

The Canberra Fisherman

Bryan Pratt



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Bryan Pratt

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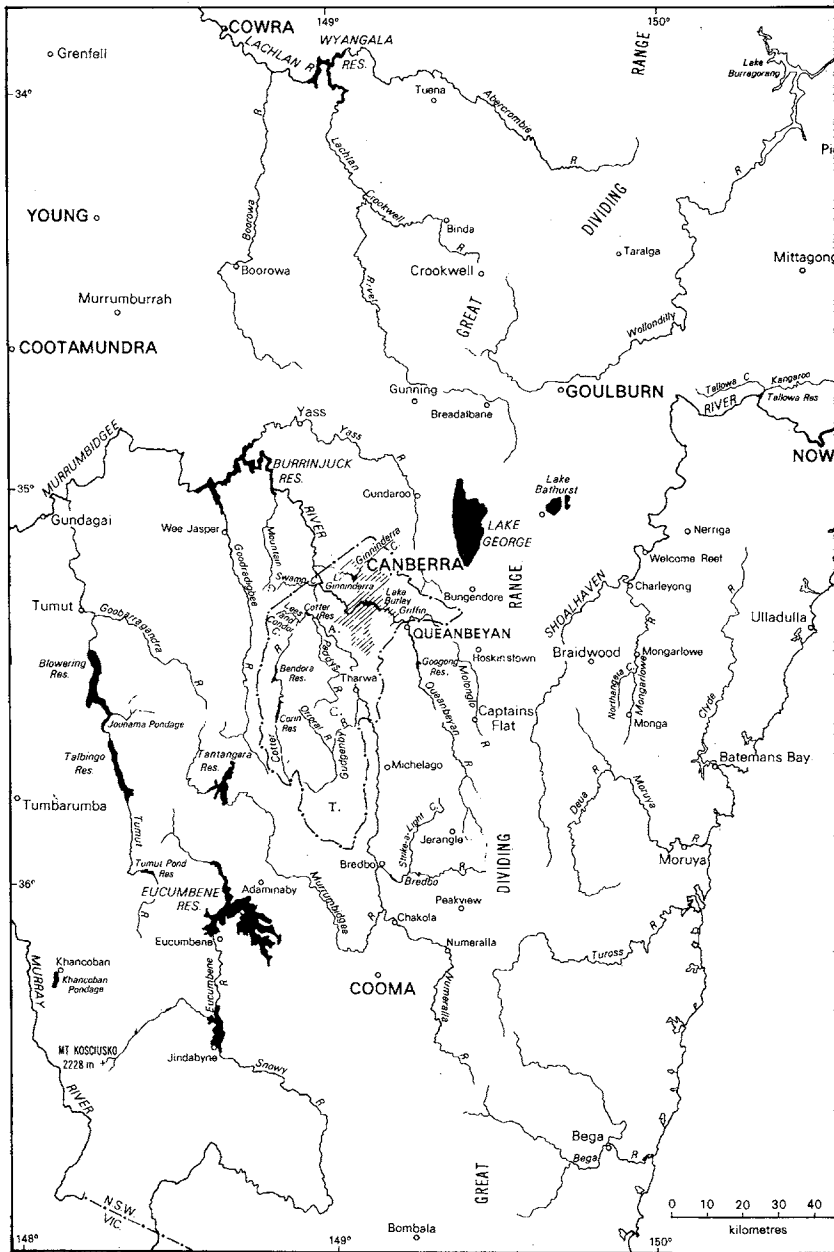
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Throughout this book I have drawn heavily on the writings and knowledge of various scientific colleagues in universities, CSIRO and State and Territory fisheries organisations. I greatly appreciate their assistance and particularly that of the NSW State Fisheries which, by pioneering the studies of the reproductive and other habits of indigenous fish in particular, has led to a whole new understanding and appreciation of this unique group of Australian animals. The fact that they have managed to maintain many of the significant indigenous fisheries and simultaneously develop and maintain a series of quality trout fisheries in this, the driest continent on Earth, is a tribute to their skill and dedication.

Finally, my thanks to my wife and three children who take no notice whatsoever when Dad manages to catch a good fish, but laugh uproariously when he doesn't. They exemplify the enjoyment and satisfaction of what this funny game of angling is all about, and what this book is intended to portray.



The Canberra region

Introduction

If you are a fisherman and have the good fortune to visit Canberra then you will find yourself in good company. Nobody is quite sure how many fishermen there are in the ACT but estimates based on NSW surveys suggest that approximately 30 per cent of the population fish at some time of the year and on this basis there should be about 75,000 people in the ACT who fish. This means that fishing is one of the most popular recreational activities in the community today, which is no mean feat considering the varied range of indoor and outdoor activities vying for public attention in the ACT.

Not all of these people are freshwater fishermen, of course. Nor are they all regular or dedicated anglers. Many are dilettantes in the sense that they fish intermittently, or when the opportunity arises, such as during a weekend or summer holiday visit to the south coast, or during a quick visit to one of the large lakes of the Snowy Mountains.

A surprising proportion, however, are keen and regular anglers. Some fish only in saltwater, some in freshwater, but many are adept at fishing both systems and take every opportunity to wet a line. Some of the really dedicated ones look forward to every weekend as a potential fishing outing and regard work as a minor irritation between fishing trips.

The popular appeal of fishing is not difficult to understand. It requires relatively little organisation, it can be practised with only a modest outlay on tackle and equipment, it is not particularly demanding in terms of skill or knowledge and it can be practised all the year round in a wide variety of lake and river environments near to home or far enough away to give anglers the sense of adventure or isolation that many find so pleasurable.

Angling attracts men, women and children of all ages and from all walks of life. In Canberra, public servants fish, construction workers fish, bus drivers fish, office girls and housewives fish, members of the diplomatic corps fish, and even a Prime Minister

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has been known to wet a line now and then.

A big appeal of fishing in Canberra is that it can be practised by all members of the family at the same time. Canberra has a relatively young population by comparison with other areas of Australia, and there is a continuing demand for activities which, whilst not too demanding, allow the family to participate as a group. Fishing is one of the few sports where this can happen and where mum, dad and the kids can all start off on an equal footing. At the same time, there is no special demand to participate if this is not desired, as fishing can be enjoyed both as a spectator and a participatory sport. If you have any doubts about the latter just stand around at any popular fishing location and watch the spectators in the gallery. Watch how quickly the crowd swells when a fish is caught, and watch the expressions of interest and pleasure on the faces of people as they share in the delight of the successful angler. Watch also how quickly they then disappear for a while then reappear with rod and reel to join in the fun.

One of the special delights of fishing is that the anglers are able to set personal goals for achievement and pursue their sport at any chosen pace largely free from outside interference or pressure. This is because of the differing degrees of satisfaction inherent in the sport, both spiritual and material, and because it is an activity with relatively few rules or restrictions.

A large appeal of fishing for Canberra residents, of course, is that they have a wide range of fishing waters to choose from within the ACT and in surrounding areas of NSW. Within a moderate distance from Canberra, for example, it is possible to fish in ocean and estuarine saltwater, warm coastal saltwater and freshwater streams, tumbling mountain creeks, placid lowland rivers, cold mountain reservoirs and turbid urban lakes. The waters are available for fishing day and night, and for all or most of each year. They can be fished with artificial lure, bait or fly, and offer a range of opportunities which allows anglers to pursue their sport in gentle, undemanding fashion or vigorously and dynamically as near to or as far from home as they choose.

Anglers have a multitude of opportunities to absorb or be absorbed in their surroundings in a manner not commonly encountered in other sports. Anglers are generally thought of as fishermen, but they are often simply people interested in nature and the outdoors and fishing is the excuse to be there. Thus most anglers

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build up a storehouse of enjoyable and satisfying memories of times spent watching birds, insects, other animals, and the endless array of nature as it parades and pulsates before and around them. They know the pleasures of an early summer sunrise, the wash of a soft night breeze, the lifting and wavering of insects hatching in their multitudes along a river bank, the splat of a platypus tail as it dives beneath the water in search of food, the whistle of a flight of wood ducks as they hurtle along a river corridor. Anglers on that very special day out can watch big fish and little fish, water rats, lizards and snakes, hawks and swallows, grebes and water hens, tortoises and yabbies and a myriad of other living creatures. They can observe the outdoor environment at close quarters and for a short time become part of it, at a time and place of their own choosing. They can challenge nature, commune with it, understand it, protect it, tussle with it and utilise it. They can at various times be boater, canoeist, bushwalker, skier, orienteer, naturalist, ornithologist, entomologist, environmentalist, philosopher, optimist or pessimist. It is their choice. In addition, they may, from time to time, bring home a fish or two for the pot. It is for those people that this book is written.

The purpose of this book is to introduce those who fish to those who do not, unsuccessful fishermen to those who are more successful and fishermen everywhere to a broader range of ideas, attitudes and opportunities gleaned, over many years, from anglers in the Canberra district and from all over Australia. It is a book intentionally about fishing but only slightly less so about conservation. Fishing is defined simply as anything to do with the catching of fish, and conservation as the wise use of natural or man-made resources.

In combination the wise use of our angling resources is seen as the harvesting of fish stocks in a manner which provides the community with the greatest pleasure and satisfaction whilst at the same time ensuring through the proper protection of habitat and husbandry of breeding stock that future generations of Australians obtain satisfaction and enjoyment of their sport equal to that experienced by those of us in the present generation, or our forebears.

This book concentrates on the Canberra region, which in this instance is described as the ACT and the adjoining regions of NSW within a radius of approximately 150 km. It includes descriptions of the major fish species, their biology and breeding habits,

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relevant angling techniques and descriptions of popular angling locations. Whilst it describes the Canberra region in great detail much of it is applicable to eastern and southern Australia generally. The locations differ but the techniques and more particularly the philosophy, remain the same wherever anglers gather. On the basis that this is a book written by anglers for anglers I feel sure it will be found acceptable throughout Australia.

You will notice that some areas relatively close to Canberra are not dealt with in great detail — the saltwater scene, many of the Monaro rivers and lakes, some of the hidden bass streams of the south coast. These are themselves the subjects of current or proposed books which for the moment I leave to my colleagues to prepare.

The Fish

Fish can be classified in various ways. Most people instinctively group them in some simplistic fashion which makes them easy to remember. Biologists on the other hand prefer a scientific classification based on the evolutionary relationships of different species. This approach enables biologists throughout the world to understand exactly which fish is which without having to decipher or attempt to understand the multitude of common or local names that are given to all species of fish.

Other forms of classification are as varied as people's imagination. The sportfish concept, in which fish are classed as sporting or non-sporting species, is one of the most convenient. Sportfish in the broadest sense include all of those species which grow large enough to be caught on angling tackle and provide a degree of challenge and satisfaction for the angler. A sense of fun and achievement are important parts of the sportfishing concept, but such things as edibility or palatability of the catch are not necessarily important. All species of freshwater fish are edible, in the sense that they are safe to eat, but some are more palatable than others. However, the best sporting species are not necessarily the most palatable and it brings to mind the biting wit of a famous English gentleman who described both angling and fox hunting in that country as the pursuit of the inedible by the unspeakable. In Australia it is important to understand that anglers fish for fun and entertainment much more than they do for food.

Non-sporting fish species include all of the smaller species which rarely or never reach angling size, or which lack the fighting power to be designated as sporting fish. Of course such a classification, like all non-scientific classifications, is quite arbitrary, and although an experienced angler of long standing may find little challenge in the capture of a bag of small goldfish the same thing cannot necessarily be said of a small boy on the very threshold of his angling career. The concept of sporting and non-sporting fish,

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then, is one very much of the mind.

Small non-sporting fish species are commonly referred to as forage species because they are widely utilised as food by larger fish. Obviously all species of fish may be considered as forage fish at some stage of their development but the true forage fish is typified by a high breeding rate, relatively rapid growth rate and small maximum size. Some forage species are particularly significant in the survival of some important sporting species because of the interlinked nature of their life cycles and the dependence of one on the other as food at a critical stage of development.

Fish can be classified also by their place of origin. Exotic or introduced species are those which evolved in countries other than Australia and which were established in this country following settlement by European man. By contrast native or indigenous species evolved in Australia.

Some exotic species such as redfin perch, carp and trout are common not only in Australia but in many other countries to which they spread from their homelands. Their survival is assured both by their wide distribution and by their ability to colonise a variety of habitats in different countries.

The indigenous species are more rare and of differing significance in that they are unique to Australia, that is they do not occur in the wild state in any other country. None of our indigenous species developed simultaneously in other countries, nor do they migrate to any other country as do trout and salmon of the northern hemisphere. They are limited to Australia and the total world population, with the exception of a handful kept in aquaria in various overseas countries, is contained within Australia, subject to the vagaries of environmental change, the whims of developers who have the power to alter river and lake environments, anglers who wish to utilise them and environmental managers who are charged with the task of looking after them.

In the Canberra region there are at least thirteen indigenous and eight exotic fish species of significance. A complete list is give in the table.

The Fish

Fish species found in the ACT and surrounding region

<i>Common name</i>	<i>Scientific name</i>
<i>Indigenous species</i>	
Murray cod	<i>Maccullochella peeli</i>
Trout cod	<i>Maccullochella macquariensis</i>
Golden perch	<i>Plectroplites ambiguus</i>
Silver perch	<i>Bidyanus bidyanus</i>
Macquarie perch	<i>Macquaria australasica</i>
Black fish	<i>Gadopsis marmoratus</i>
Catfish	<i>Tandanus tandanus</i>
Smelt	<i>Retropinna semoni</i>
Western carp gudgeon	<i>Hypseleotris klunzingeri</i>
Galaxias	<i>Galaxias</i> spp.
Eels	<i>Anguilla australis</i> , <i>A. reinhardti</i>
Bass, Estuary perch	<i>Percalates colonorum</i> , <i>P. novemaculeatus</i>
<i>Introduced species</i>	
Rainbow trout	<i>Salmo gairdneri</i>
Brown trout	<i>Salmo trutta</i>
Brook trout	<i>Salvelinus fontinalis</i>
Atlantic salmon	<i>Salmo salar</i>
European carp	<i>Cyprinus carpio</i>
Carp, Goldfish	<i>Carassius carassius</i> , <i>C. auratus</i>
Redfin perch	<i>Perca fluviatilis</i>
Mosquito fish	<i>Gambusia affinis</i>

The different groups of fish vary widely in their habitat requirements, reflecting their different evolutionary backgrounds and level of adaptability. It is useful for anglers as well as biologists to understand some of these differences.

Trout and salmon for example reflect a European and north American origin in that they prefer cool waters and spawn in winter in cold flowing streams with low turbidity. They can survive for only limited periods in the warm, turbid waters which typify much of the Australian continent and consequently are confined largely to the higher altitude streams of southern and south-eastern Australia, including the Canberra region.

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By contrast indigenous fish such as Murray cod and silver and golden perch are well suited to survival in the warmer and more turbid streams of the Murray-Darling River system. Some of these species are found in the Canberra region, and survive happily in hot conditions where trout and salmon cannot survive. They breed in summer but have no special requirement for cool or clear waters. They can breed in turbid waters and usually require warm water, and are often stimulated to spawn by the onset of rapid summer flooding.

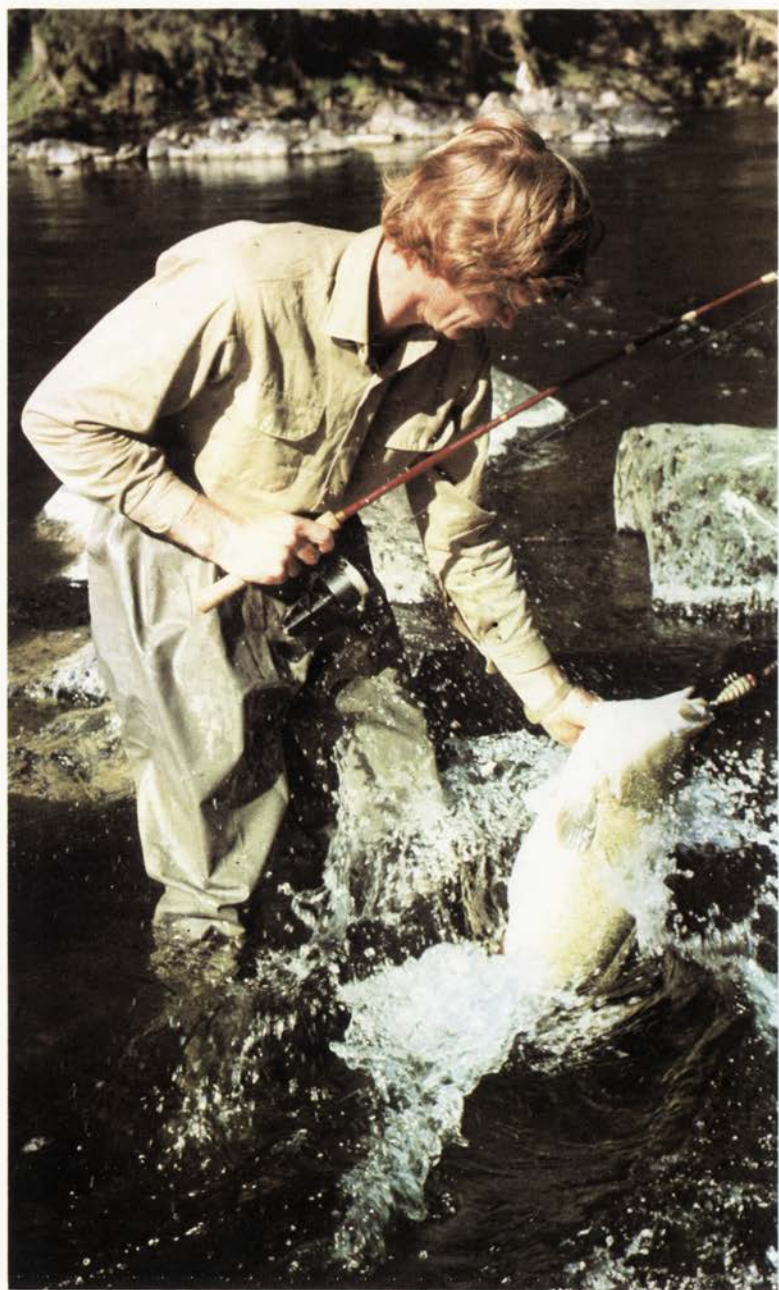
These are the extremes, but in between there are both exotic and introduced species which can tolerate some of the conditions favoured by either group. Indigenous Macquarie perch, for example, are well suited to survival in the upper reaches of what are now called trout streams, and probably would still be a common species in some of these streams if it were not for the intense competition from the more aggressive trout, which have similar dietary preferences. Equally, Macquarie perch can survive in the warmer, lower reaches of parts of the Murray-Darling River system, in company with silver and golden perch and Murray cod. Unfortunately, although Macquarie perch appear to have considerable adaptability in the sense that they can colonise a variety of physical environments, their inability to cope with competition with other species means that they do not do particularly well in a mixed fishery.

Similarly, introduced redfin perch can survive in company with trout and salmon from the northern hemisphere in medium-altitude trout streams in Australia, but can also extend their range down to the lowest and warmest reaches of the Murray-Darling system. At times they appear capable of survival in some lowland habitats where even silver and golden perch and Murray cod have died out. In this sense they are a remarkably adaptable and opportunistic species and this accounts for their success in many different countries throughout the world.

Consequently it is inevitable that in some areas there is an overlap of species. This may result from temporary migration of one species into the territory of another or because the individual river systems are sufficiently variable to ensure support and survival of more than one species. Many of the rivers in the

An excellent specimen of golden perch taken on a Tiny Tad lure





The Fish

Murray-Darling system, particularly the larger ones such as the Murrumbidgee and the Lachlan, and man-made lakes such as Burrinjuck, Wyangala, Hume and Burrendong, are in the latter category.

An important prerequisite to the success of these mixed fisheries is the existence of adequate spawning facilities for each of the fish species. To this must be added a food supply of sufficient diversity and quantity for each type of fish. Finally, as the seasons change, the fish must be able to migrate to and from favourable feeding areas to the spawning areas.

European man has interfered with these basic resources in nearly all areas of Australia, the Canberra region being no exception, and as a consequence has made some areas less favourable for the original fish species. In addition he has created many new habitats which are not suitable for native fish. Many of these areas provide suitable habitats for introduced species of fish, and given that useful sporting species are introduced, they are generally welcomed by anglers.

Indigenous species

Murray cod

Murray cod are the largest of the native fish species in the Canberra region and one of the largest and most spectacular freshwater species in the world. The fish are widely sought after because of their large size, excellent eating qualities and superb sporting characteristics. They can be taken on a variety of baits and artificial lures and are vigorous fighters on light to medium sporting tackle.

Murray cod are widely distributed throughout the Murray-Darling River system and occur also in a few coastal streams and urban water supply dams in NSW. Once an extremely widespread and common species, it has declined in many rivers as a result of unfavourable habitat alteration associated with dam and weir construction, and interference to natural flooding cycles, reduction in water temperatures and disruption of annual migrations. In particular the cooling effect of releases of cold water from the base of water storages used for flood mitigation and hydro-electric production has forced the cod populations to move further and further

Peter Black lands a small cod amid a shower of spray. This fish took a shallow-run striped minnow in clear shallow water

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downstream in search of warmer waters and a more amenable habitat.

This reduction in available river habitat has been balanced to some extent by construction of man-made lakes which provide an expanded area for cod where water conditions are suitable for survival and reproduction. In some areas populations have been augmented by small stockings of fish produced in hatcheries, but artificial breeding is proving to be a complicated and difficult process and only small numbers of fish have been available for stocking purposes.

In the Canberra region the fish are found in relatively small numbers in the lower sections of the Goodradigbee, Yass and Murrumbidgee rivers above Burrinjuck Reservoir, the Murrumbidgee River well below the dam, the lower reaches of the Tumut River, the Lachlan and Abercrombie rivers above Wyangala Dam and the Lachlan River below the dam.

The fish are notably absent from many other streams and lakes and from the upper sections of the above rivers. Reasons for the absence include the inability of the fish to negotiate dams and weirs which block migratory pathways, and the fact that many of the streams are too small, too cold or lack sufficient food to support the fish for more than short periods. Other streams are unsuitable because of pollution from urban stormwater runoff, wastes from sewage treatment works, mining areas and small industrial and manufacturing plants.



Gordon Winter with a giant Murray cod taken on light baitcaster tackle. It takes considerable skill to locate and catch fish of this size

The Fish

Cold water released from the base of Blowering, Burrinjuck and Wyangala dams effectively prevents the fish from colonising or breeding in the rivers for distances of at least 30-40 kilometres downstream and sometimes for considerably longer distances.

