Gondwana relict groups of special interest, and other relics of groups which lived in the coastal parts of south-western Australia in those early periods which followed separation of the Australian land mass. □

Mud minnow — *Galaxiella munda* McDowall

The mud minnow and its relatives in the family Galaxiidae are southern hemisphere relatives of trout and salmon. The present distribution of galaxiids provides good evidence of their Gondwanaland origin. The mud minnow inhabits streams and swamps between Albany and Augusta.

G. Allen

B. Main

The ancient Gondwana trap-door spider family Antinopodidae evolved during the period after Africa split away from the ancestral southern continent. Today one relict group, *Missulena*, survives in Australia.

Species of *Missulena* are widespread in Australia. Females are squat, clumsy and stout legged; males are smaller and longer legged. They make deep vertical burrows with double doors. Seated inside the entrance the spider detects the presence of prey (insects) moving on the ground above, often with the aid of silken 'trip threads'. Unlike other trap-door spiders, *Missulena* young disperse with the wind on silky threads from the mother's burrow.

Cliff Winfield

Bothriembryon glauerti crawling among leaf litter in Stirling Range National Park after rain.

Bothriembryon is a genus of native land snails confined to southern Australia. There are many species in south-western Australia and a few in the south-east. They belong to the family Bulimulidae which is also represented in South America. It is believed that the family originated in ancient Gondwana and that *Bothriembryon*, the sole surviving group in Australia, has radiated successfully in southern Australia since isolation. These snails mostly live in damp gullies where they feed in the leaf litter. Many are restricted to very small areas. A number of species have become extinct in this century because of land-clearing. The illustrated species is one of those whose future is secure in a reserve.

Wild plum *(Podocarpus drouynianus)*

This plant is a true relict of the ancient flora of Gondwana. The family Podocarpaceae thrived in Gondwana a hundred and fifty million years ago. In modern times its centre of distribution is the southern hemisphere. *Podocarpus*, one of the larger surviving genera, is found in southern and eastern Australia, southern Africa, South America and indo-Malaysia. Many of the species are large trees but the sole surviving W.A. species is *P. drouynianus*, a small multi-stemmed shrub common in the south-west forests. It is a conifer. Male and female cones are borne on different plants. The female cone (illustrated) is borne on an enlarged succulent base which is sweet and edible, giving the plant its common name.

S D Hopper

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COVER PHOTO
Shipwreck at Broome (Jiri Lochman).

EDITORIAL

For more than 100 years W.A. has recognised the importance of protecting significant areas of its natural heritage.

Today, about 4.5 million hectares of our State is classified as national parks, vibrant natural museums ranging from the hardwood forests of the south-west to vast inland deserts that represent our unique terrestrial flora and fauna.

Until now, however, there has been a missing element: the marine environment.

Clearly, its absence has made our park system less representative of W.A.'s environment, especially considering that the State has some 12700 km of coastline.

Recently a start was made to address this imbalance with the official opening of the Marmion Marine Park, W.A.'s first marine park.

The primary objective in establishing this park, which is located on metropolitan Perth's doorstep, is to conserve significant examples of our marine heritage, and to encourage public understanding, appreciation and continued enjoyment of the marine environment in ways which will leave it unimpaired for future generations.

These same values apply to the proposed Ningaloo Marine Park which is situated along 260 km of the State's coastline south of Exmouth. Ningaloo will be vested in the National Parks and Nature Conservation Authority as a marine park in July.

Both of these marine parks not only allow for the development of proper management techniques to protect the marine environment, but also to enhance recreation.

Marmion reef has long been a popular holiday destination for many Western Australians who fished for the huge groper and crayfish offshore, and swam in the protected lagoons.

Ningaloo might be less well known because of its isolation, but the tourist industry is expected to promote this area of our coastline and the adjacent Cape Range National Park and, as a consequence, it will become one of the State's premier tourist attractions.

The establishing of marine parks will provide many benefits.

Some intangible, such as the knowledge that future generations will be able to appreciate areas of unspoiled natural beauty.

Others more tangible, such as the enjoyment of visiting a marine park.

There will also be benefits in terms of jobs created and the expansion of a growing and viable tourist industry.

Furthermore, marine parks will provide ecological benchmarks for research into natural processes and into the relative effects of marine and coastal uses.

W.A. has a responsibility to protect special marine environments and to encourage public appreciation of these areas now and in the future.

Our marine parks will do this.