LAKE Gregory

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When it comes to waterbirds and birdwatching the Great Sandy Desert may not be a location that springs to mind, but with as many as 600 000 birds recorded in one month, Lake Gregory changes a remote corner of the Great Sandy Desert into a birdwatcher's garden of plenty.

In the north-eastern margin of the Great Sandy Desert lies Lake Gregory. It is a vast single lake with a series of smaller inter-connected lakes and forms a system so large that, even at high speed, it would take a powerboat several hours to travel its length.

The lake receives virtually all of its water from Sturt Creek, which has a catchment area of 65 000 square kilometres, mostly in the Northern Territory. The smaller Salt Pan and Djaluwan Creeks also provide some water from the area immediately east of the lake. As there is no outflow from Lake Gregory, its size and depth depend on the amount of water received from Sturt Creek, which flows only during flash floods. This dependence on the Sturt means that in recent years the water in the lake has fluctuated from depths of nearly ten metres to zero.

Lake Gregory has long been an area of significance to Aborigines. Because of its plentiful water, it was an important meeting place and there are many culturally significant sites associated with the lake.

The lake is named after Augustus Gregory, the first surveyor-general in Western Australia, who visited the lake in 1856. Since 1977, Lake Gregory has been under the control of the Aboriginal Lands Trust and is managed by the Djurabalan Pastoral Company. The continued presence of traditional owners, many of whom live nearby at Billiluna, Mulan and Balgo, gives the lake great anthropological value.

The lake also has a rich natural history. Currently, scientists from the Department of Conservation and Land Management (CALM) are researching many aspects of Lake Gregory: the invertebrates, the water levels, even the algae, and of course, the lake's most dramatic feature - its incredible abundance of birdlife.

A MOST POPULAR WATERING HOLE

As long as there is water in Lake Gregory there are birds, and in this respect the lake is undoubtedly one of the State's natural history wonders. The lake regularly supports in excess of 100 000 waterbirds - more than any other inland wetland in Australia.

For the birdwatcher, the odd contrast of being on such a vast stretch of water surrounded by a desert seems only to enhance the experience. And what an experience it is. In March 1988 approximately 600 000 waterbirds were seen there. So far, 67 species of waterbird have been recorded on the lake. Of these, 13 species have been found breeding. Birds like Caspian terns (*Hydroprogne caspia*) and Australian pelicans (*Pelecanus conspicillatus*) can be found breeding at the same time as pied cormorants (*Phalacrocorax varius*), magpie geese (*Anseranas semipalmata*) and grey teal (*Anas gibberifrons*). As well, many terrestrial birds take advantage of the available water and gentler environment.

Although the waterbird population at Lake Gregory is usually dominated by

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Photomosaic view of Lake Gregory and associated lakes.
Photo - AGL Petroleum
Inset:
Great egret (*Egretta alba*) in breeding plumage.
Photo - Michael Morcombe

Top: Grey teal (*Anas gibberifrons*) is one of the most abundant waterbirds at Lake Gregory.
Photo - Jiri Lochman

Right: Spinifex - east of Lake Gregory, near Mulan community.
Photo - Stuart Halse

Below right: Flooded eastern shoreline of the Lake.
Photo - Stuart Halse

Top: Australian pelicans (*Pelecanus conspicillatus*) are a common sight at the lake.
Photo - Jiri Lochman

Middle: Red-capped plovers (*Charadrius ruficapillus*) occur regularly along the shore.
Photo - M & I Morcombe

Bottom: Large flocks of hardheads (*Aythya australis*) are a characteristic sight at Lake Gregory.
Photo - M & I Morcombe

ducks and fish-eating birds, such as cormorants and terns, very large numbers of migratory waders sometimes occur. For example, 10 000 to 15 000 sharp-tailed sandpipers (*Calidris acuminata*) were observed in March 1988 and a further 8 000 were recorded in October 1989, together with 26 000 oriental plovers (*Charadrius veredus*). The lake seems to be a significant staging point for the less marine species that do not congregate on the beaches. Comparatively large numbers of some rare species, such as long-toed stints (*Calidris subminuta*) and marsh sandpipers (*Tringa stagnatilis*), also occur.

One of the most striking things about the birds of Lake Gregory is the large number of brolgas (*Grus rubicundus*). They are often counted in the thousands. The lake can also produce surprises, such as a count of almost 900 freckled ducks (*Stictonetta naevosa*) in August 1986. Waterbird surveys will document the species using the lake, the time of year they use it and their numbers.

WHY SO POPULAR?

Another aspect of the research program is the question of why so many birds use the lake. One likely reason is the occurrence of fringing trees that are inundated when the lake floods and provide nesting and roosting sites. Another reason is the enormous productivity of Lake Gregory.