The fish are not known to exist in Blowering Reservoir and those trapped in the area during dam construction are now presumed to have died or to be too few in number to be significant. Similarly the fish are not known to exist in Lake Burley Griffin, although plans are in hand to stock these lakes when supplies of young fish are available. In Wyangala Reservoir the small population of naturally occurring and stocked fish is thought to be expanding slowly and may eventually recolonise the lake and river. In Lake George a population of native fish, believed to include Murray cod, which was fished commercially in order to supply the nearby gold mining areas of Mongarlowe, Braidwood and Araluen in the mid to late nineteenth century, has become extinct, presumably as a result of major droughts which caused the lake to dry out for varying periods.

The most significant population of Murray cod in the local region is in Burrinjuck Reservoir where the fish occur throughout the backed up waters of the storage and migrate for varying distances up and down the Yass, Goodradigbee and Murrumbidgee rivers, particularly the last. In the Goodradigbee River cod are rarely found above Wee Jasper and in the Yass River the fish rarely penetrate as far upstream as the Yass township.

In the Murrumbidgee River upstream movement of the fish is severely restricted by two small weirs at Casuarina Sands near the junction with the Cotter River. Only the lower weir is fitted with a fish ladder although another is planned for the upper structure. Some fish appear to negotiate the dual barrier or remain upstream from year to year, thus occasional fish are found upstream at Kambah Pool and Colinton and rare specimens have even been recovered from the extreme upstream section near Bolairo.

The fish are found in the Burrinjuck storage throughout the year but are encountered in the feeder rivers mostly during the period October-March. Local observations over many years suggest that some of the fish migrate upstream progressively from Burrinjuck Reservoir during the spring and early summer period, feed actively during the summer and spawn in mid to late summer, then return to the reservoir during autumn and early winter. The migration is not

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a total one, however, as individual fish can be found in some of the larger holes along the river throughout the winter.

The upper size limit of Murray cod is not known with certainty but Australian folklore is liberally sprinkled with tales of monsters weighing more than 90 kg. In the local region a fish of 49 kg was taken in Burrinjuck Reservoir in 1973 and local anglers claim a larger fish of 60 kg was taken some years earlier. Fish to 25 kg are not uncommon in Burrinjuck Reservoir and the average size of fish taken by anglers is 2-10 kg.

Murray cod have a varied diet and are known to feed on a wide range of animals including worms, lizards, frogs, mice, shrimps, yabbies, freshwater crayfish, fish of various types, and insects and their larvae including grasshoppers, large moths and beetles and mudeyes.

There are many stories of the fish feeding on odd items. A 24 kg fish taken from the Murrumbidgee River above Burrinjuck Reservoir in 1977 was found to have a freshly swallowed 70 cm water dragon in its throat, and the head and intestines of a freshly cleaned rabbit, presumably thrown into the river by a hunter, was recovered from the stomach of an 11 kg cod in the same river several years earlier. A large cod in a hatchery some years ago was reported to have swallowed a whole cormorant which presumably had dived into the pool seeking food. From time to time anglers also have reported suspicious losses of ducklings and other birds in rivers and lakes but these accounts are difficult to verify.

Much of the early understanding of the reproductive habits of Murray cod and other native fish came from the work of the late John Lake, followed later by other workers. Murray cod are thought to breed at about four years of age when they are approximately 56 cm in length and weigh 2-3 kg. Small fish may produce 2000 eggs but larger fish produce more than 200,000. The eggs are laid in summer when water temperatures reach approximately 20°C or following a flooding stimulus or suitable development and maturation period. Observation in the Canberra region suggests that this occurs in early to mid March but that large-scale breeding does not necessarily occur every year.

The eggs are adhesive and may be attached to the insides of hollow logs or other objects. The eggs hatch in 6-13 days depending on temperature. The young fish feed on zooplankton (animal plankton) and later take other organisms. The forage fish Aus-

The Fish

tralian smelt and western carp gudgeon are eaten in large quantities when available. Many species of fish are eaten by larger cod, and they appear particularly fond of goldfish and European carp.

Trout cod

Trout cod are closely related to Murray cod and were only recently determined to be a separate species. Even today there is still confusion on the correct scientific names to assign to the two species. Much of the definitive work leading to the knowledge that there were two separate species of cod was carried out by fisheries biologists working at the Australian National University, with the assistance of local anglers who provided small numbers of living specimens of trout cod and Murray cod from the upper reaches of the Murrumbidgee River for comparison with fish obtained from other areas of eastern and southern Australia.

Trout cod presumably were relatively common in the Murrumbidgee River and other streams of the Murray-Darling system in past years but are now exceedingly rare and are not normally encountered by anglers. Precise reasons for the decline are not known but are presumed to relate to unfavourable alteration to habitat, similar to that which has affected Murray cod, stemming from clearing of catchments and river beds, release of cold water from dams, urban and mining pollution of streams. Trout cod presumably are more sensitive to change and have suffered accordingly, possibly because of their preference for the upper reaches of streams, which are more fragile and more easily affected by man's activities.

Trout cod are difficult to distinguish from Murray cod without detailed scientific analysis, but some experienced anglers can pick them apart. Trout cod are usually small fish and although fish in the lower reaches of the Murrumbidgee River in past years were reputed to grow to approximately 14 kg the largest specimen reported from the Canberra district during the past thirteen years weighed approximately 4 kg and most have been around the 2 kg mark. Trout cod appear to have larger or more prominent eyes than Murray cod and a straighter line from nose to forehead, and have an overshot rather than an undershot upper jaw, i.e. the upper jaw is longer than the lower jaw. They may occasionally be more strongly marked on the ventral (lower) surface, sometimes with dark mottling or specks, whereas Murray cod are usually yellow-

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cream on the underbelly, with little or no dark colouration. Some specimens have a speckled pattern on the sides and dorsal (upper) surface instead of the mottled pattern more commonly found on Murray cod.

Little is known of the dietary, breeding or migratory habits of trout cod but they are presumed to be generally similar to those of Murray cod. The continued existence of the species upstream of the main Murray cod habitat in the Murrumbidgee River, and in a similar habitat in a small tributary of the Goulburn River in Victoria, suggests that the fish prefer and may breed in the cooler and clearer waters of these streams.

The population in the Canberra region appears to be small and localised and the area in which the fish are known to travel and feed is not being publicised until all current scientific and management studies have been completed.

Only time will tell whether this rare and beautiful fish species is able to survive in the wild. In the meantime anglers can assist by ensuring wherever possible that the river environments are retained in as near-natural a state as possible, that unnecessary development and land disturbance in critical parts of the catchments, particularly the upper areas, is kept to a minimum, and that rivers are kept free of unnecessary indignities such as pollution from sewage effluent, urban stormwater drains, riverbank carparks and over-developed picnic sites and barriers to fish migration such as dams and weirs. It may also help in some small way if anglers refrain from fishing in those few areas where trout cod are known to exist, and return to the water any fish hooked accidentally.

The reason for mentioning trout cod in this book is not to teach anglers how and where to catch them but rather in the hope that it will stimulate awareness and interest as a necessary prerequisite to conduct of detailed research into habitat requirements and other information necessary to ensure survival of this endangered fish species.

Silver perch

Silver perch are known also as grunter or bream, and are one of the most common and widespread of the native sportfish in the Murray-Darling River system and in the Canberra region. The fish are particularly common throughout Burrinjuck Reservoir and the Murrumbidgee River above and below the reservoir. Upstream

The Fish



Rod Harrison with an outsize silver perch taken on a deep diving lure

from Burrinjuck they penetrate the Goodradigbee River to approximately Wee Jasper and more rarely to about the junction with Flea Creek. In the Yass River the fish are found upstream almost as far as Yass township but a small, seemingly separate population which existed upstream near Gundaroo until recent years is now believed to have died out. In the Murrumbidgee River the fish are found in progressively decreasing numbers upstream to approximately Kambah Pool although a few small specimens have been seen in recent years as far upstream as Cooma and in the lower reaches of the Umeralla River. Silver perch have been stocked in both Lake Burley Griffin and Lake Ginninderra in recent years but it is not yet known if the fish are breeding. Small numbers of fish have been found in the Molonglo River below Scrivener Dam, presumably having been washed from Lake Burley Griffin during floods, but the possibility of natural migration upstream from the Murrumbidgee River cannot be discounted. The fish are found in the Lachlan River below Wyangala Dam and there is a small but increasing population in the Reservoir and its upstream tributaries. Small numbers of fish are found occasionally in the Tumut River near the Murrumbidgee junction, and there is a small residual population in Blowering Reservoir of unknown breeding status.

Silver perch exhibit a migratory habit similar to that of Murray

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cod. Throughout the winter the fish remain in the deeper sections of the lower reaches of major rivers, and in the major reservoirs, then migrate for long distances upstream during spring and summer and spawn in late summer. Spawning is believed to occur in the Murrumbidgee River in or near the ACT in early to mid-March and recently spawned fish have been noted at this time of the year on several occasions. At the end of the summer period they return to the lower reaches of the rivers and the large dams.

The upstream migration from Burrinjuck is a marked annual angling event and numerous anglers fish the upstream section of Burrinjuck Reservoir at Taemus Bridge during October and November as schools of fish move upstream to the Murrumbidgee River. The presumed return of the fish is even more marked in that almost the entire population of silver perch in the upstream sections of the river disappear from the angling scene in the space of one to two weeks, usually during mid to late March and immediately following the presumed spawning period. However, as the fish are not usually caught by anglers during this period it is not known whether there is a mass downstream migration or merely a sudden change in the feeding habits of the fish.

The maximum size of the fish found in the Canberra region is approximately 3 kg but this is considered an exceptionally large specimen and the average size encountered by anglers is less than 1 kg.

The fish are fine sporting opponents and may be taken on bait throughout the year or on lures during the summer months. The larger fish in particular become exceedingly aggressive during mid to late summer and attack lures with great vigour. On rare occasions fish are also taken on flies, usually from shallow rapids where fish sometimes shelter during hot weather.

Silver perch have a breeding cycle similar to that of Murray cod and golden perch. Eggs are laid in summer when the temperature is about 23°C or following a suitable development and maturation period or a sudden warm water flooding stimulus. Fish up to 1.8 kg produce up to 500,000 eggs. The eggs are planktonic and hatch in 30 hours. The young fish feed extensively on zooplankton and phytoplankton (plant plankton) before progressing to larger food items. The adult fish have a varied diet and eat a wide range of insects and their larvae, shrimps, small fish, snails, yabbies, worms, leeches and algae. In fact with the exception of larger aquatic plants it seems that there is little in the streams that they will not eat.

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In recent years a number of hatcheries, particularly the NSW State Fisheries Inland Research Station at Narranderra, have successfully bred large numbers of silver perch using a variety of techniques based on additions of warmed water to brood ponds or injections of a synthetic hormone gonadotrophin or extract of European carp pituitary glands to stimulate egg maturation and spawning. The fish are being used increasingly for stocking of large water storages and farm ponds to provide an angling and food resource for the future.

Macquarie perch

Macquarie perch are known also as mountain perch or black perch. In past years the fish appear to have been well distributed throughout the Murray-Darling River system and particularly the Canberra region but in recent times they have declined markedly and are now rare in most areas. Populations in the Canberra region seem to be small and localised and it is doubtful whether all will survive if the present trend continues. The major cause of decline is thought to be associated with unfavourable alteration to habitat resulting from land clearing, siltation of spawning areas, pollution of streams by



Macquarie perch are an extremely testing opponent on fly tackle

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urban runoff and sewage effluent, and blockage of migratory pathways by dams and weirs. In addition Macquarie perch are significant insect feeders — much more so than most other native fish species — and appear to be seriously disadvantaged by competition from both rainbow and brown trout which also are insect feeders and which dominate the upper reaches of many streams where Macquarie perch are found. In addition trout may prey on young Macquarie perch to some extent, but the significance of this has not been determined.

Macquarie perch occur throughout the Burrinjuck storage and extend up the Yass River almost to Yass township, up the Goodradigbee River to at least Brindabella, and up the Murrumbidgee River to the base of Tantangara Dam. Small numbers are found in the Murrumbidgee River below Burrinjuck Dam. They occur also in the Cotter River system and in the Cotter Reservoir and presumably in Bendora and Corin reservoirs, in the lower reaches of the Umeralla River, the lower reaches of the Queanbeyan River and Googong Reservoir and in Wyangala Reservoir and upstream in the Lachlan and Abercrombie rivers. The fish are not known to occur in Lake Burley Griffin or Lake Ginninderra.

Macquarie perch are part of the group of Australian native fish which initially were thought to be restricted to the Murray-Darling River system. Whilst this is generally true, a number of interesting exceptions have been noted. For example, Macquarie perch are found in the Shoalhaven River and its tributaries the Mongarlowe River and Northangera Creek, in the upper reaches of the Clyde River, and in a number of the Sydney urban water supply dams, none of which are connected to the Murray-Darling system. Several theories have been proposed to account for the presence of the fish so far outside their presumed natural range, including transfer by Aborigines or European man and suggestions that the fish in the eastern watershed is a separate strain or sub-species to those of the western watershed, but there is only a small amount of useful evidence to support either proposal as yet.

Macquarie perch are superb sporting fish and are renowned as being, weight for weight, one of the strongest of the freshwater fish species in Australia. In addition they are a superb table fish, undoubtedly in the gourmet class. They are usually taken on bait but are occasionally taken on flies or lures. Most of the fish encountered are small specimens taken accidentally on bait in Burrinjuck

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Reservoir or on flies and lures in the upper Murrumbidgee River, although some of the larger specimens in the Lachlan-Abercrombie River system are deliberately sought after.

Macquarie perch grow to approximately 2.5 kg but the fish most commonly encountered by anglers weigh less than 0.5 kg.

Surprisingly little is known of the breeding habits of Macquarie perch in the Canberra region. Spawning is thought to occur in spring and summer and a 1 kg fish may produce 100,000 eggs. The eggs are attached to stones and other hard objects on the bottom of fast flowing streams and the main spawning areas are thought to be in the upper reaches of the rivers above the major Murray cod, silver perch and golden perch areas.

Golden perch

Golden perch are known also as callop or yellowbelly. Although they are widespread throughout the Murray-Darling system and a prolific and common sportfish in some areas they are a variable fish throughout the Canberra region. For example, although they were once a major species in the Murrumbidgee River, they disappeared from all upstream areas following construction of Burrinjuck Dam in 1927. Following reintroduction to the Burrinjuck



Don McKenzie inspecting a good catch of Macquarie perch (in hand and at right) and golden perch (left)

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Reservoir in the 1960s the fish appear to have bred and become successfully re-established and are now one of the more common sporting species in the reservoir. They undertake annual summer migrations similar to those of Murray cod and silver perch and penetrate the lower reaches of the Goodradigbee and Yass rivers, and the Murrumbidgee River to slightly upstream of Tharwa. The fish are also becoming increasingly common below Burrinjuck Dam and occasional specimens are recovered from the lower reaches of the Tumut River.

There is also an excellent population in the Lachlan River below Wyangala Dam and it is hoped that reintroductions to the reservoir in recent years will lead to successful re-establishment of the species in the reservoir and the Lachlan and Abercrombie rivers.

Golden perch also have been stocked in Lake Burley Griffin and Lake Ginninderra but it is not yet known whether the fish are reproducing. Small numbers of fish are found in the Molonglo River immediately upstream of Lake Burley Griffin and immediately below Scrivener Dam. Golden perch grow to a large size and several fish in excess of 12 kg have been reported by anglers from the lower reaches of the Murray River. A 24 kg fish reported from Kow Swamp in Victoria in 1938 has never been verified although it is referred to by various authors as the largest known size for a golden perch. In the Canberra region a number of fish up to 7 kg have been taken in recent years and a 7.5 kg fish was taken from Burrinjuck Reservoir in 1973.

Golden perch grow rapidly and are a superb, strongly-muscled sportfish appreciated by anglers both for sport and as a table fish. The fish are taken on bait throughout the year and on lures for much of the year but particularly during the warm summer months.

The species exhibits the same general breeding pattern as Murray cod and silver perch. Spawning occurs during summer when water temperatures approximate 23°C, either following a sudden flooding stimulus or at the end of a suitable development and maturation period. A fish of 2.3 kg has produced up to 500,000 eggs which are planktonic and hatch in about 33 hours depending on temperature.

The survival of young fish appears to depend primarily on the extent, duration and type of flooding which influences the production of plankton which forms the food of larval fish. Adult fish have a diet similar to Murray cod but not generally as varied as that of silver perch. Golden perch in captive or stocked situations in

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farm dams and large reservoirs show a distinct year-round feeding preference for yabbies, with lesser quantities of shrimps and larger insect larvae such as mudeyes.

Blackfish

Freshwater blackfish are known to most fishermen by the vernacular name of slipperies. Once a common and widespread species in the upper reaches of streams in the Murray-Darling River system and particularly the small streams of the Canberra region, the blackfish has now disappeared from most areas and is known to occur in only a handful of stream locations. The major reasons for decline are presumed to be unfavourable alteration to habitat, particularly that related to destruction of spawning areas by siltation, removal of dead trees from rivers and creeks and dam construction, loss of shade and shelter by clearing along river banks, and competition from trout for the limited insect and other available food in the streams.

Few fish have been seen in the Canberra region in recent years. Nevertheless some are known to survive in the Cotter, Bendora and Corin reservoirs and the upper Cotter River and the Goodradigbee River upstream of the Flea Creek junction.

Few anglers fish deliberately for these rare and beautiful creatures and the ones seen are usually taken accidentally on worms or fly while fishing for trout or Macquarie perch. The largest fish recorded in the region in recent years weighed approximately 0.8 kg and although the species is known to reach a larger size, most of the specimens seen weigh less than 0.2 kg.

Little is known of the breeding habits but they are thought to spawn in spring and summer in small, heavily timbered creeks, and only small numbers of eggs are produced by adult fish. The eggs are laid in hollow logs and possibly other locations and the young are presumed to feed on both phytoplankton and zooplankton before progressing to insects.

Catfish

Freshwater catfish are known also as tandans, eel-tail catfish, jewfish and jewel fish. They are a member of the familiar catfish family found in freshwater and marine environments throughout the world. They were a common and widespread species in the Murray-Darling system, particularly in the lower reaches of the

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Gordon Winter with a catfish from the Wyangala Reservoir

larger rivers, but were not particularly common in the Canberra region.

They are a somewhat sluggish fish to catch, but provide a lot of fun for bait anglers and are delicious to eat. They are active throughout the year, particularly at night during early to mid summer. Most are taken on bait although on rare occasions a larger specimen has taken a lure worked along the bottom of a deep hole or along the sloping edge of a reservoir.

The maximum size is not precisely known but fish of 7 kg have been taken and fish to 2 kg are not uncommon in some waters. In the Canberra region the fish have a limited distribution, being found only in Wyangala Reservoir and the Lachlan River well downstream, and the lower reaches of the Murrumbidgee well below Burrinjuck Dam. Only the Wyangala Reservoir population is of sufficient size to be fished deliberately. In 1978 small numbers of catfish were stocked in both Lake Burley Griffin and Lake Ginninderra, but it is not yet known if the fish are reproducing.

The fish breed in circular nests constructed from pebbles and other materials on the bottom and the eggs are laid during late spring to mid summer. The eggs are laid in and under the gravel of

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the nest which is then guarded and fanned by the male. A fish of 1.4 kg produces about 20,000 eggs and they hatch in about seven days at temperatures of 19-25°C. The young fish feed on zooplankton but the adult fish are carnivorous, feeding heavily on molluscs and crustaceans.

Galaxias

Galaxias is a small trout-like fish, of which there are at least 26 species in Australia. The most common of several species in the Canberra region is thought to be *Galaxias bongbong*, which occurs in many small creeks and in Lake George.

The fish are presumed to have been a common species in the region before the introduction of trout but have declined markedly since that significant event as they are a favoured food for both rainbow and brown trout. Much of the surviving *Galaxias* population is found in creeks which are too small to support significant populations of trout, such as Rendezvous Creek, Grassy Creek and Larrys Creek and the upper reaches of Paddys River and the Tidbinbilla River. Somewhat surprisingly, the fish have also been recovered in recent years from the Molonglo River near Hoskinstown, in an area heavily polluted by mine wastes from Captains Flat and which is still not considered safe for survival of trout and most other fish species.

Galaxias grows to a length of approximately 12 cm and although it has no direct sporting value it is of interest as a species of native fauna and obviously plays an important role in the diet of trout and native fish populations and may contribute to the survival of redfin perch in Lake George.

Little is known of the breeding habits of the fish except that it is thought to breed during winter in the small creeks where it is found throughout the year. The fish are carnivorous and feed heavily on insects and a variety of small aquatic creatures.

Australian smelt

Australian smelt are a small fish which reach a maximum size of only about 8 cm. They occur in large numbers in many parts of the Murray-Darling River system and particularly in the Canberra region. They are common in Burrinjuck Reservoir and penetrate for long distances up the Yass River, Goodradigbee River and both upstream and downstream in the Murrumbidgee River.

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They are an extremely important food fish for larger species including trout, redfin perch, silver and golden perch and Murray cod, and are thought to be critical to the survival and development of young Murray cod in some areas.

The fish mature at about one year of age and spawn during spring when water temperatures reach about 15°C. An adult fish may lay less than 200 eggs and they hatch in approximately 7 days.

Western carp gudgeon

Western carp gudgeon are another of the small forage fish which are widespread throughout the Murray-Darling River system and the Canberra region. They grow to approximately the same size as Australian smelt and are an equally important food source for larger fish including trout, redfin perch, Murray cod and silver and golden perch.

They are well distributed throughout the Canberra region and appear to be increasing their range to cope with new man-made environments. For example the fish were unknown in Lake Burley Griffin until 1973 when a single specimen was reported, but by 1978 the population had developed to a point where it was one of the most common species in the lake. It has now also been reported from Lake Ginninderra and should be a valuable addition to the forage fish population there.

The fish mature at about one year of age and produce large numbers of eggs. They spawn in summer when water temperatures reach approximately 22°C and the eggs are deposited on aquatic plants and other objects.

Happy anglers and staff at the Belconnen Shopping Mall with one and two-year-old trout on the occasion of the first angling competition held in Lake Ginninderra in 1974. The trout are 12-18 months of age

An array of deep diving lures commonly used for Murray cod, silver and golden perch and large trout

Did Gadsby tying a fly on the banks of the river. The monocle is an optional extra

The roof of Australia deep in the winter snow which nourishes streams in the Canberra region during spring and summer

Proof of the pudding. ACT tackle dealer Wayne Lodington with a fine Murray cod taken on a lure sold to a keen angler the previous day — with guarantee, of course!









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Eels

Two species of eels, shortfinned and longfinned, occur in the streams in the eastern edge of the Canberra region. They are found in all eastward flowing streams that are open to the sea, although an occasional specimen is recovered from the reservoirs of the Snowy Mountains presumably having been trapped there during construction or migrated there through the tunnels which connect the different reservoirs of the eastward and westward flowing streams.

