

## Dry swamps and duck-breeding

In the world's driest inhabited continent, wetlands and their associated flora and fauna are things to be cherished. So draining a swamp has often appeared a disaster to lovers of Australia's waterfowl.

Biological studies had concluded that many ducks would only breed when the water level was rising, which seemed to fit in with common sense — obviously if the water level is rapidly falling a drought could be imminent and food will be scarce, so it's not a good time to bring young into the world.

However, recent studies have challenged the assertion that a rising water level is always necessary for duck-breeding in Australia, and the new results may have an important bearing on the management of some of our wetlands.

The original idea was that a rising water level would stimulate the production of

food on the newly flooded ground, and the subsequent sudden improvement in nutrition would stimulate breeding. Observations suggested that different species of duck bred at different times in the flooding cycle, in part according to their feeding specialisations.

Thus the grey teal would breed as the water rises, the Pacific black duck near peak water level, and the pink-eared duck as the level started to fall. Other ducks, such as the blue-billed, were considered to breed at regular intervals regardless of the water level.

Of course, biologists have also recognised that other factors have a bearing on the matter. For example, as with many other animals, an increasing day length is very important (outside the tropics), because it heralds the start of summer. The waterfowl breeding season in temperate Australia generally runs from about July to December.

Mr Frank Crome of CSIRO's Division of Wildlife and Ecology has re-examined the whole question of water level

and breeding by studying waterfowl for about 4 years — from the beginning of 1976 to the end of 1979 — in a complex of swamps near Booligal, in western New South Wales. He has found that water-birds do not breed on a rising water level *per se*. The situation is a little more subtle.

Rising water level will induce breeding only if a complete drying up of the wetland occurred beforehand. A rise in water level in an already well-watered swamp will have no effect. A good drawdown and thorough drying out are the necessary factors. Such drawdowns can result from evaporation of all the water, or deliberate drainage, or an artificial reduction in water flow into the system.

For his investigation Mr Crome recorded water levels at Lake Merrimajeel and the Murrumbidgee Swamp near Booligal. Every 4 weeks he and his assistants sampled plankton and nekton at 20 different sites in the lake. At the same time, they monitored the nesting activity of the

waterfowl by checking 200 nest sites — namely holes in river red gums — around the whole study site, and noted the number and stage of development of the eggs.

As unhatched eggs remain in the holes, it was possible to calculate hatching rates. (Dr Wayne Braithwaite and Mr Mark Clayton, also of the Division, had previously found and marked these nesting holes.) The scientists also regularly recorded the vegetation present in the zone around the lake.

The results show that the greatest bout of breeding occurred in 1978. This was on a rising water level, but, crucially, it followed a complete drying of the swamps at the end of the previous summer.

In 1977, breeding also took place during a rise in the water — which began from a depth of 1 metre — but proved far less prolific than in 1978.

The 1976 season, not very productive, occurred in conjunction with a slight fall, as did the 1979 season, which was a bad one despite the water remaining quite high.



A selection of our ducks — clockwise from top left, the blue-billed duck, the grey teal, some pink-eared ducks, and the black duck. (Photos by Graeme Chapman.)

But 1978, following the drawdown, as well as being very much more successful for the four duck species that bred in the other years, was the only year in which the pink-eared duck, the freckled duck, the Australasian shoveller, and the great-crested grebe bred at all.

From his surveys of water organisms and shore vegetation, Mr Crome has come up with a reason for all this. Put simply, the flooding of a dried-out area triggers an explosion of productivity in the system.

This is because the whole swamp community — which in his study area is dominated by ribbonweed plants, fast-swimming insects, and fish — dies with the loss of all the water, resulting in a decomposing but nutrient-rich bottom ooze. Dryland vegetation may then start growing in the basin, but eventually the area floods again and the organic compounds from the decay of the previous community (and any dryland vegetation) allow the development of

populations of detritus-eaters such as chironomids — a type of midge with an aquatic larval stage.

Later, aquatic plants develop and other invertebrates proliferate, and with time the system changes back into its mature phase of ribbonweed and fish.

Now, the adults and young of many duck species can easily harvest the abundant

chironomids. They find the invertebrates present at other times, although edible, harder to collect in such numbers.