After major inflows there are large algal blooms before aquatic plants such as *Myriophyllum* and species of Characeae become established. Silt deposited in the lake by the creeks that enter it increases productivity. The algae and larger plants probably provide much of the food source for the enormous number of aquatic invertebrates and fish in the lake, as well as for some birds. Determining these dietary links and the level of productivity, found in tropical lakes where water temperatures are high and animals and plants grow rapidly, are two other parts of the research program.

Lake Gregory's enormous population of invertebrates is well adapted to the lake's changing conditions. When the system floods it contains very fresh water, but with evaporation, salinity increases until, just before it dries, the lake is as salty as seawater. When water is fresh, there are many microscopic species of crustacean and larval stages of insects. As salinity increases, the numbers of species of crustaceans and insects decreases. However, some species become very abundant, maintaining the high invertebrate biomass. The aquatic invertebrates of northern Australian lakes are poorly known. Another aim is to document the invertebrate species present in Lake Gregory and determine at which stage of the flooding and salinity cycle they occur.

FLUCTUATING WATERS

The natural history of Lake Gregory is not limited to plants and animals. The study of the lake's palaeohydrology, that is, the history of water levels, provides a

window on the past and can help us to understand the effects of changing rainfall levels in the future.

Several features make Lake Gregory particularly useful as a record of the past. In this region, climate is an expression of the intensity and position of the monsoon. As the monsoon moves south, desert areas receive rain and as it moves north conditions become drier. The catchment area of Lake Gregory lies on the southern margin of the usual position of the monsoon and, hence, rainfall in the catchment is a sensitive indicator of monsoonal intensity.

Recent research has shown a strong connection between monsoonal regimes and solar radiation. According to computer simulations, there was a substantial decrease in the amount of solar radiation received in tropical parts of the southern hemisphere some 9 000 years ago. It is likely that in north-western Australia the monsoons contracted north and decreased in intensity. Research at Lake Gregory will map and date fluctuations in the size of the lake system, determine the implications in terms of the amount of rainfall, and examine whether the lake area corresponds with changes in solar radiation.

This research is relevant to present-day concerns, such as the 'greenhouse' warming, predicted by some scientists. Two periods in the lake's history - one from about 5 000 to 9 000 years ago, the other from 125 000 to 135 000 years ago - were periods when the global climates are thought to have been warmer than today. Knowledge of rainfall patterns during these periods may assist agricultural and economic planning.

DESERT DUNES

Paradoxically, much of the history of water levels is revealed by the surrounding desert. Low dunes on the downwind side of the lake were created from windblown sediments. There is a dune 25 kilometres west of the existing lake system that marks the shore of a mega-Lake Gregory - 15 times larger than it is today. Rainfall must have been much higher then, but it is not clear exactly when this mega-lake existed. Material from the dune and bivalve shells from the old lake bed suggest it occurred at least 30 000 years ago.

The desert around Lake Gregory contains regular transverse east-west dunes. The same process, associated with dry conditions that created the desert dunes, created smaller transverse dunes within the area of the mega-lake after it contracted. Most of the small dunes are about 18 000 years old. The existing lake floods out into the small dunes on the south-east side, and this is particularly significant. For the dunes to have become established, the lake must have been smaller at some stage during the past 18 000 years than it is today.

There is a wealth of geological information available from Lake Gregory. So far research has concentrated on comparatively recent climatic events, but the system is old and a 90-metre-deep core of lake sediments, recovered in the 1960s, may provide information covering the last ten million years.

The combined research into birdlife, invertebrates, algae and palaeohydrology should give us a better understanding of the significance of Lake Gregory. The results will provide a clearer picture of the past and present, and possibly some important insights into our future. ■

Top: Fish-eating species, such as this great cormorant (*Phalacrocorax carbo*), occur in large numbers.
Photo - M & I Morcombe

Above: Algal scum floating on the surface near the eastern shore of Lake Gregory.
Photo - Stuart Halse

Left: Pink-eared ducks (*Malacorhynchus membranaceus*) are a common inland species that can be very numerous at Lake Gregory.
Photo - M & I Morcombe

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LANDSCOPE

VOLUME EIGHT NO. 2 SUMMER ISSUE 1992-3

Twenty-three captive-bred chuditch were recently released in the Julimar forest in an attempt to establish a new population. The story of the 'Return of the Chuditch' is on page 10.

In a remote corner of the Gibson Desert lies Lake Gregory, a birdwatcher's paradise. See page 16.

A silent workforce of volunteers assist CALM with a multitude of projects. Colin Ingram tells us more about these 'Volunteers for Nature' on page 28.

'Back in the Outback' (page 34) follows the trail of endangered mammals recently reintroduced into the Gibson Desert from Barrow Is.

The urban cat vies with its feral cousin and the fox for top spot in the predator stakes. See 'Masterly Marauders' on page 20.

FEATURES

REGULARS

COVER

*The chuditch (*Dasyurus geoffroii*) was once found in every State and Territory of mainland Australia. Now it is only found in the jarrah forest and parts of the southern wheatlbelt in the south-west of WA - about two percent of its former range.*

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