Eels are hatched in the Pacific Ocean, possibly in the Great Barrier Reef region, and migrate to the mouths of coastal rivers on the ocean currents. They ascend the rivers to feed and develop and may spend 10-20 years in freshwater, feeding on a variety of fish and other animals before returning to saltwater to spawn. They grow to approximately 1 metre in length. The shortfinned and longfinned species can be identified by examining the dorsal fin. In the longfinned eel the dorsal fin extends from near the shoulder to the tail whereas in the shortfinned species it is distinctly more limited.

Eels are excellent to eat fresh or smoked although many anglers adjusted to other fish tastes find the flesh overly rich and unpalatable.

Eels are common in all of the coastal streams adjoining the Canberra region and penetrate for long distances up the Shoalhaven River and the Mongarlowe and Northangera tributaries and associated dams and lagoons.

Relatively few anglers fish deliberately for eels presumably because of the general prejudice against the species for its snake-like appearance and its reputation as a predator of trout and other highly valued sportfish species.

A large freshwater catfish taken from Wyangala Reservoir. This is the only established population of these species in the Canberra fishing region

Two fat trout taken from the shallows of a reservoir where the waters have risen quickly over new ground

Brian Julian with a brace of outsize Murray cod taken from the Murrumbidgee River

Exotic species

Mosquito fish

Gambusia or mosquito fish was deliberately introduced to Australia earlier this century in the mistaken belief that it would control mosquitoes in Australian waterways. The fish are exceedingly hardy, tolerant to both high and low water temperatures and low oxygen tension and have since spread to many parts of Australia. Amongst the few habitats that they have not colonised are the cold, high mountain lakes and rivers and streams with a fast flow.

The fish are common throughout most of the Canberra region and are particularly common in Lake Burley Griffin and Lake Ginninderra, but surprisingly are not usually seen in Burrinjuck Reservoir.

In most areas they are regarded as a mixed blessing. They have a nasty habit of constantly chasing and harassing other fish, particularly if they venture near to the surface where *Gambusia* typically feed, and they compete with other fish species for food. On the other hand they provide food for many species of birds and are avidly eaten by other fish including trout, golden, silver, Macquarie and redfin perch, and Murray cod. They are commonly used as bait and although they could hardly be classified as a sportfish they do provide children with many hours of fun and enjoyment.

The fish do not lay eggs as they are viviparous, that is, live bearers. This means that the eggs hatch inside the brood pouch of the fertilised female and develop into self-reliant juveniles before they are expelled. Females may produce up to 80 young and may reproduce several times during the year if water temperatures are sufficiently high. The females reach a maximum size of approximately 6 cm and the males approximately 2.5 cm.

Redfin perch

Redfin perch are also known as European perch or simply as redfin. They were introduced to Australia from England during the last century, and spread rapidly throughout much of the south-eastern part of the country. The earliest introductions appear to have been to Tasmania in 1862, Victoria in 1868 and NSW in 1888.

They have colonised a wide variety of environments and have penetrated many of the major rivers for considerable distances. Somewhat surprisingly, however, they have not become firmly

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entrenched in the higher level streams and lakes. This is unlikely to be because of a low temperature barrier, as is commonly assumed, but more probably because the fish have difficulty in traversing fast flowing streams. This is borne out by the steady expansion of the redfin population up the Tumut River following the construction of the Blowering, Jounama and Talbingo dams which effectively disrupted the flow barrier of the river and enabled the fish to colonise the new, man-made still-water environments.

In some areas competition from other species which have already colonised an area may be a significant factor in preventing establishment of redfin perch. Redfin, for example, have colonised the Murrumbidgee and Lachlan rivers right up to the bases of the Burrinjuck and Wyangala dams, but not the reservoirs above the dams, despite the fact that the waters appear suitable for their establishment. In each instance there is a considerable population of native and other exotic species already established in each of these areas and they may exert a strong predatory pressure on the invading species. However, whilst this may be important, it is unlikely to be the only mechanism by which colonisation is prevented.

An occasional redfin perch has been recovered from Lake Burley Griffin, but the species has not become established there. One possible explanation for the occurrence of these occasional specimens is that they are introduced with shipments of other fish used for stocking purposes obtained from hatcheries where redfin perch or their eggs can gain access from adjacent rivers.

In the Canberra region the known distribution of redfin perch now includes the Murrumbidgee River up to Burrinjuck Dam, the Lachlan River up to Wyangala Dam and the Tumut River, Blowering Reservoir, Jounama Pondage, Talbingo Reservoir and Lake George.

The fish grow to a maximum size of more than 10 kg but in the Canberra region most of the fish weigh less than 1 kg with the exception of Lake George where large specimens are commonly encountered. The myriads of small specimens which infest some areas sometimes seriously interfere with angling for other species. It is well known that because of the prolific breeding capacity, redfin perch can build up to such numbers that they outstrip the available food supply with the result that the great majority of the fish remain stunted and of little interest to anglers. It is an important management technique therefore for redfin fisheries to be

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fished extremely hard to keep the population down to a level commensurate with the available food supply and which allows a significant proportion of the population to grow to useful sporting size.

Redfin spawn in spring when water temperatures rise above approximately 12°C. The fish mature early and one-year-old fish have been observed spawning. A 1 kg fish may produce 100,000 eggs. The fish eat a wide variety of organisms including insects, frogs, yabbies, snails, shrimps, worms, fish eggs and small fish.

The flesh is light coloured and has excellent taste if the fish are properly prepared, which usually involves skinning.

Redfin will take a variety of baits and lures in most waters and slowly worked flies in the clearer waters of areas such as Blowering Reservoir and the Tumut River.

Carp and goldfish

Carp of various types have been introduced to Australia from Asia and Europe on several occasions since the first introductions were made during the last century. Until relatively recently the most common species of carp in the Canberra region were the so-called Crucian carp and goldfish. These originally were thought to be separate species, but now are more commonly thought of as a single species with the common name goldfish or that only one species occurs in the region. There are many colour forms ranging from black to bronze to gold/orange. They grow to approximately 2 kg in weight, but most fish seen are considerably smaller, weighing about 0.3 kilograms.

The fish are found in most lakes and rivers, where they are thought of as a relatively harmless species useful perhaps as food for birds and most predatory fish and providing fun and entertainment for children in places such as Lake Burley Griffin.

The fish spawn in spring or early summer and the sticky eggs are deposited on aquatic weeds and other objects. Large numbers of eggs are produced and the fish mature at an early age.

The fish have a weak fumbling bite and do not fight strongly. They are edible, but not considered particularly palatable by most anglers. Consequently the fish are not highly thought of although they are commonly sought after as bait for Murray cod and some trout fishing and the more highly coloured forms are widely used for aquariums and outdoor fish ponds in Canberra.

European carp

In more recent years another species of carp, European carp or *Cyprinus carpio*, has become possibly the best known freshwater species in Australia. The species was first introduced into Australia from Europe in 1872, but although it spread to some areas subsequently it apparently caused few problems. Two genetic types known colloquially as the Prospect and Singapore strains have been identified amongst the descendants of the early introductions.

In 1960 another genetic type of *Cyprinus carpio* known as the River strain was introduced illegally from Germany to a fish farm in Victoria. The fish were distributed from the farm and subsequently spread at remarkable speed throughout much of Victoria, NSW, South Australia, northern Tasmania, the ACT and southern Queensland. A great number of rivers, lakes, lagoons, swamps, dams and reservoirs throughout these areas have been colonised. The major exceptions are the fast flowing streams and the cold highland lakes and streams.

The fish are a major problem to anglers and fisheries authorities because although they have some favourable qualities they also have some markedly undesirable ones. On the credit side they breed prolifically, grow quickly, take baits avidly and fight strongly when hooked.

Taste and eating qualities vary. The fish is not highly thought of by many Australians accustomed to other fish tastes although it is keenly sought after by people with an Asian or a European background, many of whom live in the Canberra region. It is worth noting that European carp is a popular farm and market species in these countries and is greatly prized as a traditional Christmas dish.

On the debit side the fish can cause major ecological damage because of their special method of feeding. The fish locate food by means of four sensitive whiskers or barbels on the upper jaw. When desirable food material is located it is sucked up from the bottom along with quantities of mud and other debris then squirted out again as a fine suspension. The fish then selects the food items it wishes to retain. Continuous feeding of this nature, particularly by large fish or large numbers of fish of any size, may render the waters so turbid and laden with suspended sediment that other species of fish are gradually suffocated and aquatic plants die or are retarded because of restricted light penetration of the water. In extreme cases the fish, birds and other animals which depend on or

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are associated with the aquatic weeds decline or die out and the European carp survives to dominate the system. In less extreme cases the carp can still be a significant problem as they are omnivorous and thus compete with all other species of fish for food.

In mixed fisheries where carp are prevalent they incur the wrath of anglers by taking baits intended for other more desirable species. This can be overcome in part by using baits such as yabbies or large shrimps, which are not as keenly sought after by carp as other baits such as worms or corn. Carp will take slow moving lures occasionally, but are not generally thought of as a lure-taking fish. They commonly take flies, ranging from small dry black gnats to large matukas such as Mrs Simpson and Hamills Killer, and provide excellent sport on fly tackle.

The fish spawn in spring and summer when temperatures exceed approximately 12°C and large numbers of eggs are produced. The sticky eggs adhere to aquatic plants and other objects and may hatch in a few days. In the Canberra region the fish are common in the slower reaches of the Lachlan River below Wyangala Dam, the Tumut River below Blowering Dam, the Murrumbidgee River below Burrinjuck Dam, the Molonglo River above and below Scrivener Dam, in Lake Burley Griffin and Lake Ginninderra. Increasing numbers are being recovered from Burrinjuck Reservoir, and the species now appears to be colonising that area.

The fish were detected for the first time in 1976 in Lake Burley Griffin and in 1979 in Lake Ginninderra. In Lake Burley Griffin the fish have developed into a huge population with the largest fish recovered to date weighing approximately 10 kg. The fish have since spread up the Molonglo and Queanbeyan rivers, but do not appear to have penetrated to Googong Reservoir. Downstream the fish are common in the Molonglo River and adjacent sections of the Murrumbidgee River and appear to be spreading slowly both up and down the Murrumbidgee River.

In Lake Burley Griffin the carp serve a useful purpose as a food supply for the large population of cormorants, darters, egrets, herons and other fish-eating birds which abound in the lake, and the rainbow and brown trout, golden and silver perch which have been stocked in the lake. In addition they provide excellent sport for Canberra's cosmopolitan angling population and are becoming a modestly popular table fish with the gradual dissemination of useful cooking recipes and techniques for preparation. Worms and

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corn are the most useful baits. They now appear to have largely replaced the goldfish population in Lake Burley Griffin, presumably as a result of direct competition for food and direct or indirect competition for spawning waters.

Trout and salmon

Brown and rainbow trout are widespread throughout Australia and are particularly well entrenched in all of the lakes and streams of the Canberra region. Both were introduced to Australia during the last century, the browns originating from Europe and the rainbows from California. Rainbow trout are commonly stocked in streams and lakes in the Canberra region on an annual basis to supplement wild breeding stocks. Brown trout are also used for stocking in the ACT but less commonly in NSW.

In the ACT trout stocking is undertaken by the Department of the Capital Territory, assisted on occasions by local angling clubs such as the Canberra Anglers' Association. In adjacent NSW regions stocking is undertaken by the Central Acclimatisation Society, the Southern Districts Council of Angling Clubs, and the Monaro Acclimatisation Society acting in close consultation with



Atlantic salmon (right) can be distinguished from trout (left) on the basis of the more strongly-forked tail and the narrow junction (caudal peduncle) between tail and body

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NSW State Fisheries which has overall responsibility for implementation of fisheries policies throughout the State. Trout for stocking are bred at the NSW State Fisheries Hatcheries at Jindabyne (the Gaden Hatchery) and Ebor, or at private hatcheries at Tumut near Blowering Dam, near the mouth of the Goobragandra River, at Hume Weir and at Ballarat in Victoria.

The majority of the brown and rainbow trout in the Canberra region remain within a limited river and lake system, typically migrating between the two types of waters on a seasonal basis in search of food, spawning areas or larger and deeper waters which provide protection during periods of drought stress.

On rare occasions, where rivers open directly to the sea as in the case of the Tuross, Moruya, Snowy and Shoalhaven rivers trout may move out to sea. Although an occasional one is caught in marine waters by amateur and professional fishermen the fate of the bulk of the migrating populations in these situations is not known.

The Atlantic salmon, which also originated from North America, is a landlocked species which does not need to migrate to marine waters for spawning. They are being bred by NSW State Fisheries at the Gaden Hatchery and released on an experimental basis into various local waters including Jindabyne Reservoir and Burrinjuck Reservoir. The success of the introductions in establishing a self-sustaining population is not yet known, but anglers who have caught specimens report them to be a fine sporting fish, highly acrobatic and a welcome addition to the local angling scene.

Brook trout, which are not really trout of the brown and rainbow type, but a separate type of fish known as a char, also were introduced to Australia from North America. In recent years large numbers have been bred in the Gaden and Ebor Hatcheries and released into local waters and lakes, including Lake Burley Griffin, in an attempt to establish a self-sustaining population. The results to date are not particularly encouraging. Many areas report that the fish grew quickly and took lures and flies avidly in the first or second year following stocking but then disappeared in subsequent years. The present whereabouts of all of the fish that were stocked in the Canberra region remains a mystery which is sure to provide anglers and fisheries authorities alike with an interesting problem to solve. However it is hoped that these problems can be overcome.



Brook trout have been used in numerous experimental stockings in NSW and ACT

as the fish would be a welcome addition to the fisheries of the Canberra region.

Brown and rainbow trout are easy to tell apart by their different colour patterns, and the smaller mouth of the rainbow, but more particularly as only the rainbow has distinct dark spots on the tail. Atlantic salmon have the general colouration of a brown trout but have a distinctly forked tail and the junction of the upper and lower jaws extends to below but not beyond the level of the eye. Brook trout are identifiable by the deep body shape, the mottled body patterning, white edges to the lower fins and an ultra-large mouth.

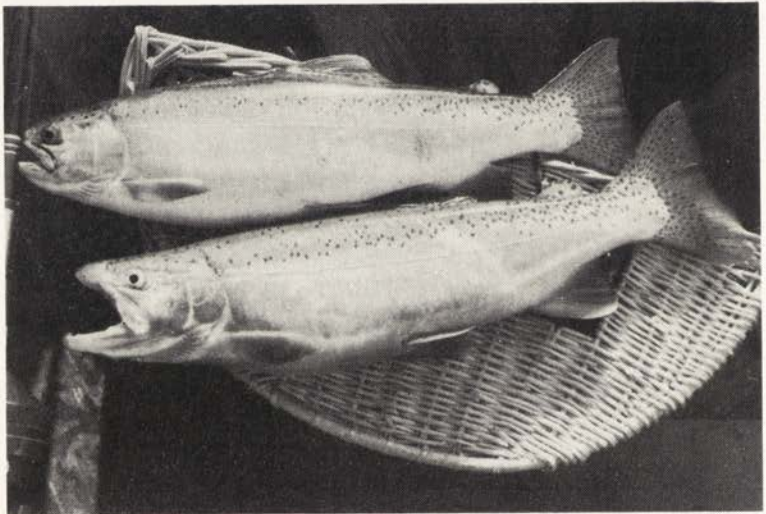
Trout are one of the most important freshwater fish in the world and one of the most sought-after freshwater species in Australia. As such their environmental requirements and particularly their breeding requirements have been examined in greater detail than perhaps any other species of freshwater fish.

Trout in a lake move upstream at spawning time, often gathering in large numbers in bays and inlets before entering the flowing water. Upstream movement commonly coincides with a rise in river level resulting from rain or melting snow. The fish select gravel areas in the shallows of highly oxygenated rivers and creeks where

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water currents pass down through the gravel. The female uses strong body movements to dig nests known as redds where the eggs are deposited, and the eggs are then fertilised by an accompanying male fish. Four or five redds may be made. Eggs are covered with gravel, and pass down through spaces between the gravel after laying. The eggs are relatively large, usually 4-5 mm in diameter, and the number produced depends on the size of the fish. Usually they are produced at the rate of 1300-1500 per kg of body weight. Hatching time varies with water temperature. The colder the water the longer the eggs take to hatch, for example brown trout eggs hatched in 35 days at 11°C but required 118 days at 3.5°C. Hatching is not very successful at temperatures over 12.5°C.

Newly hatched trout (alevins) carry their own food supply in the form of yolk sacs and thus do not feed. They absorb the yolk sac in 2-3 weeks, depending on temperature, then begin to feed actively. The fry feed on zooplankton then graduate to other items as they grow older. The diet of older fish consists largely of insects, but may include many other items such as water fleas, frogs, snails, yabbies, shrimps and small fish. As the fish develop they disperse from breeding areas to rivers and lakes. Adult fish which have spawned also return to the lakes and rivers.

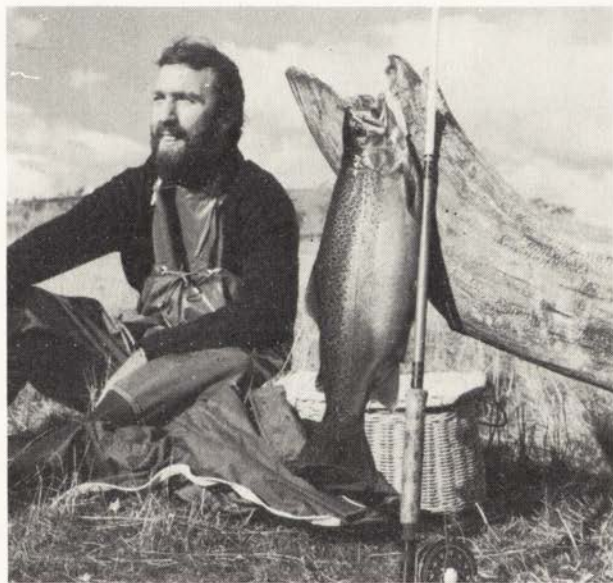


Rainbow trout are easy to identify because they have spots on their tails. Male (lower) has a more hooked jaw than the female

The Fish

Hatching is a critical time of trout development and there are several significant hazards to be considered. Competition for spawning sites may mean that eggs deposited by one fish are later dug up by other fish and killed, eaten or washed away in the water flow. Trout are cannibalistic and commonly eat eggs and young fish. Yabbies may also eat eggs and young fish. Sudden increases in water temperature, accompanied by decreases in oxygen availability, may cause death of eggs and young fish. The greatest danger, however, is from siltation. Soil particles washed into spawning streams smother eggs and young fish, resulting in rapid deaths. Continued siltation of gravel beds may then render them unsuitable for breeding in subsequent years. Other materials which may cause death of eggs and young fish include chemical pollutants from mining and industrial areas, pesticides, domestic wastes, sewage effluent, detergents, stormwater from urban areas and petroleum residues released into the streams.

In addition to losses of eggs and alevins, further losses occur as the fry develop. Research in Australia and overseas suggests that there is an exceedingly high mortality during the first year of life,



Brian Julian with a superb late season rainbow trout

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and possibly only 2-3 per cent of fry survive to become yearlings. In some streams losses may be considerably higher.

Brown and rainbow trout tend to spawn at different times of the year. The main spawning run of brown trout in a so-called average year could begin in May and continue through to early August. As this run declines the main spawning run of rainbow trout could begin in July-August and continue to October. An overlap in many streams is inevitable. Small numbers of brown trout may be found spawning before May and rainbows are occasionally found spawning as late as November. Spawning cycles may be severely disrupted during drought periods.

Only limited observations have been made of Atlantic salmon and brook trout in Australia, but overseas information suggests that they are most likely to spawn in Australia during the peak period of June-August, in the manner described for brown and rainbow trout. No information is available on the effects of competition between the trout, char and salmon species for spawning areas, but it is an additional factor to consider in relation to the future of fisheries in the Canberra region.

Water flow and water temperature appear to be the two major factors influencing upstream migration of spawning fish, but other factors may be important in both upstream and downstream migration. Toxic or irritant chemicals, detergents, sewage effluent, high concentrations of organic detritus and high levels of turbidity may prevent or restrict migration. Weirs, dams, fences and heavily silted areas which restrict fish passage may have a similar effect. Trout also dislike strong sunlight and may be more reluctant to travel along open and non-shaded streams than those with aquatic weeds and bankside vegetation for shade and cover. Excess activity adjacent to the stream by anglers or other users may inhibit fish migration during daylight.

Most local lakes such as Burrinjuck, Wyangala, Googong, Burley Griffin and Ginninderra lack areas of clean gravel with the required flow of clean water and are therefore not suitable for trout spawning. Occasional reports of trout 'spawning' along the foreshores, typically among wind-driven waves along stretches of loose gravel, are presumed to refer to pre-spawning courtship rather than to actual egg-laying and fertilisation. Consequently, to maintain trout populations in these fisheries it is necessary either to stock fingerlings periodically or to allow the adult fish access to suitable

The Fish

spawning areas in the upstream tributary creeks and rivers.

In Burrinjuck Reservoir trout commonly congregate in the mouths of small creeks such as Carrolls Creek, MacPhersons Creek, Burrinjuck Creek and Macys Creek, immediately before the main spawning periods. Many rainbow and brown trout are known to attempt to spawn each year in the upper reaches of these creeks, although much of the gravel area available has now been rendered unsuitable by siltation resulting from erosion of adjacent land or by deposition from the waters of the reservoir during inundation of the lower ends of the creeks.

Gravel beds throughout the lower and middle sectors of the Yass River are mostly heavily silted and of limited use to spawning trout. Nevertheless, there are larger spawning areas in better condition in the upper reaches of the river, and the populations of trout in the upper part of the river are thought to be the result of natural regeneration as well as from hatchery stockings.

Two weirs across the river near Yass township prevent upstream movement of trout from Burrinjuck Reservoir but their effect on downstream migration of young fish from the spawning areas is not known. High turbidity levels and other pollution of the river in the township area, particularly from the stormwater run-off, may inhibit migration through the area.

Major problems limiting trout breeding in the Yass River are turbidity and siltation resulting from stormwater run-off, erosion of pasture and crop land, fouling of water by domestic stock, washing of roads and tracks, and the lack of reliable stream flow during critical spawning periods.

Mountain Creek contains extensive areas of gravel, but has only a limited water flow and much of the area has become heavily silted and unsuitable for spawning. The immediate catchment area has been heavily eroded in past years and significant quantities of the vegetation which helped stabilise the stream banks has died. Shallow areas restrict migration of fish upstream to spawn. Nevertheless, where spawning and hatching is successful, young fish have only a short distance to travel to reach the Murrumbidgee Arm, and the creek is presumed to be a valuable area for recruitment of young fish for the Burrinjuck fishery each year.