So the chironomid bloom enables the ducks to take in a large quantity of nutrients very quickly and with little effort. They don't have to wait for a classic food chain to establish itself — with plants growing first, followed by plant-feeding invertebrates and finally fish.

The chironomids are also a godsend for the young ducklings hatched after the reflooding, which find it difficult to catch fast, free-swimming invertebrates and are inexperienced at foraging.

Other water-birds, such as herons, have different tastes, and the peak of their breeding often occurs when chironomid populations have fallen. For them, frogs and large crustaceans may be more important.

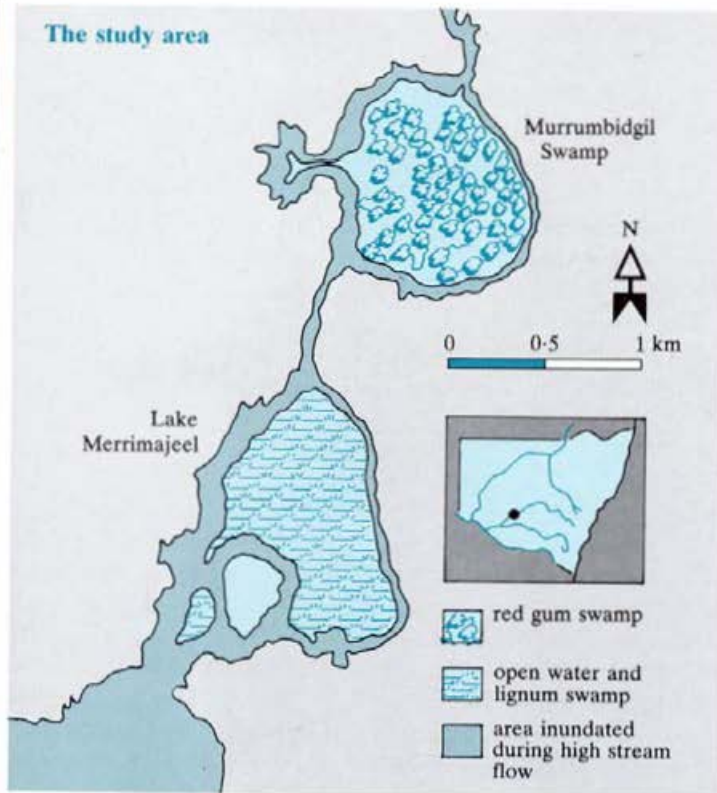
Mr Crome's conclusions mean that the ecology of duck-breeding in Australia is more like that in the rest of the world than we first thought. The importance of flooding after a drawdown is well known in North America and Europe.

Mr Crome thinks that, instead of talking about grey teal needing a rising water level to breed, and pink-eared ducks a falling one, we should now emphasise the occurrence of drawdowns, the production of detritus, and the feeding abilities of the ducks, and how these interact with other

River red gums in the swamp near Booligal where Mr Crome carried out his studies.



### The study area



Mr Crome's study area in inland New South Wales.

determinants of breeding, such as day length.

The drying out of a swamp is not good news for all creatures. Mr Crome found that it definitely disadvantaged water-birds that specialise in eating fish.

So, although deliberate draining of a swamp to stimulate breeding could be a powerful management tool, it would need to be carefully planned. We should not do it before the breeding season has finished.

The young must have time to mature to a state where they can leave the dry swamp. A late-summer or early-autumn drawdown would be the most useful for waterfowl-breeding in the next season.

Of course, some swamps must remain as drought refuges for all birds. However,

a swamp that is contracting, in which only a little water remains permanently, may prove the worst of both worlds. It will be a poor drought refuge, but, because it does not dry out completely, next year it will only provide a good breeding ground for fish-eating water-birds and not ducks.

Certainly mankind's efforts in permanent swamp drainage and river control are posing serious threats to waterfowl conservation, but on a local scale the drying up of a swamp at the right time of year need no longer be seen as a disaster.

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Australian waterfowl do not necessarily breed on a rising water level. F.H.J. Crome. *Australian Wildlife Research*, 1986, **13**, 461-80.