The Murrumbidgee River has spawning facilities of varying quality throughout its length. The lower reaches, from Taemus Bridge to approximately the Naas River junction, are not generally

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suitable for spawning. Few gravel beds are available, and most are heavily silted or coated with algae and organic detritus. Water is of variable chemical and physical quality because of inputs from a heavily disturbed and eroded catchment and particularly from the large population centres of Tuggeranong, Canberra, Belconnen and Queanbeyan, and as a result of discharge of effluent from the Lower Molonglo Water Quality Control Centre.

A small number of fish have been observed spawning in Swamp Creek, which enters the Murrumbidgee River near Uriarra Crossing, but the creek is small and has limited spawning facilities because of excessive siltation and is not considered to be of significance to the Burrinjuck fishery.

Upstream migration of spawning fish from the Murrumbidgee to the Molonglo, Queanbeyan and Cotter rivers is prevented by dams. However, all other tributaries are easily negotiated by migrating fish.

The upper reaches of the Murrumbidgee River and most tributary rivers, and many small creeks throughout the area, are suitable for trout spawning but the usefulness of many areas is severely restricted by siltation. Both brown and rainbow trout spawn in these areas, but stream conditions greatly favour brown trout and these dominate most of the streams.

The numbers of young fish recruited for the Burrinjuck Dam fishery from these upstream spawning areas is not known. Young fish have many hazards to face in the long trip to Burrinjuck Reservoir but competition for space and food presumably exerts strong pressure on a proportion of the population to migrate. Relatively few trout are seen in the lower reaches of the Murrumbidgee River, and it may be that water of less desirable quality downstream from Canberra acts as a deterrent to fish attempting to pass through the area. Nevertheless, it may be that there is considerably greater downstream migration of fish during periods of high water flow.

The Goodradigbee River is regarded as the major breeding area for the trout population of Burrinjuck Reservoir. The river is relatively short, with a turbulent flow through granite and limestone country. The bed of the stream is commonly rocky and there are numerous rapids, thus the water is highly oxygenated. The river drains a mountainous catchment, much of it protected against disturbance or development within the Kosciusko National Park, thus the water is of high quality. Snowfields in the upper part of the

The Fish

catchment ensure a reliable flow of cold water at spawning time. Heavy shading of the river and most tributary creeks by eucalypt forest, *Acacia* spp., *Casuarina* sp., and native grasses helps maintain low water temperatures and provides cover for migrating fish. There are numerous creeks with extensive gravel beds relatively free from siltation throughout their length, and similar gravel beds throughout much of the main river.

A major feature of the catchment is that most of it has been only lightly disturbed by man, and much of it is uninhabited. The remainder is only sparsely populated, with few roads or tracks, thus erosion, turbidity, siltation and other forms of pollution are not major problems. Consequently, there are excellent spawning facilities for trout throughout the length of the river, from slightly upstream of Wee Jasper to the headwaters, and in the numerous creeks draining into the river. The creeks vary in the amount of spawning space available and in the degree of difficulty of access by migrating fish, but all are considered important in the maintenance of the Burrinjuck trout population. Flea Creek and Micalong Creek appear especially important because of the large numbers of fish using them for spawning.



Youngster with a good brown trout from the Molonglo River below Scrivener Dam

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Trout are able to survive and thrive in both still and flowing waters, even though the physical characteristics of each habitat vary greatly. Brown trout may be found in all types of water from tumbling mountain streams to placid rivers and lakes, but thrive best in deeper, quieter waters of weedy rivers and lakes. Rainbow trout thrive best in fast flowing mountain streams, but do well in some lakes.

In many rivers and lakes where both types of trout occur it is common for brown trout to gradually dominate or force out the rainbow trout. This situation commonly arises in trout streams in mainland Australia, and various management techniques have been employed in an attempt to restore the balance and to maintain the relative populations at desired levels. Additional stockings of streams with rainbow trout fingerlings from hatcheries is the most common technique. Nevertheless, brown trout remain the dominant species in most ACT and NSW streams and lakes, although paradoxically, rainbow trout are more commonly caught in some lakes such as Burrinjuck Reservoir and Lake Burley Griffin. This results of course from the fact that rainbow trout are generally more eager than brown trout to take lures and flies.

Anglers who complain about the poor quality of a particular fishery or the imbalance between the various species of fish may not realise that there are a number of complex physical and chemical relationships which affect the productivity of a lake or stream by influencing the types of plants and animals that occur, and the many inter- and intra-specific relationships existing between them. Several of the more important ones are population size, temperature and oxygen levels, water depth and turbidity, and a brief discussion of these, based on the work of biologist Richard Tilzey, may be useful in helping anglers to understand and obtain greater enjoyment from the areas which they fish.

In the broadest sense, Tilzey states, the total number of fish making up the population of trout or other water is dependent on annual mortality, adequacy of spawning facilities, and the annual

*Children in Lake Burley Griffin display their prize, a fat European carp
Fish, mostly European carp, killed by petrol which leaked from an
overturned tanker on the banks of a creek tributary of Lake Burley
Griffin. Urban fisheries are constantly exposed to pollution hazards of
this type, from a variety of sources.*





The Fish

recruitment of young fish. Each of these must be studied in detail in order to develop an effective management policy to maintain the quality of the fishery at a high level. The ecological balance of any body of water is an extremely delicate and complex affair and should not be interfered with unless a comprehensive ecological knowledge of the water concerned is available. A wrong decision may take years to rectify. That is why it is necessary to have trained biologists rather than anglers or angling writers managing our current modern mix of semi-natural and totally man-made fisheries.

Both brown and rainbow trout prefer water temperatures between 10°C and 18°C. The upper limit of tolerance of trout is approximately 24°C, and if they are exposed to this temperature for a prolonged period they may die from inability to absorb sufficient oxygen from the water.

Trout are cold-blooded animals and do not feel 'warm' and 'cold' in the mammalian sense of the words. Their temperature preference is prompted more by oxygen availability than by actual temperature. The amount of oxygen that can be dissolved in a given quantity of water is inversely proportional to the temperature of the water. The colder the water the more oxygen it can dissolve and vice versa. Water warmer than 21°C is not preferred by trout as it does not contain the desirable amount of dissolved oxygen and renders respiration difficult. Indigenous Australian fish, having evolved in this country and with a consequently different physiological response, have a much greater tolerance of warmer waters and can survive and live and breed happily in waters at temperatures lethal to trout.

Temperature is not the only environmental factor influencing the amount of dissolved oxygen in the water. In a stream the rate of flow, number of rapids, amount of organic detritus and numerous other factors must be taken into consideration. In a lake the depth, steepness of the sides, rates of inflow and outflow must be considered along with other factors. The geographical location and climate of both types of water must also be considered.

Don McKenzie with a good catch of browns and rainbows

Murrumbidgee River crayfish are readily distinguished by their over-sized white claws. They are delicious eating

A superbly proportioned brown trout taken in spring when the fish are in peak condition



The rare and beautiful trout cod, now an endangered species. Note the over-shot upper jaw and the mottled body patterning

Vertical distribution of fish in a lake is often influenced by the high water temperatures that occur in summer. Water temperature can often be disregarded as a limiting factor in winter as temperature is more constant throughout the lake. However, during summer there is a marked difference between temperatures at various depths and the vertical distribution of fish, particularly trout, varies accordingly.

Vertical distribution may be influenced also by the distribution of food items. Thus in summer when insects and other organisms are active near the surface trout tend to gather there to feed. In winter when surface activity of insects declines the fish may revert to their role as bottom or midwater feeders.

Light intensity also may play a role in vertical distribution of fish. Trout in particular dislike strong sunlight and will move to lower depths to avoid irritation from strong light. Most native fish also prefer to avoid strong direct light and spend much of their time hiding in the shade of logs, rocks, overhanging trees or in or near aquatic weed beds. Hiding in this fashion has the added advantage of allowing fish to escape from predators and to waylay other food animals which unwittingly blunder into the vicinity, some, ironically enough, also seeking to escape the strong light.

The Fish

Light and the availability of dissolved nutrients are two of the most important factors influencing productivity of a lake or stream. Light values are dependent on day length, time of the year and angle of the sun, but are also influenced by local factors such as the amount of shading by bankside vegetation, the extent and thickness of algal and aquatic weed layers, and turbidity of the water.

Temperature together with light availability largely determines the seasonal pattern of productivity of the water. Increasing day length and rising temperatures result in greatly increased primary production during spring and summer, providing temperature does not become too high.

Productivity is greatly influenced by the amount of dissolved nutrients in the water, and in general terms waters occurring in limestone country are richer in dissolved nutrients than those occurring in granite country and exhibit proportionately greater productivity. Under conditions of excess nutrition, eutrophication or over-enrichment may occur and result in lowered productivity of the water and this threat is a constant problem in the rich urban lakes such as Burley Griffin and Ginninderra and in streams below the outfall of sewage treatment plants such as those on the Molonglo, Murrumbidgee and Yass rivers. Conversely, in some of the high country streams, particularly where there is little regular use of agricultural fertilisers, the low nutrient status of the water may be a limiting factor in fish growth.

A simplistic example of the influence of temperature is seen in the local sections of the Murrumbidgee and Goodradigbee rivers. Because the Snowy Mountains and surrounding ranges are snow covered for up to five months each year, stream temperatures there are lower than in other areas. The upper sections of the Murrumbidgee and Goodradigbee rivers in this area are more suited to trout than other fish, and the natural fertility of the area results in a relatively rapid growth rate and often of fish of unusually high vigour. This suitability is maintained throughout the length of the Goodradigbee River but diminishes rapidly in the downstream sections of the Murrumbidgee River where environmental conditions and particularly higher temperatures tend to favour indigenous fish rather than trout.

The most common sources of man-caused stream sediments are non-sealed roads and bare soils with compacted surface layers and

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reduced permeability. Other sources include areas disturbed for housing and road construction, which is the curse of the Canberra region, and areas ploughed for cropping.

Suspended sediments may have a directly lethal effect on fish as a result of abrasion, thickening and fusion of gills or adhesion of silt particles to the eggs of some species, particularly trout. In addition, suspended sediment decreases light penetration and thereby limits production of phytoplankton and other aquatic plants used by fish for food and cover. It may also cause alterations in stream temperature-change rates and precipitation of organic particles which produce high stream biological oxygen demands. Another concern is the loss of sportfishing opportunity as a result of increased turbidities. It has been stated that fishing success declines with increasing turbidity above 25 ppm. Lake Burley Griffin is a classic example of a large potentially useful lure and fly fishing water unsuitable for use for this purpose for much of the year because of excess turbidity.

Bedload sediments are among the most damaging agencies affecting aquatic life. The smothering effect and instability of sediment reduces invertebrate density and populations, reduces available living space, and reduces early survival of fish. Bedload sediment fills gravel interstices in trout spawning areas, thereby reducing inter- and intra-gravel waterflow, reducing dissolved oxygen supply to incubating ova, and physically preventing emergence of alevins or fry.

Organic sediments also are important in streams where they decrease dissolved oxygen concentrations and inhibit gill functions of fish, particularly young fish.

Once again, however, indigenous fish have learned to cope with high sediment and turbidity levels, and their breeding is not disadvantaged in the above manner, although it may still be affected.

Streams

The ACT and surrounding region contain numerous small streams and a number of larger rivers mostly above the 600 m altitude level which drain eastward to the Pacific Ocean through NSW or Victoria or westward to the Murrumbidgee River and eventually to the Murray River and the Southern Ocean.

The streams vary in size, character and angling quality, all dependent on a variety of factors. These include temperature, which in turn is related to altitude, depth and shading, flow rate which is dependent on the total amount and periodicity of rainfall and turbidity and fertility which depend on the type and extent of land clearing, disturbance and urban development in the catchment, the nature of the parent rock and soil type and the acidity or alkalinity of the water. Other major influences include the type and extent of inputs from urban stormwater run-off, sewage treatment plants and agricultural, manufacturing and mining developments.

Streams are significantly affected also by construction of weirs and dams, diversion and abstraction of water for domestic use, irrigation or hydro-electric production, and their general accessibility and proximity to towns and the fishing and other recreational pressure exerted on the area.

Small streams

Most of the streams in the area are relatively small and are characterised by heavy flows in winter and declining flows in summer. Some are fast flow streams draining relatively undisturbed, semi-natural mountain catchments dominated by eucalypt and wattle communities with she-oak and tea-tree communities along the stream banks. Commercial conifer plantations are located in some areas. Other streams flow more slowly through richer but more heavily disturbed cropping and grazing lands or town areas. Exotic trees and shrubs including poplars, willows, elms and hawthorn are

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common in many areas. Together they provide an interesting and exciting mix of habitats and locations sufficient to satisfy even the most demanding of anglers on a year-round basis.

Most of the streams contain trout, and most of the upper reaches are thought of primarily as trout streams. The lower reaches of some streams may contain populations of other exotic fish or native species in addition to trout and there is a growing awareness of the value of these other species as food and sportfish.

There is often a marked difference between the appearance of a stream and its value for angling. The fast flow high mountain streams, for example, with crystal clear water tumbling down rocky slopes, alpine meadows or fern-draped gullies, look superbly attractive on a tourist brochure, but usually are not especially productive trout streams. Because of the high altitude, low year-round temperature, rocky stream bed, fast flow and limited fertiliser use in the catchment they are not rich in nutrients and consequently have a reduced population of the insects and other animals required for rapid and continuous growth of trout. On the other hand they commonly have good quality spawning facilities such as silt-free gravel beds where a high proportion of eggs can be hatched successfully. The end result common in many streams is an inordinately large number of small trout, all competing for the limited food supply available but with few ever gaining sufficient to grow to a large size. The few large fish encountered tend to be large headed, slim bodied fish in poor condition and not particularly attractive to anglers.

Slower flowing streams, particularly those at lower altitudes and draining cropping or grazing country where fertiliser is more regularly applied, tend to be much more productive. They commonly contain a more extensive range of habitats including rock and earth lined pools, often with extensive weed beds in both deep and shallow water, and are typified by higher levels of food production, faster growth rates, greater maximum size of fish and greater overall carrying capacity. The faster growing trout are commonly small-headed, deeper bellied, well-conditioned fish which are admired by anglers both for appearance and for sporting quality. Where natural breeding is sufficient, or is supplemented by adequate stocking from hatcheries, the streams are regarded as our most productive trout waters.

All of the small streams are characterised each year by reduced

Streams

flow, depleted oxygen levels and elevated temperatures during summer. Many are subject to extreme drought stress at intervals of at least once every five or six years. Although fish sometimes can migrate downstream to deeper and more permanent waters to escape drought stress, significant fish kills sometimes occur and streams may take many years to recover. Extreme flooding, especially immediately following a prolonged drought period, is also thought to result in depletion of the fish population.

Some streams, particularly those with unrestricted access near to large population centres, become overfished, not so much in the sense of excess numbers of fish being removed but more because of the excess activity along the banks which continually disturbs feeding fish and puts them down. Repeated disturbance results in fish becoming excessively wary and difficult to catch and in some streams the only worthwhile times to fish are in early mornings and late evenings, and on quiet days of the week when there are few people about.

Large streams

Larger streams are typically deeper, warmer and more sluggish and contain a greater variety of habitats than the small streams. Food supplies also tend to be more diverse and more reliable. The streams contain native fish, trout, or both. They drain broad and varied catchments modified to varying extents by forestry, agricultural, mining, industrial and urban development. They commonly become turbid following even moderate falls of rain, with subsequent reduced opportunities for lure and fly fishing where water clarity is important. The value of spawning areas for trout, blackfish and Macquarie perch are commonly significantly reduced by siltation, although spawning of other fish may not be as strongly affected.

Paddys River

This small stream originates in the undulating, heavily wooded country in the central part of the ACT, then flows through cleared grazing country and mixed conifer and eucalypt forest in the Paddys River valley to join the Cotter River immediately above its junction with the Murrumbidgee River. The main tributaries are Gibraltar Creek, Larrys Creek and the Tidbinbilla River, none of which are useful angling streams.

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The river has a distinct meadow quality in the upper reaches but tends to be rocky and heavily shaded in the lower section. An excellent trout stream in past years, it has declined in recent years because of unfavourable alteration to the stream habitat following increased use of the area for general recreation, land disturbance throughout the catchment and subsequent siltation of spawning areas. Roadworks and other disturbance contribute markedly to increased turbidity in the stream.

Despite this, the stream still contains a useful population of trout which provides some interesting mid-week fishing and it is a useful training area close to Canberra for junior anglers. The fish are generally small, and specimens larger than 0.5 kg are rare.

Only lure and fly fishing is allowed. The upper reaches are fairly open and accessible and are more suited to fly fishing than the lower reaches which tend to be thickly vegetated along both banks. The stream is small enough to wade throughout its length. It is accessible from the Paddys River and Tidbinbilla roads but the section upstream of the pine forest on the Paddys River road flows through leased land and permission to enter must be sought from landholders.

Cotter River

The Cotter River originates in the higher levels of the Brindabella Ranges then flows to join the Murrumbidgee River immediately upstream of Casuarina Sands. Dams are constructed at three sites to form the Cotter, Bendora and Corin reservoirs which provide the bulk of Canberra's domestic water supply. The catchment is subject to firm restrictions designed to ensure continued protection of the quality of the water, and considerable care is required when fishing the area. There is no development in the catchment with the exception of a few administration and forestry buildings and necessary access roads.

The river flows through largely undisturbed sub-alpine meadows and eucalypt woodland in the upper and middle sections and exotic conifer forests in the lower sections. The stream is largely rocky throughout, with the exception of a small meadow section at the upper end.

Before construction of the dams the river was renowned as an angling stream, with brown and rainbow trout throughout and Macquarie perch and blackfish and occasional silver perch and

Streams



A comfortably dressed mobile angler floating a fly down one of the many small streams in the Canberra district

Murray cod in the lower section. Habitat change resulting from construction of the dams, and increased recreational use of the lower section of the river below the Cotter Dam, has resulted in significant change to the fish populations. Silver perch and Murray cod are now unknown in the system, blackfish populations are so small as to be almost extinct and Macquarie perch are found only in small numbers in the reservoirs. Trout populations remain at a reasonable level but the population tends to outstrip the available food supplies and most fish are small, with many exhibiting the slim bodied and large headed characteristics which anglers find unattractive. The fish are slow growing, and in the stream a fish heavier than 0.5 kg is considered large. Nevertheless the stream provides useful fishing in superb surroundings relatively close to Canberra.

The three reservoirs are closed to fishing at all times, but the river sections linking each are open. Fishing is prohibited in the Cotter Reservoir in the area between the Cotter Dam wall and Pierces Creek, in Bendora Reservoir between the wall of Bendora Dam and the small weir upstream and in Corin Reservoir between the wall of Corin Dam and the mouth of Gingera Creek. Fishing with fly or artificial lure is allowed, but bait fishing is prohibited.

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The stream is thickly vegetated along both banks and some areas are heavily shaded. The stream can be waded for much of its length.

The river below the Cotter Dam is accessible from the sealed main road and the Cotter Recreation Reserve, and above the reservoir via forestry roads leading from the Mt McDonald-Picadilly Circus road or by walking downstream from Bendora Dam. The section above Bendora Reservoir can be reached only by walking downstream from Corin Dam. There is no public road access above Corin Dam.

Shoalhaven River

The Shoalhaven rises on the eastern side of the Great Dividing Range near Krawarree and flows into the Pacific Ocean near Nowra. The upper reaches pass through mixed eucalypt woodland and cleared grazing country and contain small but useful populations of trout. More significantly, however, the stream contains a residual population of Macquarie perch, a species normally thought to be restricted to the westward flowing streams of the Murray-Darling River system.

The middle section of the river near Braidwood tends to be wide and shallow and passes through sandy and rocky terrain where the living inhabitants of the stream appear to consist largely of eels and tortoises. Despite its attractive appearance it is of little interest to anglers.

Downstream from the junction with the Mongarlowe River, the river passes through steep rocky country with spectacular dissected gorges and magnificent cliffs of great scenic beauty, then flows into the lower tidal sections which support a variety of marine species including the now-endangered Australian grayling. There are relatively small populations of trout and Macquarie perch which migrate from upstream areas, but the water tends to be too warm for long-term survival of trout. Bass and estuary perch migrate for long distances upstream in spring each year after a feeding and spawning period in the salt or brackish water.

The recently constructed Tallowa Dam, on the lower reaches of the river, will undoubtedly result in significant ecological and sociological change in the area. The dam acts as a disturbing barrier to upstream and downstream migration of bass, estuary perch, grayling and eels but the reservoir will provide an enlarged habitat

Streams



Selecting the right fly can be the key to a successful day's fishing. Matching the hatch is useful but not always essential

potentially suitable for trout, Macquarie perch and other indigenous Murray-Darling species and possibly stocked bass. Angling on a restricted basis is already allowed in the reservoir, but a 300 metre section of river immediately below the dam is closed to fishing to protect the large numbers of migrating fish which congregate there. Eels occur throughout the system and are particularly numerous in the lower and middle reaches.

The river is accessible from various roads radiating from Braidwood and Moss Vale but access to the lower sections between the Welcome Reef area, Tallowa Reservoir and Burrier requires considerable local knowledge of bush tracks and forestry roads. Many enthusiasts prefer to gain access to the downstream sections via boat or canoe and report it to be an exhilarating and enjoyable journey.

Queanbeyan River

The Queanbeyan River rises in the Tinderry Mountains and flows through partially cleared grazing country to join the Molonglo River between Queanbeyan and Canberra, just upstream from Lake Burley Griffin. The river is dammed at Googong, just above

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Queanbeyan township, to form the Googong Reservoir which supplies water for domestic use to Queanbeyan and the ACT.

Fishing below Googong dam is not usually productive because of the generally reduced flow of the river, barriers to upstream and downstream migration of fish and the general urban development in the area. When water conditions are suitable small numbers of trout move into the lower reaches of the river from Lake Burley Griffin and the Molonglo River, and in recent years these have been joined by small numbers of silver and golden perch from the same source, plus increasing numbers of large European carp weighing up to 8 kg.

The river upstream of Googong Reservoir is a useful trout stream with good populations of both brown and rainbow trout. The fish are renowned for their rapid growth rate and good sporting qualities but they are equally renowned for their wariness in a stream which is remarkable for the lack of cover along the banks. There are suitable spawning areas in the river and in a number of small tributary creeks. Small populations of Macquarie perch still exist in some of the larger holes in the lower section, near to Googong Reservoir.

Googong Reservoir was completed in 1978 and although it is a terminal storage, holding water intended for direct human consumption, all the water is fully treated by filtration and chlorination prior to supply to the consumers. Consequently the Commonwealth Government, which manages the area, intends opening the reservoir to anglers on a trial basis. This should prove a bonanza to local anglers as the waters should form an ideal trout fishery, particularly in the upper reaches. The reservoir contains both rainbow and brown trout, and Macquarie perch, and early indications are that the area could be at least as productive as the famed Eucumbene Reservoir in the Snowy Mountains.

Access to the river is limited. In the lower reaches below Googong the river can be reached from a variety of suburban roads. Above the reservoir access is generally difficult because it traverses land which is largely privately owned. However, it can be reached from road crossings on the Captains Flat-Michelago road and the Captains Flat-Jerangle road at Anembo.

Sherlock Creek and Ballinafad Creek

These tiny tributaries of the Queanbeyan River sometimes contain

Streams

useful populations of trout, particularly following prolonged periods of suitable water conditions. The fish are generally small but well-fed and in good condition and provide some fun fishing for local anglers.

Strike a Light Creek and Bredbo River

These small streams originate in the Tinderry Mountains then join and flow into the Murrumbidgee River near Bredbo. The lower reaches of the Bredbo River are shallow, sandy and of little direct use to anglers. Nevertheless just a short distance upstream the character of the river changes markedly and there are useful populations of brown and rainbow trout in both streams.

Access can be gained from various crossings on the roads connecting Jerangle, Bredbo and Peak View.

Umeralla River

The Umeralla River rises in the Great Dividing Range and drains the Kydra, Kybean, Badja and Big Badja rivers to the Murrumbidgee River. The Umeralla and its tributaries are renowned as some of the finest trout streams in the region. All have good spawning facilities and are rich in food. The trout are generally fast-growing, well conditioned and highly attractive to anglers.

An exception to the generally high quality of the river system is the lower section near Chakola where erosion in the catchment plus sand and gravel mining of the river bed and banks has resulted in significant siltation and degradation of what was previously prime fishing country. The river also now rapidly becomes turbid and unfishable following even moderate falls of rain.

The stream contains both brown and rainbows and although there is an abundance of tiny fish in some sections there are more than enough larger specimens to entice anglers back for repeat trips. Small numbers of Macquarie perch are found in the lower sections of the river, particularly in the large pool beneath the bridge on the Canberra-Cooma road.

Access to the stream is predictably difficult as with all good angling streams. It can be reached from road crossings on the Canberra-Cooma road and a small side road to Chakola immediately south of the road bridge, the Cooma-Numeralla road and upstream at Nimmitabel.

Molonglo River

The Molonglo River rises in the Great Dividing Range near Captains Flat where it is dammed to form the town water supply, then flows through the outskirts of Queanbeyan and the centre of Canberra to join the Murrumbidgee River. At Canberra it is blocked by Scrivener Dam to form Lake Burley Griffin. Small numbers of trout still occur in the water supply dam immediately upstream of Captains Flat, but they are reputed to be wary and difficult to catch.

The Molonglo River downstream from Captains Flat is a tragic case history in Australia's management of its inland waters. Once considered to be one of the most pleasant and productive trout and native fish streams in the region, it became progressively polluted from copper, lead, silver and zinc mining operations at Captains Flat. Gross pollution resulted from collapse of mine waste dumps into the river on at least two occasions. Water which once supported excellent populations of trout and native fish, plus many other aquatic animals and plants, became sterile and toxic to all life for many kilometres downstream from the mining area, becoming marginally safe for fish survival only because of dilution by the Queanbeyan River downstream. Recent attempts at restoration and revegetation of the old mine dumps and plugging of mine drainage holes has reduced the problem to some extent but fish are still unable to survive in the section of river between Captains Flat and the Queanbeyan-Hoskinstown road bridge, and are sadly depleted in the downstream area to Lake Burley Griffin.

In the downstream section there is no useful fishing until the approximate region of the Molonglo Gorge. In the section below the gorge small numbers of golden and silver perch and increasing numbers of European carp migrate to and from Lake Burley Griffin and anglers with good local knowledge enjoy some useful fishing at particular times. The river quickly becomes turbid after rain and is best fished during a prolonged dry spell.

Fishing in the Molonglo River below Scrivener Dam is variable. In past years inflows from the Weston Creek sewage treatment works and depletion of river flow ruined the stream as an angling location. Following the closure of the treatment works in 1978 it is expected that the river may slowly regain something of its former character and may even eventually support new populations of golden and silver perch and trout.

Streams

Useful populations of fish can be found in the small section of river between Scrivener Dam and the Weston Creek junction. These include exceedingly large specimens of brown and rainbow trout and golden perch, with a few silver perch and increasing numbers of European carp. The fishing is necessarily intermittent, as the stream is badly affected by drought when water is not released from Lake Burley Griffin, and by excess turbidity following rain. Nevertheless the fish are large and are keenly sought after by anglers.

Lees and Condor Creeks

These tiny streams drain a mixture of eucalypt and planted conifer forest in the Brindabella Mountains and typify many of the small streams scattered throughout the Canberra region. They have a reasonable flow during winter and spring but fall away quickly in summer. Trout move into the streams from the more permanent waters of the Cotter River and Cotter Reservoir to feed and breed during winter and remain in the stream as long as there is sufficient water present. When food, oxygen or space become limiting they migrate downstream to the larger pools or back to the main river. Although the streams carry relatively large numbers of fish in the good years the fish are generally small and specimens larger than 0.5 kg are rare.

The stream banks are heavily vegetated in most sections and almost completely overgrown with vines and shrubs on some pools. This presents the angler with an interesting challenge and it requires considerable skill to fish the streams effectively.

The streams are accessible from a variety of forestry roads leading from the Mt McDonald-Picadilly Circus road.

Gudgenby River

The Gudgenby is a small to medium sized stream which rises in the mountain country in the Gudgenby Nature Reserve south of Canberra and drains thick, undisturbed or lightly disturbed eucalypt forest in the upper reaches and partially cleared grazing country in the lower reaches to join the Naas River and then the Murrumbidgee River near Tharwa.

It has a pleasantly reliable water flow throughout the year and supports a moderate population of brown and rainbow trout. The stream varies from steep rocky sections with heavily vegetated

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banks where only small lures can be used effectively to more open sections which are well-suited to fly fishing. The fish are generally small and specimens weighing more than 0.5 kg are rare. Nevertheless the fish are usually attractive and well conditioned and good sporting specimens.

The river is accessible from various road crossings near the Murrumbidgee and Naas junctions, at Rocky Crossing on the Orroral road and at Glendale Crossing and further south on the Adaminaby road.

Only lure and fly fishing are allowed.

Orroral River

The Orroral River is a small gentle stream which drains an undisturbed or lightly disturbed eucalypt forest catchment and flows into the Gudgenby River. It provided fairly useful fishing in past years but has declined somewhat in recent times and now provides only token fishing. It contains brown and rainbow trout which tend to be small but well conditioned. Much of the stream is narrow and overgrown and it can be fished efficiently only by an expert caster. Lure and fly fishing only are allowed.

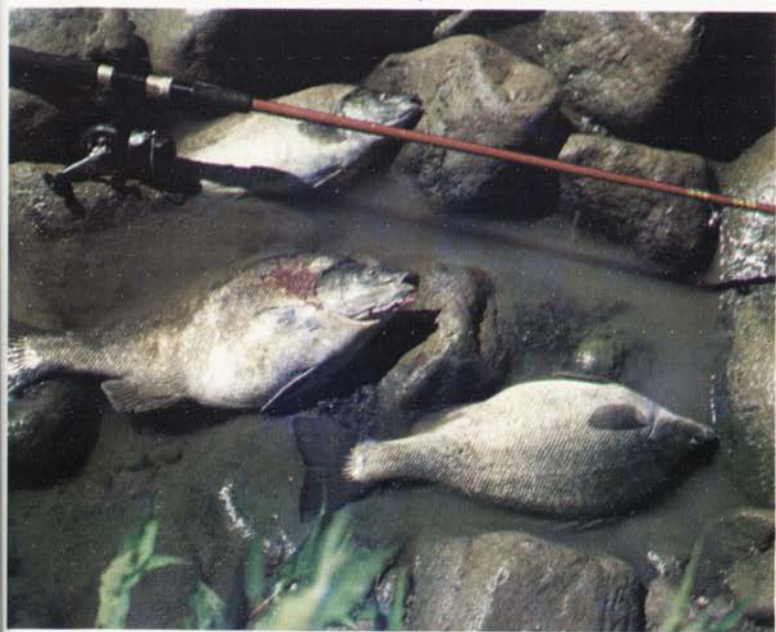
The stream is accessible from the main sealed road linking Tharwa with the Orroral Tracking Station. Only the section downstream of the road is open to fishing, the upper section being closed permanently to protect spawning waters.

Naas River

The Naas River is a small stream which originates in the southern part of the ACT and drains the eastern sector of the Gudgenby Nature Reserve. It carries intermittent populations of small trout but is of little value as an angling stream.

European carp are not favoured as a sport fish by all anglers but this youngster seems happy with his catch from the Murrumbidgee River below Burrinjuck Dam

Large specimens of silver perch readily take lures in mid to late summer and provide exciting sport in the Murrumbidgee River and Burrinjuck Reservoir





Streams

Swamp Creek

This small creek drains cleared grazing country to the west of Canberra and flows into the Murrumbidgee River near Uriarra Crossing. It was previously a useful trout breeding and angling stream but has become heavily silted in recent years and now has no value as an angling or breeding stream.

Boorowa River

The Boorowa River is a moderate sized stream which drains the rich agricultural country of the Boorowa and Frogmore districts and joins the Lachlan River downstream from Wyangala Dam.

It carries brown and rainbow trout in the middle and upper reaches with an occasional native fish and there is presumed to be a regular migration of fish between the Lachlan and Boorowa rivers. It provides useful local fishing, particularly early in the season when water levels are still relatively high, but is usually strongly affected by high temperatures and low water conditions later in the season. The waters are rich in nutrient and food and the system produces some surprisingly large and well conditioned trout.

The river is accessible from the Boorowa-Gunnary-Frogmore-Bennet Springs roads which cross the system in numerous locations.

Abercrombie River, Crookwell River and Lachlan River

This complex of three rivers and numerous small tributaries drains a varied catchment of rich cropping and grazing lands interspersed with residual eucalypt forest on the western side of the Great Dividing Range, upstream of Wyangala Dam.

The streams are rich in nutrients and food and carry large numbers of trout and variable populations of native fish, particularly Macquarie perch and catfish, which migrate between the streams and the large permanent waters of Wyangala Reservoir. Fishing varies greatly depending on water levels, water temperature and the

An excellent specimen of Macquarie perch taken in earlier days when the fish were relatively common in many streams. Today the fish is regarded as an endangered species and there is considerable concern at the ability of the species to survive in the Canberra region

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progress of individual species' upstream and downstream migrations. Trout fishing tends to be best during the early and late parts of the season whilst native fishing is at its best during the middle and late parts of the summer. However, this is variable and good fishing may be encountered at other times provided there is sufficient water in the section of stream being fished.

The streams can be reached from a variety of roads radiating from Crookwell, Abercrombie, Boorowa and Taralga and both the Lachlan and Abercrombie rivers are navigable for long distances by boat from Wyangala Reservoir.

The section of Lachlan River immediately below Wyangala Dam has been transformed from the traditional warm Australian river to a relatively cold stream as a result of releases from the lower and colder levels of the reservoir. Consequently the initial sections of the stream are well suited to trout but less so to native fish. Depending on water flow there is considerable overlap and intermixing of trout and native fish downstream, until the stream reverts to its normal warm Australian character well to the west.



One of the beasts routinely encountered by anglers along the river. They too have their place in the outdoors and will do no harm if left to their own devices

Streams

The stream is rich in nutrients and food and carries an excellent population of trout, together with native fish, European carp and redfin perch. Some of the fish are of exceedingly large size.

No fishing is allowed between the Wyangala Dam and the small bridge about 1 km downstream. The area between the bridge and Darbys Falls bridge is declared trout water, and is subject to normal trout fishing regulations and open and closed seasons. Downstream the river is classed as open fishing waters and can be fished by other methods.

The river is accessible at Wyangala Dam, from the Cowra-Wyangala Dam road crossing near Darbys Falls, at Cowra township and from the Cowra-Goolagong road.

Tumut River

The Tumut River rises in the high mountain country on the western side of the Snowy Mountains and flows to join the Murrumbidgee River near Gundagai. It is a large, snow-fed river which is greatly augmented throughout the year by water from the Murrumbidgee-Snowy-Eucumbene river systems which would normally flow eastward to the sea or north to Canberra but which is now diverted westward to the Tumut River through the long rock tunnels of the Snowy Mountains Hydro-electric Scheme. Thus water which would have flowed down the Murrumbidgee River, or eastward to the Pacific Ocean via the Snowy River, is fed into the Tumut River, stored in reservoirs at Talbingo, Jounama and Blowering, then released as required for hydro-electric production.

The stream originally carried large overlapping and intermingled populations of Murray cod, and presumably trout cod, silver perch, golden perch, Macquarie perch, carp and redfin perch in the lower and middle reaches, with rainbow and brown trout in the middle and upper reaches.

Dam construction, land clearing and changing land use in the catchment have resulted in major ecological change to the Tumut River, with consequent significant alteration to fish populations and migratory behaviour. Release of cold water from the base of dams has been one of the most potent environmental effects. The cooling effect on the section of river downstream from each dam has seriously disadvantaged the warm-water native fish and forced them to move further and further downstream in search of a suitable habitat. Consequently the cod and native perch population

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of the Tumut River is now largely restricted to the lower reaches and represents only a small vestige of that which previously existed. By contrast both the redfin perch and trout populations have gained a significant advantage from the change — the trout because the generally cooler conditions suit their survival and the redfin perch because the dams have enabled them to overcome the flow barrier of the stream and penetrate further upstream to expand in the newly created impoundments.

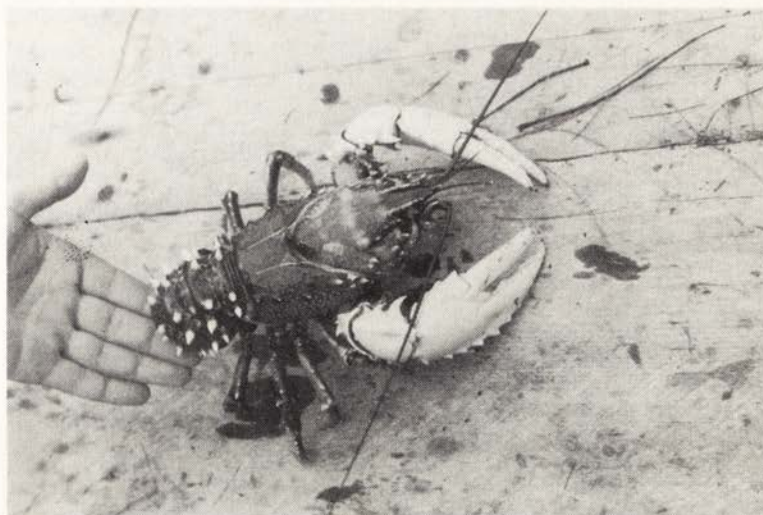
The upstream section of the Tumut River flows through superb high-country eucalypt woodland with extensive conifer plantations adjacent to Blowering Reservoir and a mixture of eucalypt woodland and partially cleared grazing and cropping land in the middle and lower reaches. The upper and middle reaches, to just below Blowering Dam, represent some of the most attractive and productive trout water in Australia. Trout develop to a large size in both the river and the lake with the browns as expected being the dominant species.

There are small residual populations of native fish in the reservoirs and in the upstream section of the river but only time will tell whether any can survive and breed under these conditions or whether they will follow the pattern of other populations in similar situations in eastern and southern Australia which have lapsed into obscurity and eventual extinction.

Redfin perch are notorious for developing large populations of small, stunted fish as a result of prolific breeding and shortage of food supply or lack of fishing pressure and Blowering Reservoir is no exception. At times the shallow edges of the dam are infested with tiny redfin which vigorously attack all baits, lures and flies presented in the area. This makes it difficult to catch other species using routine techniques and on occasions it is necessary to resort to ultra-large lures, flies or baits or to fish early in the morning or late in the afternoon or at night to escape the small finny pests. There are, of course, some excellent redfin in the area and these can be taken in large numbers on some occasions when the little fellows are temporarily absent. The use of larger yabbies, shrimps or grubs, which are too big for the small fish to take in a single bite, is often an effective escape technique especially when fishing in deep water.

The river is accessible from each of the major dams, from the Talbingo-Tumut, Tumut-Jugiong and Tumut-Gundagai roads, and

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Murray River crayfish grow to a large size and are delicious eating

a variety of small mountain roads in the upper part of the catchment. The lower roads are accessible throughout the year but the upper reaches receive heavy winter and spring snowfalls and may be blocked or made dangerous by snow and ice.

The Tumut River has a number of small tributary creeks and rivers which carry useful populations of trout and redfin perch depending on the amount of water carried at the time.

Goobarragandra River

The Goobarragandra River flows into the Tumut River near Tumut township downstream from Blowering Dam. It is a clear, cold stream with good trout spawning facilities and carries a good population of brown and rainbow trout. It is accessible from the Tumut-Goobarragandra road and is situated in some of the most picturesque country in the region.

Murrumbidgee River

The Murrumbidgee River is the largest river in the Canberra region. It rises in the Snowy Mountains and follows a twisting route throughout southern NSW and the ACT to Burrinjuck Dam and then westward to join the Murray River and Lachlan River beyond Hay.

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The river has a number of important tributaries including the Umeralla, Kydra, Kybean, Badja, Big Badja, Sams, Paddys, Cotter, Queanbeyan and Molonglo rivers. The upper reaches of the Murrumbidgee are snowfed in winter and spring and this may result in temporarily turbulent flows. However, at lower levels and particularly in summer and autumn the tendency is for a more gentle flow. The river is characterised by a series of long pools separated by short sections of rapids. River flow may cease temporarily during drought periods.

The river and its tributaries drain a large and varied catchment containing a number of towns and villages of varying size of which the largest are Adaminaby, Cooma, Bredbo, Queanbeyan, Canberra and Yass. Land use in the catchment varies greatly. The upper parts are in steep mountainous country within the boundaries of the Kosciusko National Park and are largely uninhabited. No sheep or cattle grazing is allowed above 1220 metres altitude and soil erosion previously associated with livestock grazing in the high country is now well under control. Higher catchment areas are heavily vegetated by eucalypt forest whilst the river banks throughout commonly are planted with exotics such as willows, poplars, elms and various shrub species. Much of the catchment area for the middle and lower sections of the river has been cleared for sheep and cattle grazing, particularly on the southern and eastern side, with limited cropping.

All of the upper reaches of the river and its tributaries, to approximately Angle Crossing on the southern border of the ACT, are classed as high to medium quality trout water. From Angle Crossing downstream to Burrinjuck Reservoir the river becomes increasingly suitable for native fish and decreasingly suitable for trout, although trout are taken from this section from time to time.

Below Burrinjuck Dam the river is cold and subject to constant fluctuation in water level as a result of intermittent release of water from the reservoir. There is a large trout population below the dam with small numbers of native fish. With increasing distance downstream below the dam the river becomes less suited to trout and more suited to native fish.

Redfin perch are found in large numbers below, but not above the dam. European carp are common below the dam and are increasing in number in the reservoir and upstream in the area near the junction with the Molonglo River, in the ACT. Macquarie,

Streams

silver and golden perch and Murray cod are found in variable numbers above and well below the reservoir and there is a small population of trout cod in the middle section above Casuarina Sands.

Yass River

The Yass River rises in undulating country between the ACT and Lake George then flows through gently undulating country to join the Murrumbidgee River within the backed-up waters of Burrinjuck Reservoir.

The river is generally shallow throughout with a gentle flow, and consists mostly of a series of long shallow pools joined by small rapids. The river is blocked by two weirs near Yass township to supply water for town use and to the NSW Railways.

Most of the catchment consists of cleared country used for grazing and cropping. There has been extensive subdivision of larger properties in recent years, mainly to provide people from Canberra with small rural holdings and this has exacerbated problems associated with road construction, soil erosion and subsequent increase in siltation and turbidity of the river.

The Yass River is thought of predominantly as a trout stream, but also contains native fish which migrate between the lower reaches of the stream and Burrinjuck Reservoir. A small population of silver perch in the extreme upper reaches of the stream appears to have died out in recent years. The Yass River is an extremely useful trout stream both early and late in the season, but is severely affected by drought, as are most other streams in the general locality.

Goodradigbee River

The Goodradigbee River rises in the Snowy Mountains and flows to join the Murrumbidgee River within Burrinjuck Reservoir. It originates in steep mountainous country where heavy snowfalls are common for three to six months of each year and has a rapid and often turbulent flow throughout its length. The river is joined by a series of short turbulent creeks of which the largest are Flea Creek, Micalong Creek, Limestone Creek, Bramina Creek and Wee Jasper Creek.

Most of the catchment is mountainous and thickly vegetated with eucalypt forest which has been only lightly disturbed. The only significant land clearing has been around the small farming settlement

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of Brindabella near the middle section of the river, near Wee Jasper, adjacent to Burrinjuck Reservoir at the lower end of the river, and in the north-western sector of the catchment.

The southern and south-western parts of the catchment are located within the boundaries of the Kosciusko National Park and the south-eastern sector is contiguous with the heavily vegetated Cotter River and Gudgenby River catchments and the magnificent Gudgenby Nature Reserve in the ACT.

The Goodradigbee River is a superb quality trout stream although in recent years it has become significantly affected by heavy fishing pressure, especially on weekends. It contains both brown and rainbow trout throughout, with remnant populations of Macquarie perch and blackfish in the lower reaches. The river is accessible at Brindabella, from the Canberra-Brindabella-Rules Point-Tumut road, and from the Wee Jasper-Micalong Creek road at the lower end.

Lakes and Reservoirs

Lakes and reservoirs are the life blood of any angling region especially in areas where the streams are unable to withstand the fishing pressure associated with a large angling population as in the Canberra region. It is fortunate then that there are several lake fisheries of medium to high quality within easy travelling distance of Canberra.

Lake George

Lake George is one of Australia's few natural fresh water lakes. In fact, despite the fact that the lake tends to disappear at intervals of every 20 or 30 years or so, it is usually referred to as Australia's largest natural freshwater lake. This is probably a reasonable claim if you discount the more ephemeral salt lakes such as Lake Eyre in Central Australia, but it does highlight the paucity and surprisingly small size of natural freshwater lakes in Australia.

Lake George is 30 km from Canberra on the Canberra-Goulburn road. It is a long shallow lake approximately 26 km long by 10 km wide, and 2-3 metres deep throughout and only about 5 metres deep at its deepest point. It has only a few small creek tributaries and a large evaporative surface, thus it nearly always has the appearance of a drying or drought stricken lake except immediately following periods of prolonged heavy rain.

It is not a particularly attractive lake in appearance because of its slightly turbid water and heavy algal growth at times, but it fascinates many people because of its erratic filling and drying pattern and it does carry some of the more spectacular and beautiful water bird populations of the region.

Lake George appears to have had a varied fishing history. Early references to the period when the Mongarlowe goldfields and pioneer farming in the district were developing in the 1850s refer to trawlers working the lake for fish which apparently included Murray cod and perch, although the true identity of the latter has

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not been established. In later years the lake was stocked with trout. All of these fish were reported to have thrived in the lake although some were reported to be infested with a rather unattractive flesh worm. All eventually died out during subsequent periods when the lake dried out temporarily as a result of an excess of evaporation over inflows in the area. In about 1956 the lake was stocked with redfin perch and golden perch. The redfin in particular grew rapidly and quickly bred to develop an enormous population of fish. This resulted in a bonanza for local anglers who fished from the shore and from boats for hauls of fish which sometimes exceeded 200 fish per angler, with individual fish sometimes weighing more than 2 kg.

This persisted until the late 1960s when the lake almost dried up in 1968. At this time the populations of golden perch, trout and redfin were thought to have perished, but apparently a few redfin perch survived in the small, deeper, patch of water which persisted on the eastern side, and these are now recolonising the lake. On present indications it is expected that there will be a return to the highly successful redfin fishery of the mid-1960s in the near future.

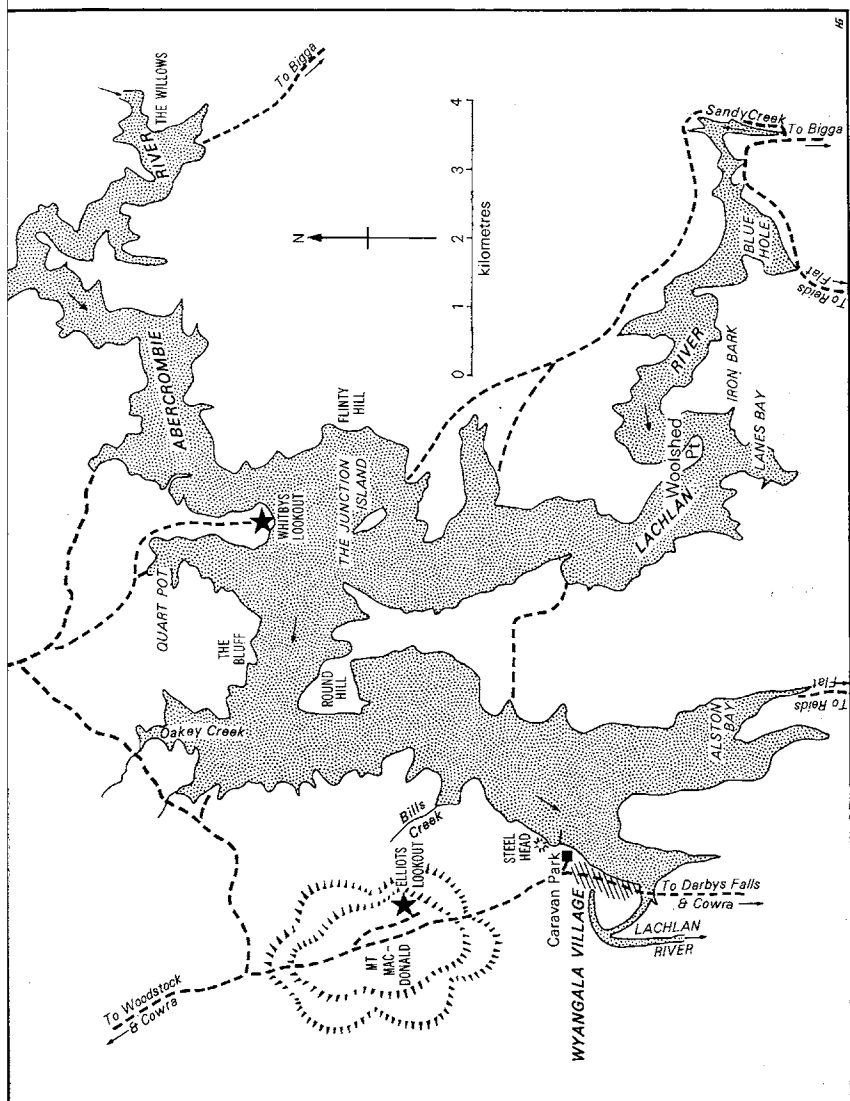
The lake is accessible along the western shore from the Canberra-Goulburn road, and near Bungendore, and although it can be fished from the shore, boat fishing is preferred. The water is commonly milky thus bait fishing is preferred, but highly reflective and slow-worked lures can be successful when a school of fish is located. The fish will take a variety of baits but worms, shrimp and pieces of redfin flesh are the most preferred.

A word of warning. Because the lake is long and shallow it loses heat rapidly and becomes exceedingly cold in winter. It is exposed to the wind, which generates short choppy waves which are spaced unexpectedly close together and which will not roll. This makes it extremely dangerous for boaters and a number of deaths resulted from boating accidents in the lake in the 1950s and 1960s. Obviously great caution is required in fishing this area.

Wyangala Reservoir

Wyangala Reservoir is a man-made lake formed by damming the Lachlan River 40 km upstream from Cowra causing water to back up for approximately 16 km in both the Lachlan and Abercrombie rivers. It is a highly productive lake which drains a rich and fertile agricultural and grazing region. The water remains clear to

Lakes and Reservoirs



Wyangala Reservoir

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moderately clear in the main body of the reservoir throughout most or all of the year. The lake is suitable on both a climatic and biological basis for trout and a wide variety of native fish.

Both rainbow and brown trout occur throughout the reservoir and extend to the upper reaches of the tributary rivers and creeks. Brook trout have been released in the area, but do not appear to have yet successfully colonised the reservoir. As in other large reservoirs of this type rainbow trout predominate in anglers' catches although the populations of brown and rainbow trout are likely to be more similar than catches would indicate.

Other exotic species in the lake and upstream tributaries include goldfish and *Gambusia* which are found throughout the area. Red-fin perch and European carp are common in the river below the dam, but to date do not appear to have successfully colonised the lake. The native fish are a mixed population which appear to be still adjusting to the new man-made environment in the reservoir. Western carp gudgeon and smelt are common throughout and are a valuable source of food for trout and other fish. The present small populations of Murray cod, golden and silver perch, resulting largely from recent stockings, provide some interesting fishing in addition to the trout and it is hoped that they will increase as a result of natural breeding and judicious stocking to form a population approaching that of Burrinjuck Reservoir.

One of the more pleasant surprises about the Wyangala Reservoir is that it still contains a viable population of Macquarie perch in the main basin and in both the Abercrombie and Lachlan River arms. The reason for the continued survival of this marvellous fish in a region where the species has generally declined to the endangered level is not understood, but the event is widely applauded by anglers and biologists who take a keen interest in the sporting and scientific aspects of this species.

The reservoir also contains the only viable self-sustaining population of catfish in the Canberra region. The nearest other groups are in the very lowest reaches of the Murrumbidgee and Lachlan rivers and the Murray River. Catfish are not exactly a strong sporting opponent in the manner of cod, perch or trout, but they are fun to catch and are a superb table fish. Most anglers regard Wyangala as a trout/catfish fishery only and fish it accordingly.

Trout are taken mostly by trolling or by bait fishing with worms or mudeyes, but there are excellent opportunities for lure and fly



John Harris with the results of a session polaroiding the shallows of a reservoir

fishing from the shore throughout the reservoir. Some exceptionally large trout are taken along the shoreline adjacent to the main dam wall and the nearby camping ground and boat launching area. The small bays with grassy banks and small clumps of dead trees scattered throughout the reservoir are exceedingly pleasant places to picnic and nearly all offer opportunities for bait, lure and fly fishing in reasonable isolation except at the height of the summer visitor season.

Catfish are generally taken only on bait, mostly worms, fished on the bottom. They are active both day and night, but many anglers prefer to fish at night when the fish are supposedly easier to catch. The fish are found throughout the reservoir but are most common on the mud flats similar to those opposite the main camping area and along the sloping shores of Alston Bay. Large concentrations of fish are sometimes found at the bases of dead trees, but the fish are highly mobile and may be found virtually anywhere in the reservoir at different times.

Power boats are allowed on the reservoir, but permits must first be obtained from the Wyangala State Recreation Area Office.

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Anglers should take particular heed of the 8 knot speed restriction in the main body of the reservoir. The reservoir is accessible throughout by boats which can be launched adjacent to the camping/picnic area, and by road via Cowra-Darbys Falls, Cowra-Woodstock, Lyndhurst, Bigga and Reids Flat.

There are several important points to be aware of in the river immediately downstream of the dam. Although the reservoir is open to fishing all year round the river downstream as far as Darbys Falls Bridge is declared trout water and therefore can be fished only during the open season which normally extends from the beginning of October to the end of May. Only a single rod and line held in the hand can be used. There is a total prohibition at all times on fishing between the water outlet in the base of the dam and the small bridge across the river approximately 1 km downstream.

The lower section of the Lachlan River is open water and therefore can be fished with a rod and line held in the hand supplemented by up to four set lines provided the name and address of the angler is shown on an attached tag. It is worth remembering that the fisheries and facilities generally in this area, as elsewhere, did not happen by accident. The reservoir is managed and maintained by the NSW Water Resources Commission and the fishery is managed by NSW State Fisheries. Fish stocking is under the local control of the Central Acclimatisation Society which is an entirely voluntary body which works in close association with NSW State Fisheries. The hard and dedicated work of these groups is to the advantage of all anglers irrespective of whether they are residents or visitors in the area. Anglers can repay this dedication and courtesy by offering their general support for management programs and by scrupulously observing regulations and ethics of their sport.

The picturesque surroundings, pleasant vistas and relaxing atmosphere are a feature of the Wyangala area. Consequently the district is well used by a varied group of other visitors including sailors, power boaters, water skiers, swimmers, picnickers, photographers and those interested in nature study. There are picnic shelters, barbecues, playing areas, toilets, boat-launching ramps and a kiosk for both day and overnight visitors and a modern caravan park, furnished cabins and a camping area for those wishing to stay longer.

Lakes and Reservoirs

Googong Reservoir

Googong Reservoir is situated on the Queanbeyan River a short distance upstream from Queanbeyan. It was completed and filled during the 1977-78 season. The reservoir and a small buffer zone surrounding the backed up waters are Commonwealth owned territory within the State of NSW. The purpose of the reservoir is to store water for domestic use for Queanbeyan and the ACT, but as the water receives full physical and chemical treatment before supply to the consumers, the area can be used for limited recreation, including angling.

The area contains brown and rainbow trout, goldfish and Macquarie perch all originating from pre-existing populations in the Queanbeyan River with the exception of an additional stocking of hatchery-bred rainbow trout fingerlings made in May 1979.

Because the reservoir has only recently been completed and filled, little is known of the biology of the area or its fishing potential. However, early indications are that it will be eminently suitable for both trout and Macquarie perch, and possibly other native species, and it could develop into an angling resource rivalling that of Lake Eucumbene and Lake Burrinjuck.



Boats are useful in gaining access to the quieter and more remote parts of larger lakes and reservoirs

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Present indications are that angling is to be under strict control in the reservoir, with fishermen allowed in only during certain specified hours and an off-take protection zone near the dam wall is to remain closed to fishing at all times. The area is to be managed by the Commonwealth Department of the Capital Territory, but NSW fishing regulations will apply. Consequently all anglers wishing to use the area will require a current NSW Inland Angling Licence.

Access to the reservoir currently can be gained only by the main access road to the dam lookout, but a new road to provide access to the southern end of the foreshores is planned for the near future.

Burrinjuck Reservoir

Burrinjuck Reservoir was formed by constructing a concrete dam across the Murrumbidgee River in a narrow gorge 59 km south-west of Yass causing water to back-up in the Murrumbidgee, Goodradigbee and Yass rivers. It is controlled by the New South Wales Water Conservation and Irrigation Commission and is open to angling on a year-round basis.

Construction was commenced in 1907 and was completed in 1927, although works to heighten and strengthen the dam wall were carried out during 1938-57. The wall of the dam is 80.5 m high, 152 m in length, 61 m thick at the base, and the spillway is 348 m in length. As such it is an imposing structure, set in a dramatically stark outdoor environment, and is a considerable tourist attraction.

The reservoir, in association with Blowering Reservoir on the Tumut River, is used to supply water for downstream irrigation. It also provides, in normal times, a continuous flow in the Murrumbidgee River from which private irrigators pump for domestic, stock and crop and pasture irrigation purposes. The main irrigation season for the important downstream areas is approximately September-May. Water released from the dam for irrigation has also been used for power production by means of local hydro-electric stations operated by the NSW Electricity Commission. Burrinjuck Reservoir has been used for irrigation since 1912, and has

The grace and beauty of this group of brown and rainbow trout helps explain the romantic affection Australian anglers have developed for these European and North American immigrants

A superbly proportioned brown trout framed against a blue sky over a quiet lake typifies the scenic beauty of the Canberra-Monaro region





Lakes and Reservoirs

played an important role in development of the various irrigation schemes. The reservoir has a storage capacity of $102,951 \times 10^4$ cubic metres, and a storage area of 5670 hectares, with a catchment area of 1,295,000 km², extending to the major snowfield areas of the Snowy Mountains in southern NSW.

The dam causes water to back up in numerous small creeks and in the Yass, Goodradigbee and Murrumbidgee rivers, of which the last is the largest supplier of water. The storage can be conveniently divided into four sections, the Yass, Goodradigbee and Murrumbidgee Arms, and the Main Basin adjacent to the dam wall. At maximum storage water is backed up for approximately 7 km in the Yass Arm, 11 km in the Goodradigbee Arm and 32 km in the Murrumbidgee Arm. The storage is crossed by bridges near the upstream end of the Murrumbidgee Arm at Taemus Bridge, and the upstream end of the Goodradigbee Arm at Wee Jasper.

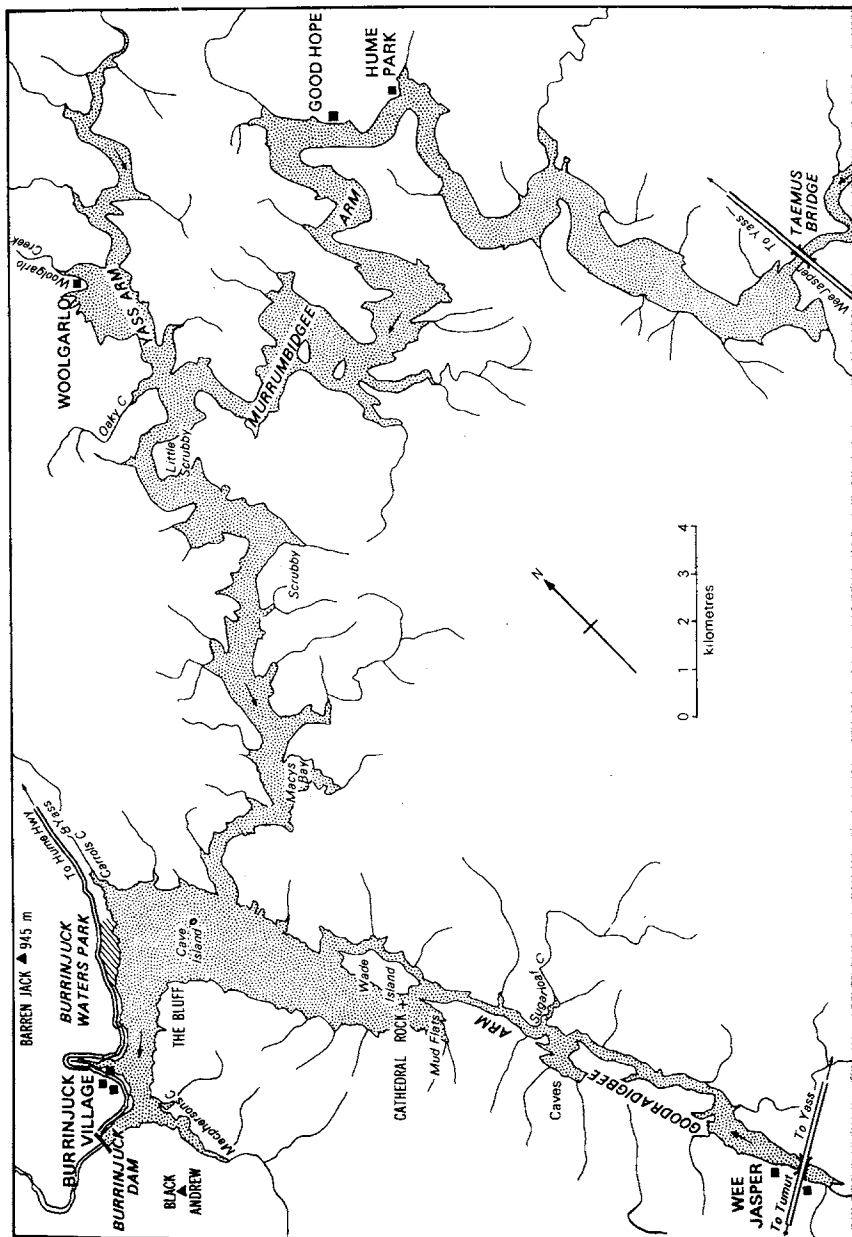
Angling is the main recreational use of Burrinjuck Reservoir. The area has strong appeal to anglers because of the large and varied population of both exotic and indigenous fish, and because of the wide variety of angling environments available for year-round use. The reservoir is devoted entirely to amateur fishing and no commercial fishing is allowed.

The area provides an excellent recreational outlet for anglers from many inland towns, including Canberra, Wagga, Albury, Goulburn, Queanbeyan, Cootamundra, Young, Yass and Junee, as well as more distant areas. Distances from the reservoir of some major towns are as follows: Canberra 115 km, Yass 59 km, Goulburn 139 km, Wagga 188 km, Albury 288 km and Sydney 350 km.

A large school of goldfish near the junction of Sullivan's Creek and Lake Burley Griffin. Schooling behaviour such as this is thought to be a response to strong light and clear water conditions

Brendan Pratt displays a dead platypus from a fish poacher's net. Platypus and other animals such as water rats and aquatic birds become entangled in such nets whilst seeking food and die from stress or starvation

Lake Burley Griffin is an urban lake of superb beauty but an unlikely location for a recreational fishery. Nevertheless local authorities have achieved remarkable results from stocking the lake with brown and rainbow trout and silver and golden perch



Burrinjuck Reservoir

Lakes and Reservoirs

The major indigenous sportfishing species are Murray cod, silver perch, golden perch and Macquarie perch, and the introduced species include rainbow trout, brown trout, brook trout and Atlantic salmon. In particular the area is noted for the size, vigour and numbers of Murray cod and rainbow trout, and for the prolific numbers of silver perch. Other species in the reservoir include goldfish, European carp, western carp gudgeon, *Galaxias* and Australian smelt. Redfin perch are found in the Murrumbidgee River immediately below the dam wall.

The major points of access to the reservoir for anglers are the Burrinjuck State Recreation Area in the Main Basin, Woolgarlo on the Yass Arm, Good Hope, Hume Park and Taemus Bridge on the Murrumbidgee Arm, and Wee Jasper on the Goodradigbee Arm. Anglers may fish from the foreshores of the reservoir or from a boat and most access throughout the area is by boat.

Boating is popular in both summer and winter and the reservoir offers a variety of wide vistas and tree-filled bays for boating and angling enthusiasts to explore. Boats may be launched from ramps



Burrinjuck Reservoir is a favoured haunt of big rainbow trout

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at Burrinjuck Recreation Area, Woolgarlo, Good Hope, Hume Park and Wee Jasper, or from the sloping foreshores in each of these areas and at Bloomfields and Cavan near Taemus Bridge. Mud and clay banks exposed by low water levels commonly restrict launching of boats from the foreshores, and steeply sloping banks restrict launching in other areas.

Few restrictions are placed on the sizes or types of boats used on the reservoir. However, all boat users require a permit from the Water Conservation and Irrigation Commission which protects the Commission in the eventuality of an accident. Speed limits are imposed on power boats near the Burrinjuck Recreation Area and in the Main Basin adjacent to the dam. Boating is prohibited in the section immediately adjacent to the dam.

The Burrinjuck Reservoir area is of considerable interest to anglers who are also amateur or professional geologists. The area contains large amounts of limestone formed during the Devonian and Silurian periods and these have yielded many rare and interesting fossils. Several relatively large limestone caves are open to the public near Wee Jasper and smaller caves occur throughout the area.

In addition to anglers the Burrinjuck area attracts many other visitors interested in picnicking, local flora and fauna and short bushwalks. Facilities in each of the major areas are described as follows:

(a) *Burrinjuck State Recreation Area*. This is the largest and best developed of the tourist areas surrounding the reservoir. It is bordered on three sides by native forest which is a fauna reserve and which provides a habitat for numerous native animals. Many of the birds and larger animals in the area have become accustomed to humans and the birds can be fed by hand by visitors. The area has a wide variety of native shrubs and trees, many of which have name plates attached to facilitate identification.

The highest point in the immediate vicinity of the Recreation Area is Barren Jack (945 m) where light snowfalls occur in winter. The summit provides excellent views of the surrounding terrain, particularly the Brindabella Ranges in the upper part of the catchment.

The area contains a number of flats and cottages, on-site caravans, powered camping-caravan sites, showers and toilets, barbecue facilities and car parking areas for visitors, and a store

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Trolling and casting amongst the flooded dead trees is a favoured fishing method in the Burrinjuck Reservoir

which supplies provisions, ice, gas, petrol and boat fuel, and fishing tackle. Outboard motor-powered boats are available for hire, and storage facilities for boats are available.

The Recreation Area is managed by a Head Ranger, assisted by several Rangers. The main period of visitor activity is October to May although some anglers fish throughout the year. Day visitors are charged a small fee for entry by car and for boat launching.

(b) *Woolgarlo*. Woolgarlo is a private farm with frontage to the Yass Arm. Access is by an unsealed road from the main Hume Highway-Burrinjuck access road. The property has been partially developed to accommodate tourists, with powered camping-caravan sites, cottages, showers and toilets, a launching ramp, and a store supplying petrol, boat fuel, gas and provisions.

(c) *Good Hope*. Good Hope is a private farm area with frontage to the Murumbidgee Arm. Access is by sealed road from Yass. The property has been partially developed to accommodate visitors, with powered camping-caravan sites, showers and toilets, and a store supplying boat fuel, petrol, gas, and provisions. A concrete boat ramp is provided.

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(d) *Hume Park*. Hume Park is a private farm immediately adjacent to Good Hope. It provides similar facilities to Good Hope, with powered camping-caravan sites, cottages, showers and toilets, a concrete boat ramp and a small store providing groceries, petrol, boat fuel and gas.

(e) *Taemus Bridge*. Anglers may obtain access to the Murrumbidgee Arm and the lower end of the Murrumbidgee River at Taemus Bridge, accessible by sealed road from Yass or partially sealed road from Canberra, and at the adjacent areas of Cavan, Bloomfields and Mountain Creek. Access in each instance is limited to the area immediately adjacent to the public roads unless permission is obtained from private landholders. No tourist facilities are provided. Boats may be launched from the sloping foreshore at Bloomfields and Cavan when the water level is high, but launching is restricted by mud and clay banks at low water levels.

(f) *Wee Jasper*. Wee Jasper is a small village at the junction of the Goodradigbee Arm and the Goodradigbee River. Anglers have access to the Goodradigbee Arm adjacent to the main road bridge, at Careys Reserve downstream, Somerset Tourist Park upstream, and at various locations along the Goodradigbee River upstream to Micalong Creek. A camping reserve is situated adjacent to Micalong Creek.

Rainbow trout are the most sought after and the most commonly encountered trout species in Burrinjuck Reservoir. They are popular with anglers because of their exceptional vigour and aerobatic ability, and because of the relatively large size which they attain. The fish are brilliantly coloured and on the hook provide an exhilarating display for fishermen.

Specimens to approximately 3.7 kg have been caught in the reservoir, although anglers normally encounter fish in the 0.5-1.5 kg range. Rainbow trout of this size, abundance and vigour are difficult to find in other mixed fisheries in mainland Australia, and this adds to the popular appeal of the Burrinjuck fishery. In terms of the size, vigour, abundance of fish, and freedom from disease, the Burrinjuck rainbow trout fishery compares favourably with the better quality rainbow trout fisheries in other parts of the world. Rainbow trout are found throughout the reservoir, but are particularly common in the Main Basin and the Goodradigbee Arm.

Brown trout occur throughout the reservoir and extend into the

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Bruce Pritchard makes it look easy by bouncing out a big lake trout

ivers. They reach a maximum size of more than 5 kg but a common size taken by anglers in the reservoir is 1-2.5 kg. However, relatively few brown trout are caught in the reservoir where the trout catch consists largely of rainbows.

The reasons for this are not clear, but several factors may be involved. For example, rainbow trout appear more eager than brown trout to take lures and flies and are thus more easily captured. Rainbow trout also may more commonly station themselves and feed in the upper layers of water than brown trout, and thus may be more favourably situated to take lures trolled or cast by anglers. Further, most trout angling is carried out in the clearer waters of the Main Basin and the Goodradigbee Arm, rather than in the more turbid waters of the Yass Arm and Murrumbidgee Arm, and the Goodradigbee Arm and Main Basin appear to be major feeding areas for rainbow trout rather than brown trout which show some preference for more upstream areas.

Brook trout do not yet form a significant proportion of the sportfish population of Burrinjuck Reservoir. They were introduced as fingerlings in 1970, and more recent releases have been made in the upstream sections of the Murrumbidgee River and many of its tributaries, and the Yass River. The fish initially

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showed a promising growth rate and are expected to attain a maximum weight of 2.5-3.0 kg. They take lures and flies eagerly and could become a popular fish providing the rate of reproduction is sufficient to replace fish harvested by anglers. However, there is some doubt about their ability to compete with other trout species and colonise the area and many anglers are less than enthusiastic about continuing with the stocking program.

Atlantic salmon were introduced to the Burrinjuck fishery in 1963 when 9000 fingerlings were released into Micalong Creek. A further 25,000 fingerlings were released in the Goodradigbee River in 1964. The success of the introduction is still in doubt as relatively few of the fish have been caught or reported by anglers.

Goldfish are abundant throughout the dam, and occur throughout the Yass River, in the lower reaches of the Goodradigbee River, and upstream in the Murrumbidgee River. The fish are generally considered to be unpalatable and have little or no sporting value. Small specimens are used as bait for Murray cod.

In addition to fish, numerous other animals of varying aesthetic and scientific importance are found in the Canberra region and can be observed readily in large park areas such as Burrinjuck. They include platypus (*Ornithorhynchus anatinus*), echidna (*Tachyglossus* sp.), yellow-footed marsupial mouse (*Antechinus flavipes*), tiger cat (*Dasyurops masculatus*), sugar glider (*Petaurus breviceps*), brush-tailed possum (*Trichosurus vulpecula*), ring-tailed possum (*Pseudocheirus peregrinus*), wombat (*Vombatus hirsutus*), red-necked wallaby (*Wallabia rufogrisea*), swamp wallaby (*Wallabia bicolor*), great grey kangaroo (*Macropus major*), wallaroo (*Macropus robustus*), eastern water rat (*Hydromys* sp.), bush rat (*Rattus lutreolus*), little brown bat (*Vespadelus pumilus*) and various snakes, lizards and tortoises. Those with the strongest aquatic association are the platypus, eastern water rat, yellow-footed marsupial mouse, bush rat, the eastern water dragon (*Physignathus leseuri*), water skink (*Sphenomorphus quoyii*), and the long-neck tortoise (*Chelodina longicollis*). The wide variety of birds noted includes 134 indigenous and 3 exotic species. Aquatic and semi-aquatic species of importance include the Australian pelican, black cormorant, little pied cormorant, pied cormorant, little grebe, hoary-headed grebe, great-crested grebe, white-necked heron, white-faced heron, white egret, white ibis, straw-necked ibis, yellow-billed spoonbill, black swan, mountain duck, black duck,

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great teal, white-eyed duck, wood duck, musk duck, white-breasted sea eagle, coot, white-headed stilt, silver gull, whiskered tern and sacred kingfisher.

Platypus occur in the reservoir and expand to the highest reaches of the tributary rivers. Although the animals have a reputation for shyness and are widely thought of as being nocturnal, they are commonly encountered by anglers during the day in the rivers. They are obviously present in greater numbers than is generally realised, and are particularly common in the larger pools in the Murrumbidgee River. In some areas, groups of 4-5 platypus often appear together on the surface of pools. The animals exhibit considerable curiosity and will repeatedly come to the surface of a large pool to observe anglers in boats or on the shore, and may keep pace with anglers fishing along the shoreline, but rarely venture closer than 10-15 metres.

Lake Burley Griffin

Lake Burley Griffin is a man-made lake developed by blocking the Molonglo River with Scrivener Dam at Yarralumla. It is 11 km long, with a shore line of 35 km, an average depth of 4.5 m and a maximum depth of 20 m. It was first filled in 1964. It has a surface area of 716 ha and a catchment area of 1865 square kilometres, of which 96.4 per cent is in NSW. The lake was designed primarily to provide an ornamental and aesthetically pleasing centrepiece for the National Capital and to link the separate north and south communities of Canberra, but has been stocked with fish from the outset to provide a sport and recreational fishery for local residents and visitors to the ACT.

The lake is generally shallow with significant areas of weed growth, which is particularly evident during dry summers, and generous numbers of trees and shrubs planted around the shoreline. Clumps of tall aquatic weeds occur at intervals along the shoreline. Soft edges of the western area of the lake and the Molonglo River form a pleasant contrast to the more formal and less biologically interesting stone walls and hard edges in the more intensively developed parts of the lake such as Central Basin.

The lake is warm in summer and cold in winter. Ecologically it represents a habitat which is marginal for the cold water exotic fish such as trout and the warm water indigenous fish such as perch and cod.

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Lake Burley Griffin drains the rich agricultural and forest catchments of the Molonglo and Queanbeyan rivers and Jerrabomberra and Woolshed creeks. There are major inputs from local urban areas and particularly from the Queanbeyan sewage treatment plant which empties into the Molonglo River just upstream from the lake. Consequently the lake is rich in nutrients which stimulate development of significant quantities of fish food including phytoplankton and zooplankton, aquatic algae and weeds, snails, frogs, yabbies, shrimps and insects of various types. In addition the lake contains large populations of small forage fish such as western carp gudgeon, smelt and *Gambusia*, goldfish and European carp.

Trout are unable to breed in the lake or much of its tributaries the Molonglo and Queanbeyan rivers because of pollution of the Molonglo River by upstream mining operations, blockage of the Queanbeyan River by Googong Dam, inputs of urban wastes from Canberra and Queanbeyan and siltation from land disturbance. Consequently the lake must be stocked annually to maintain the populations of recreational fish.

Brown, rainbow and brook trout, and golden and silver perch and catfish have all been stocked in the lake.



Carp (goldfish) are renowned for their capacity to develop ultra-large populations. This group was photographed in the shallows of Lake Burley Griffin.

Lakes and Reservoirs

Brown trout fingerlings show excellent survival and growth rates and develop to a maximum size of approximately 4.5 kg and live for perhaps five to six years. The adult fish have a well deserved reputation for wariness and are an extremely testing fish for local anglers. The average size of fish caught by anglers is less than 1 kg, but fish of 2 kg are not uncommon.

Rainbow trout are the most numerous of the three species of trout in the lake and are the species most commonly taken by anglers. They grow exceedingly rapidly and growth rates from fingerlings to 1.5 kg in 18 months have been noted, although the average growth rate is considerably less than this. The fish live for perhaps three to four years and reach a maximum weight of approximately 3 kg, although the average size taken by anglers is less than 0.7 kg.

Brook trout have been stocked in Lake Burley Griffin on two occasions in 1975 and 1976, but do not appear to be particularly well suited to the environment, and stocking of this species is no longer undertaken. An occasional large fish resulting from the two stockings is encountered by anglers but in view of results obtained to date the local authorities see little value in continuing with this experimental species.

Golden perch were first stocked in the lake in 1973 and then in subsequent years and survival and growth rates to date have been mildly encouraging. Fish of up to 1.0 kg at 15 months and 4.5 kg at four years of age have been recovered. Despite the encouraging results of the general stocking program, there has been an unexplained major loss of golden perch in mid-winter on one occasion and there is as yet no indication that the fish are breeding. Consequently the long-term future of the species in the lake has yet to be determined.

Surprisingly few golden perch are encountered by anglers in Lake Burley Griffin. Possibly this stems from the lack of experience in catching this particular fish and the need to use specialised baits such as yabbies on which golden perch consistently feed and the difficulty of getting other baits to golden perch in the face of extreme competition from the large numbers of European carp which now infest the lake. Excess turbidity in the lake also markedly restricts the use of the specialised deep diving lures normally used to take these fish.

Silver perch were stocked in the lake in 1975 and in subsequent

years. They appear to grow more slowly than golden perch, but the more significant numbers being recovered by anglers suggest it may be a more compatible and useful species for stocking. As yet there is no evidence to indicate that breeding is occurring in the lake. Most of the fish recovered by anglers have been small specimens weighing less than 0.2 kg, but an occasional larger specimen to 1.4 kg has been reported, and the proportion of larger fish should increase as anglers become more familiar with the habits of the fish in the lake.

Freshwater catfish were stocked in the lake for the first time in 1978. There has not been sufficient time to evaluate the success of the species although it is expected that they will acclimatise to the lake and form a valuable addition to the fishery. Similarly, fisheries authorities have indicated that they intend stocking the lake with Murray cod when supplies of suitable fish are available.

Goldfish are a common species found throughout the lake, although in recent years there is increasing evidence to suggest that they are being supplanted as the major species by the more recently arrived European carp.

Lake Ginninderra

Lake Ginninderra is a small urban lake approximately 1/7th the size of Lake Burley Griffin, formed by damming a tributary of the Murrumbidgee River, Ginninderra Creek, at Belconnen. Construction was started in 1973 and the lake was first filled in 1976. The lake has a surface area of 105 ha, a shoreline of 9.7 km, a maximum depth of 13 metres and an average depth of 4.5 metres.

As with Lake Burley Griffin the primary purpose of the lake is to provide an ornamental backdrop to a city centre, in this case Belconnen, but in addition it functions as a centrepiece for a large and heavily utilised open-space recreation area. It has been stocked with rainbow and brown trout, silver and golden perch and catfish and although it is still in the early stages of development it is proving to be a most exciting, productive and successful sport fishery in the heart of Belconnen. Present indications are that with proper management it will develop into a fishery of considerably superior quality to that of Lake Burley Griffin. Growth rates of all fish species have been particularly satisfying.

Brown and rainbow trout fingerlings stocked in December 1976, for example, have developed to about 0.8 kg in 15 months and

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there have been some outstandingly larger specimens to about 1.5 kg. Golden and silver perch have grown from fingerlings to about 0.6 kg in 15 months and about 2.0 kg in less than 3 years.

Catfish were stocked for the first time in 1978 and growth rates and survival of the fish at this stage have not been assessed. However, it is expected that they will successfully colonise the lake and by local breeding form a self-sustaining population and a welcome addition to the angling scene. Murray cod will be stocked in the lake as supplies become available.

The lake drains a catchment consisting of mixed urban and open grazing lands and is open to fishing throughout the year. The lake is usually considerably less turbid than Lake Burley Griffin, but can become turbid following moderate rain and this limits much of the lure and fly fishing, and to a lesser extent, bait fishing.

The lake is accessible at all points along the shoreline with the exception of a small section in the north-east corner occupied by the Belconnen Naval Radio Station. The fish appear to be well distributed throughout the lake although experience has shown that both golden perch and silver perch tend to form large schools which move around the lake to selected feeding areas.

Angling Techniques

There are three legal ways of catching freshwater fish, using bait, flies or lures. All are popular methods in the Canberra district and the choice of technique is dependent on many factors including the type of fish being sought, the state of the water, time of year, prevailing climatic conditions, the feeding behaviour of the fish and the personal preference of the angler.

Bait fishing

Bait fishing is a practical, efficient and acceptable way of catching fish in many streams and lakes and a large proportion of fish caught each year are taken in this manner. There are many commonsense reasons for using bait, for some or all of the year. It is a simple, inexpensive and undemanding type of fishing which can be practised by skilled and novice anglers alike. It can be practised as a relaxed, slow paced technique which allows the angler an opportunity to unwind, settle down and appreciate all the other things of interest in the outdoors. Alternatively it can be practised as a vigorous, dynamic method of searching for fish in a manner rivaling the most active fly and lure fishing techniques.

Bait fishing, like other techniques, is variable in terms of numbers of fish caught but it nearly always promotes some activity or interest by the fish and thus is useful in stimulating and maintaining angler interest, particularly on those days when the fish give only limited attention to lures or flies. Consequently it is a useful, practical and interesting way of introducing youngsters and newcomers to fishing and is an ideal technique for people who are restricted in some way such as by invalidity, age or illness. Patients recuperating at the Canberra Hospital, for example, heartily enjoy their limited opportunities to fish nearby Lake Burley Griffin, and they usually concentrate on bait fishing because it can be practised quietly and gently with little stress to the system and without the need to cover long distances of the shoreline.

Angling Techniques

All species of fish can be taken on bait. Some, such as goldfish and catfish, and the smaller specimens of European carp, silver and golden perch, rarely take flies or lures and must be fished for almost exclusively on bait. Other species, such as Murray cod, larger specimens of silver and golden perch and trout and redfin will take flies and lures but are more readily taken on bait at certain times such as when they are in deep water and difficult to reach with lures and flies, or at night, when lures are difficult for the fish to locate.

Bait fishing is useful also in waters where lures and flies are ineffective for others reasons, such as where there are thick pockets or layers of algae and aquatic weeds, thick overhanging vegetation along the banks of streams, or pools strewn with dead timber and flood debris. Bait fishing is useful also in turbid or discoloured water where fish cannot see lures and flies and most depend on smell and vibration to locate the bait. Finally, there is the fun and exhilaration, the sense of expectation, tension and excitement which many anglers associate with bait fishing as distinct from other forms of fishing.



Electric motors are useful on small boats in reservoirs and larger rivers

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All baits, obviously, consist of animal or plant material, and this may be used in the natural or processed state. Many animals can be used alive as bait although in the interests of conservation and fair play it is considered appropriate to impose minor restrictions on the use of some animals. Frogs, for example, are a protected native animal under both ACT and NSW wildlife legislation, and their use as live bait is prohibited. Lizards and snakes similarly are protected. The use of some other animals, although they are not protected species, is discouraged simply on the basis of a voluntary code of ethics and the avoidance of unnecessary cruelty to animals. Several years ago in Canberra, for example, it was necessary to gently discourage local schoolchildren from using live mice which they strapped to large hooks with elastic bands in an attempt to lure to the hook some of the ultra-large brown trout reputed to haunt the western end of Lake Burley Griffin.

Worms, yabbies, shrimps, small fish, aquatic and terrestrial insects and their larvae are the most commonly used baits in the Canberra region. All are best fished in the live and vigorous state, and many can be caught in or near popular fishing areas. Catching the bait can be as much fun as catching the fish, and searching under rocks and logs and amongst the weed beds for yabbies, shrimps and insects is a great way to interest and educate newcomers to the combined fun of angling and nature study.

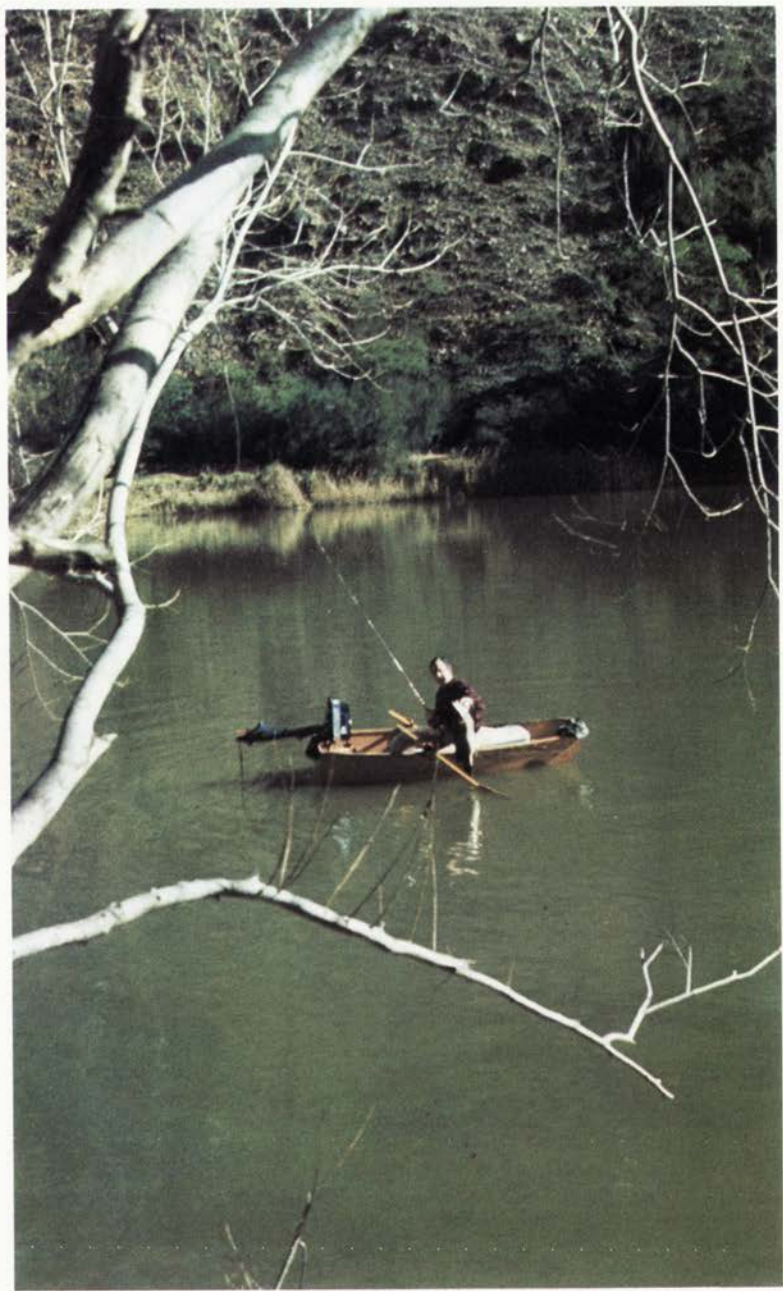
Non-living baits commonly are more convenient or simple to obtain and use than live baits, and although not always as effective as the latter they satisfy those who have reservations about the use of live animals as bait. The most commonly used baits are bread or dough made from flour and water. However, inventive and resourceful anglers are continually bringing forward new and interesting baits including such exotic items as currants, sweet corn, boiled wheat, boiled rice and various forms of pudding made from sausage, cheese and bread, all of which are reliably claimed by the proponents as being more useful and effective than that being used by everybody else on the day.

Presenting a fly to a trout in a crystal clear stream in mid-summer requires delicacy and skill

Keith Sheilds with a large golden perch taken on a deep diving lure

Flea Creek, a small tributary of the Goodradigbee River, is famous as a spawning area for trout migrating from Burrinjuck Reservoir each year





Angling Techniques

Worms are by far the most popular and widely used live bait and are taken by all species of freshwater fish. Anglers commonly breed them in backyard farms in such convenient locations as compost heaps, or purchase them from commercial suppliers who produce large numbers of worms in special earthworm farms. One such enterprising farmer who regularly supplies the Canberra market operates a worm farm in conjunction with a rabbit farm and his special worms have gained a most enviable reputation as fish attractors. Another raises worms in association with a large commercial poultry farm, and yet another with a fish farm. Competition is a feature of the commercial worm world and it is not uncommon to hear of a specific farmer lauding his particular offspring as the reddest, wriggliest, fattest and healthiest to be had.

Despite the ready availability of the commercial product, life has not changed much over the years, and the great majority of anglers still find their worms in the same locations or under the same circumstances that bedevilled our grandfathers, or grandmothers, that is in the backyard garden whilst we are locked in mortal combat with recalcitrant soils and weeds with growth qualities superior to vegetables, lawn and shrubs. It is a fact of life that fishing and gardening do not mix. One serves the other but there is no reciprocal assistance. A would-be gardener can discover enough worms to go fishing. A man who discovers enough worms and doesn't go fishing has no soul. Fishermen are not gardeners although gardeners can be fishermen, albeit opportunistic ones.

Worms can be gathered from under logs, rocks and various forms of natural debris or can be dug from river banks and lake surrounds. Whilst this may be acceptable in some areas, especially where the cover is restored to protect the habitat of the other animals which live there, the practice of digging and disfiguring river banks or a lake shore is not encouraged. It results in an unsightly appearance, damages vegetation and leads to erosion and damage to the river system, and in some cases to the fishery itself.

Another useful live bait is the common lawn grub, which is the larva of a small dark-coloured beetle. They are particularly useful for Murray cod and golden and silver perch, especially in late

Murray cod typically inhabit large river holes such as this one on the upper Murrumbidgee. A small boat makes it easier to locate the fish

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summer and early winter, but are taken on occasions by other species. They too usually are discovered during would-be attempts at gardening or lawn maintenance, resulting in the expected strained loyalties between enforced domestic duties and the more pleasant attractions of the stream bank.

Various other forms of useful beetle and moth larvae are found in living trees and fallen timber along the river bank, particularly in she-oaks, wattle and eucalypts. Whilst these are useful baits for several species of fish, including Murray cod and golden and silver perch, the usefulness of such baits is generally overstated by otherwise well meaning fishermen who dwell upon intermittent successes and unwittingly give rise to a multitude of tall stories. The end result is a constant parade of would-be bait gatherers who inflict considerable unnecessary damage with axes and saws on many of the attractive and useful trees which adorn the riverbanks and which provide necessary shade, shelter and soil stabilisation in the important riverbank zone. In most instances sufficient grubs can be obtained from non-living trees and there is generally no justification whatsoever for damaging living trees.



Norm Banham well equipped for winter night fishing with a glove, warm jacket, waders and light cane creel

Angling Techniques

Shrimps are widely used for all species of fish, and are found in the larger river pools and in Lake Ginninderra, Lake Burley Griffin and Burrinjuck and Wyangala reservoirs. They can be caught easily in nets or traps of various types baited with ordinary household soap or a piece of meat or fish flesh set during the day or overnight. A hessian or cloth bag filled with leaves and twigs and baited with fish heads or meat is a most successful form of trap and is widely used in the Burrinjuck area. The most successful trapping areas are usually located at the bases of dead trees or stumps or along the edges of thick weed beds. In some highly productive areas, such as in Lake Burley Griffin, shrimps can be harvested by raking through weed beds close to the shoreline.

Yabbies similarly can be caught in traps and nets or scooped or raked from weed beds, but most are caught in farm dams on individual baited lines or nets. Others are found in small creeks and backwaters, or under logs and rocks along the stream bank. Yabbies are favoured baits for Murray cod and golden perch but are taken by most other species.

Mudeyes are the aquatic larvae of dragonflies and are the most widely sought after insect bait for trout. They are usually found in the cracks and crevices in logs dragged from the water but can be scooped or raked from weed-filled creeks and backwaters.



Long-distance casting is a useful art to master when fishing small crystal clear streams

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Yabbies, shrimps and mudeyes can be kept alive until required in cages submerged in the water, or, for added interest, in a home aquarium. They will live for short periods wrapped in wet weeds, forest litter, hessian bags or even newspaper, particularly if they are kept under cool, shaded conditions. They can also be frozen and stored until required for use although they are not as effective as the fresh product.

Small fish which are commonly used for bait include *Gambusia* (mosquito fish) which are common in many waters, but surprisingly, not in Burrinjuck Reservoir, western carp gudgeon, which are abundant in Lake Burley Griffin and Lake Ginninderra, Australian smelt, which are abundant in Burrinjuck Reservoir, and goldfish and silver perch which occur in many areas. Small redfin and European carp may be used but this is not encouraged because of the risk of accidental transfer of the species to areas where their presence is likely to pose a threat to other more desirable fish species and other animals. *Gambusia*, western carp gudgeon and smelt can be captured using a fine mesh scoop whilst other species can be taken on bait. All are prolific breeding species which can easily withstand the pressure of use as a bait species.

Lure fishing

The principle of lure fishing is simple. Basically it consists of casting and retrieving some object which is sufficiently attractive to induce a fish to intercept and attempt to grasp it, with the result that the fish becomes hooked. It is a popular form of fishing in the Canberra region.

A major advantage of lure fishing is that it frees the angler from the need to seek out and carry bait, which can be difficult to obtain on some occasions and even more difficult to maintain in a condition suitable for use. In addition, lure fishing allows the angler to take his lure to the fish, rather than the other way around as in bait fishing. In its simplest form, lure fishing can be practised by almost any angler, whether novice or expert, with just a few minutes of tuition.

Much of the attractiveness of lure fishing stems from its active nature. An angler freed from the constraints of bait fishing in a fixed location can indulge in an invigorating and stimulating inspection and search of the waters he is fishing. He can move around in the outdoors, seeking fish in a variety of places and enjoying the

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sights and sounds of the different areas.

Lure fishermen generally like to remain active, and most derive pleasure and satisfaction just from casting, even if there are no fish active at the time. When things are slow for a lure fisherman, logs, rocks, stumps, weed beds, any selected point of interest, becomes the new target. The satisfaction comes from being able to place lures in selected locations accurately and repetitively, under a variety of stream and lake conditions, using a range of large and small lures with different rod and reel combinations.

Although lure fishing is commonly referred to as spinning, there are in fact a number of different forms of lure fishing and only some of the lures actually spin. The majority of the lures are designed to wobble from side to side, or move up and down, in various patterns, but some have a spinning vane or rotating body. The more complicated move in three separate planes with an action which results in vibrations and flashes seemingly attractive to fish, although one suspects that the great majority of lures are sold on the basis of their attractiveness to fishermen, not fish.

The majority of trout lures are surface or shallow run lures because these fish spend so much of their active feeding time at or near the surface in shallow water or clear water where they can easily see lures. Murray cod, and silver, golden, Macquarie and redfin perch, on the other hand, tend to feed or station themselves at deeper levels and lures which penetrate beyond the surface to these levels are more useful. However, all of these species have variable habits and will take lures of each type on some occasions. Some of the more common and useful lures for the Canberra region are given in the following lists.

Murray cod and golden perch

Celta, Paravan Spoon, Heddon Deep Dive River Runt, Heddon Deep Six, Heddon Tiny Tad, Heddon Tadpolly, Heddon Magnum Tadpolly, Heddon Crackleback, Shakespeare Deeper Dan, Flopy, Abu Hi-Lo, Burkeflex Wee Gillie, Burkeflex Big Dig, Arbogast Hustler, Arbogaster, Flatfish, Reb 2 Deep Diver, Reb 2 Deep Runner 3000, Bellbrook Deep Diver, Bellbrook Swayback, Mudbug, Gudebrod Bump 'n Grind, Voblex, Aeroplane Spinner, Racket Shad, Hellbender, Mister Twister, Rapala Deep Diver.

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It needs two hands to lift a big Murray cod from the river

Silver perch

Celta, Paravan Spoon, Heddon Deep Dive River Runt, Heddon Deep Six, Heddon Tiny Tad, Heddon Tadpolly, Shakespeare Deeper Dan, Flopy, Arbogaster, Flatfish, Reb 2 Deep Diver, Bellbrook Deep Diver, Bellbrook Midget, Voblex, Ondex, Pegron Tiger Minnow, Pegron Mountain Minnow, Super Duper, Abu Sonette, Wonder Wobbler, Hardys Imp, Hellbender, Mister Twister, Wonder Hot Shot, Heddon Tiger, Rapala Deep Diver.

Macquarie perch

Mister Twister, Celta, Spoon Flash, Flopy, Colorado Spoon, Tiny Tad.

Redfin and trout

Celta, Super Duper, Hardys Imp, Colorado, Indiana, Paravan Spoon, Wonder Wobbler, Abu Droppen, Ondex, Abu Sonette, Abu Reflex, Mitchell Spinner, Devon, Shakespeare Noris Minnow, Tiny Tad, Flopy, Pegron Tiger Minnow, Pegron Mountain Minnow, Flatfish, Baltic Minnow, Baltic Bobber, Arbogaster, Reb 2 Quarterback, Redeye, Voblex, Halco Twirler, Lucky Seven, Hogback, Caddy, Hot Zot, Pecos Articulate Trout, Mister Twister, Heddon Tiger.

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Fly fishing

Fly fishing is the traditional method of capturing trout. It is commonly portrayed as being a difficult and demanding form of angling, but this is one of the great myths of the angling world. The average angler can be taught the rudiments of fly fishing in a few hours, and can master the basic casting technique with just a few extra hours of practice. This is why there are so many fly anglers in the community today and why there are youngsters of 10-12 years of age and ladies of modestly elderly years confidently and effectively fishing the streams and lakes in the Canberra region.

Fly fishing differs from other forms of fishing in one basic respect. In bait and lure fishing the weight of the bait, sinker or lure is used to carry the line out from the reel during the cast. In fly fishing the reverse applies and the thick fly line is used to carry the fly out to the fish. To achieve this a special synthetic fly line is used, together with a long rod to achieve leverage and proper line control while casting. Sensitivity at the terminal end is achieved by using a fine nylon leader to which the fly is attached.

The reel used in fly fishing also differs from those used in other forms of fishing. Because it is used to only a minor extent in playing a hooked fish there is no need for a complicated, geared structure as in other reels. It is used basically for line storage and usually is a simple device with few moving parts. For convenience also it is positioned out of the way at the lower end of the rod.



Alan Basford completing a fly with a whip finish tool

Trout diet

To understand and successfully practise fly fishing, it is first necessary to understand something of trout habits and particularly trout diet. Trout eat a variety of organisms including insects, spiders, water fleas and assorted plankton, frogs, snails, shrimps, yabbies, earthworms, slugs and small fish such as *Galaxias*, Western carp gudgeon, smelt, *Gambusia*, goldfish and European carp. They also eat trout eggs and young trout including their own kind and it is assumed that they eat young redfin, Macquarie, silver and golden perch, Murray cod, catfish and blackfish. Possibly on occasions they take more unexpected items such as mice. They also can be attracted to a variety of artificial baits and it is not uncommon for trout to be taken by children fishing in Lake Burley Griffin with bread, sweet corn, or dough. There is at least one record of a fat rainbow being taken on a rabbit leg used as yabbie bait in the lake. Trout are best known, however, for their insect feeding behaviour. Trout will take larval and mature insects which live in or on the water, or which are blown, washed or fall into the water or fly near the water surface.

Most anglers are familiar with the disturbances created by a trout as it rises to suck in an insect floating on the surface of the water. This is known as the trout rise. Where the trout moves up and down a stretch of water, rising to food items, it is working a beat. Where it takes aquatic larvae of insects, that is, nymphs, creating a bulge at the water surface, it is nymphing. Anglers can catch trout in a variety of ways using natural or artificial bait, but fly fishing, which involves the use of artificial flies which are either indeterminate attractants or which imitate some specific natural food item, is considered the most attractive and most exciting.

Many aspiring anglers have assumed that it is necessary to have a detailed knowledge of entomology to be a successful fly fisherman. This is not so, as it is possible to be a first class fly fisherman without knowing the name, habits or behaviour of a single insect species and without knowing one end of an insect from the other. All an angler may need to do is purchase or tie flies in patterns known to be useful in a given area at a given time of the year, and sally forth.

Of course a knowledge of entomology, however rudimentary, can be a valuable asset in developing a better understanding of trout behaviour, and that can be put to use in terms of better

Angling Techniques

catches or more satisfying fishing. A good entomological knowledge will aid the angler in tying better and more useful flies and in making the more useful choice of a fly on a day when the fish are not feeding to any clear behaviour pattern. However this implies that the angler already has sufficient basic angling skills and knowledge of fish behaviour to make proper use of the additional entomological knowledge.

Artificial flies are constructed from a wide range of materials including bird feathers, animal hair, raffia, chenille, tinsel, silk, nylon, plastic and various other synthetic materials. They are tied on special hooks and although many patterns appear complicated most are far more simple than they look and can be tied by even novices after a few short lessons.

Flies are tied according to a recipe or pattern which can be duplicated by anglers throughout the world. The same basic group of flies is found in most countries supplemented by patterns local to a particular area.

It is a popular misconception that all flies are intended to imitate a specified insect or other animal and that on the day a fly chosen for use must imitate insects or other stream life active at the time. This is only partly true. Many flies do carry names that clearly identify them with particular insects and are tied to imitate various stages of the insect. Thus flies may be tied to represent nymphs, newly-emerged adults, mature adults, winged or non-winged adults, or adults which are spent following mating. These include moths, dragon flies, damsel flies, bees, wasps, ants, hover flies, grasshoppers, mosquitos, caddis flies, stone flies, may flies, gnats, midges, wattle beetles, pasture beetles, water boatmen, spiders and chironomids. These may be tied as dry flies, designed to be used floating on top of the water, or wet flies to be used as a sunken fly. In addition there are various wet flies tied to represent small fish, shrimps, snails and tadpoles and many others which although known to be successful and widespread attractants to trout do not necessarily represent any particular insect or other organism. Whilst all of these are known technically as flies the latter group, which are fish-like in colour or shape are known also as streamers, matukas, or even as lures in some countries.

Flies are readily obtainable from tackle stores, but most anglers sooner or later begin tying their own. Tying flies at home is inexpensive and enables an angler to be innovative, creative and to in-

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dulge in the pleasures of trying to catch fish on a fly constructed entirely from an individual effort.

Tying flies is surprisingly easy. The simpler patterns can be tied effectively after a minimum of training and practice, and even the most complicated patterns are not beyond the reach of the average angler and fly tyer. Most anglers begin tying with a more experienced person then progress with the aid of various texts and practice and experimentation. Fly tying classes also are conducted by angling clubs and occasionally by technical colleges and adult education organisations. Fly tying kits suitable for beginners are available in most tackle stores or individual items can be purchased separately. Various feathers, furs and other useful material can be purchased or obtained from a variety of sources, from friends, and in the field. Most feathers are obtained from domestic poultry including chickens and ducks which have particularly strong fibres but useful feathers are also obtained from wild ducks, pheasants and starlings. Fur or hair from mink, seal, deer and goat is widely used together with other items such as raffia, tinsel, braid, lead and copper wire, chenille, wool and stray feathers from crows and other native birds killed along roadways.



Night fishing is often productive where fish are disturbed by excessive activity by visitors during the daytime

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A good beginner's kit is comprised of the following items: one red game cock hackle, one white cock hackle, one packet black seal's fur, one packet brown seal's fur, one packet peacock herl, one packet pheasant tippets, one cock pheasant tail feather, one packet of white duck quills, one reel black gossamer silk, one reel gold tinsel, one reel of silver tinsel, one piece of fly tyer's wax, one box of hooks — size 8— one bottle of varnish, one pair of hackle pliers, one pair of scissors and a good fly tying vice.

Whilst there are myriads of fly patterns which are useful in the Canberra district there are a number of basic patterns which most anglers carry and select from on particular days.

The following groups of flies cover most of the useful patterns which are in general use in the region. In addition many anglers have well guarded secret flies which of course they claim are far superior to any of the other patterns listed here. That's one of the pleasant little things that makes trout fishing so interesting in this part of the world.

Dry flies

Coachman, Hair Wing Coachman, Glen Innes Grasshopper, Hackle Hopper, Smarts Hopper, Black Spinner, Tups Indispensable, Coch-y-bondhu, March Brown, White Moth, Iron Blue Dun, Black Ant, Muddler Minnow.

Wet flies

Phantom, Black Ant, Black and Red Matuka, Purple Nymbeet, Pheasant Tail Nymph, Brown Seals Fur Nymph, Green Seals Fur Nymph, Stick Caddis, Greenwells Glory, Hamills Killer, Mudeye, Mrs Simpson, Fuzzy Wuzzy, Bloody Mary, Steindls Yellow Mudeye, Smarts Green Hopper, Muddler Minnow, Craigs Nighttime, Green Beetle, Claret and Teal.

Angling Regulations and Illegal Fishing

The angling regulations in the ACT and NSW are basically similar, but there are some differences of which anglers should be aware.

In the ACT the only legal means by which most of the streams can be fished is with a single rod and line, held in the hand, using only flies and lures. The streams are open to fishing from the Saturday nearest 1 October to the Sunday nearest 1 June in the following year. The exceptions to this are: (a) Lake Burley Griffin and Lake Ginninderra, where live bait in addition to lures and flies may be used, and where the waters may be fished all year round; however, angling in these lakes is still restricted to the use of a single rod and line, held in the hand, and (b) two streams in the ACT which are open to bait fishing, namely the Murrumbidgee and the Molonglo downstream from Coppins Crossing. In these waters a rod and line held in the hand, plus two set lines, may be used, but a tag showing the owner's name and address must be affixed to the set lines. Angling is prohibited in the waters of the Cotter, Bendora and Corin Reservoirs described earlier, in the Orroral River upstream from the road to the Orroral Tracking Station and in the Tidbinbilla River within the boundaries of the Tidbinbilla Nature Reserve.

In NSW the only permitted method of fishing for trout is with a single rod and line held in the hand. For other species, with the exception of bass, one line held in the hand plus up to four set lines may be used, but the set lines must have tags affixed showing the angler's name and address. The closed season for trout for streams referred to in this book is from the Monday nearest 1 June to Friday preceding the Eight Hour Day Holiday in October inclusive, each year. No closed season applies in the backed up waters of Burinjuck and Blowering reservoirs, or Wyangala Reservoir upstream to the junction of the Abercrombie River with Moores Creek and upstream to the junction of the Lachlan River with Sandy Creek.

For trout fishing in NSW, the bait may consist only of natural

Angling Regulations and Illegal Fishing



This illegally set line recovered from a river was baited with large pieces of rabbit complete with fur. Perhaps he was after bunyips

flies, or insects or the larvae thereof, or worms, or artificial flies, minnows or insects, or spoons or flashes. An exception in the Canberra region is the Molonglo River upstream from the face of the Lake George Mines Limited Dam (usually known as the Captains Flat Dam) where fishing is restricted to artificial flies only.

With the exception of fishing for trout, no restrictions are imposed on the type of bait the licensed angler may use in NSW under Fisheries legislation, but anglers should note that certain animals are protected under other legislation and therefore cannot be used as bait.

The purpose of a closed season for trout is to allow the fish to spawn unhindered and thus guarantee continued good fishing in lakes and rivers as the new recruits replace the fish dying through natural mortality or harvesting by anglers. As trout do not breed in lakes, these may be kept open to fishing throughout the year without undue effect on breeding fish.

An angler is allowed to take up to 10 trout or salmon per day, each with a minimum legal length of 25.4 cm. This ensures that fish taken have reached a size at which they have had an opportunity to

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spawn, and that the population is not over-exploited. There is no size or bag limit on other species of fish, but anglers are encouraged at all times to take only enough fish for their immediate needs.

All anglers over the age of 16 years fishing in NSW must possess an Inland Angling Licence for which the annual fee is \$6.00. A 21-day licence costs \$3.00. No licence is required in the ACT.

Illegal fishing methods include the use of traps, snares, poisons, spears, explosives, firearms, set-lines, cross-lines, gill nets and drum nets. The techniques may be destructive to fish populations where excess numbers of fish are taken, as with netting and set-lining, or where they act as barriers to migration, as with nets and traps, or where the environment is significantly damaged by physical or chemical means, as with poisons and explosives.

Most illegal fishing activities in the region are suppressed by officers of NSW State Fisheries, stationed at Yass, Tumut, Cooma and Jindabyne, or officers of the Department of the Capital Territory in the ACT and Gogong Foreshores, but the area is large and difficult to cover and some illegal activities persist. Netting and set-lining are the most significant offences. However, the incidence and significance of such activities are minor compared with the effects of other activities such as improper land use in the



A satisfying catch of superbly conditioned brown and rainbow trout

Angling Regulations and Illegal Fishing

catchment and disposal of mine wastes and sewage effluent and other pollutants which can induce permanent and critical change to the aquatic and associated terrestrial habitats on which the survival and success of the fishery depends.

Road access is of special significance to illegal fishermen. Where roads are few and access is restricted, illegal fishermen who penetrate the area can operate with little chance of accidental observation by anglers or authorities. However, they may then be restricted in the numbers and weight of fish they can transport from the area. In Burrinjuck or Wyangala reservoirs for example this may be of little significance because of ready access to all areas by boat, but could be of particular importance in the steep and rugged terrain of, say, the trout spawning areas of the Goodradigbee River.

On the other hand, easier road access may mean that greater numbers of illegal fishermen have the opportunity to operate within an area, and the total destructive effect on the fishery may be the same under both sets of conditions.

Most angling organisations are familiar with the activities and effects of illegal fishermen, and those with the most intimate knowledge of the local fisheries are of the opinion that restriction



One of the tragedies associated with illegal fishing is the number of platypus and other animals which are killed



Most landholders are willing to give permission to anglers to cross their land but some apply restrictions and signpost their properties accordingly

of road access to trout spawning areas is of particular importance in the long-term protection of trout fisheries.

One unfortunate sidelight to illegal netting and trapping activities is the destruction of large numbers of air breathing animals such as tortoises, water birds and particularly platypus which become entangled or trapped on or beneath the water and die from suffocation or drowning. This is particularly disheartening in view of the importance of these pleasant and useful animals and the effort expended by authorities and individuals in ensuring that both the habitat and the animals themselves are otherwise protected from damage.

Gordon Winter with a good specimen of silver perch taken by trolling behind a small boat

Tiny trout fingerlings for stocking in Canberra's urban lakes. They grow at a remarkable rate and reach a useful takeable size in 6-9 months

Fly angler, Brian Julian, dressed for comfort and mobility with chest waders, hat and lightweight jacket. Flies and other necessities are carried in jacket pockets; fish retained can be carried on a cord attached to the waders





Angling Regulations and Illegal Fishing

Both NSW State Fisheries and the Department of the Capital Territory issue informative pamphlets on laws relating to fishing in areas under their jurisdiction. These are readily available from a variety of outlets, including fisheries offices and information centres, police stations, angling clubs and tackle stores, and ignorance of the law is therefore no excuse for illegal activities. Keep in mind the fact that these simple laws relating to fishing are designed to help, not hinder anglers, and that the money you contribute to your sport by way of licence fees is returned to you manyfold by NSW State Fisheries, by provision of a comprehensive fisheries management service. If it wasn't for them you wouldn't be enjoying your fishing tomorrow. So play the game, and help yourself to better angling.

The main basin of Burrinjuck Reservoir. The reservoir contains the backed-up waters of the Yass, Goodradigbee and Murrumbidgee rivers and contains one of Australia's best populations of trout and native fish

Wyangala Reservoir on the Lachlan River, famous for its rainbow trout and catfish population

Tackle

Tackle is a vexed item on which to advise newcomers to angling. Veteran anglers are fully familiar with the need for efficient and useful tackle, the enjoyment associated with good quality tackle and the questionable economics of purchasing cheaply made and poor quality equipment. They are aware too of the generalities of differences in rods, reels, lines, waders, creels and the myriad other items which make fishing such an interesting and diverting pastime.

They talk with perspicacity and seeming skill on items such as double action and single action reels, forward taper and double taper fly lines and sliding floats and fixed floats and it must all seem a little like Alice in Wonderland to a newcomer. However, it is not as difficult as it may seem at first glance. Understanding tackle is no more difficult than understanding what is in your kitchen cutlery drawer and the intended use for each item. Fishing tackle is used on the same principle — different hardware for different fish, different methods of catching fish and different stream and lake conditions.

Thus an angler may need one set of tackle for fly fishing, one set for bait fishing and possibly another for lure fishing. Some of the tackle items, such as rods and reels used for lure and bait fishing, are interchangeable, but others are more specialised and are used only for a single specific purpose such as fly fishing.

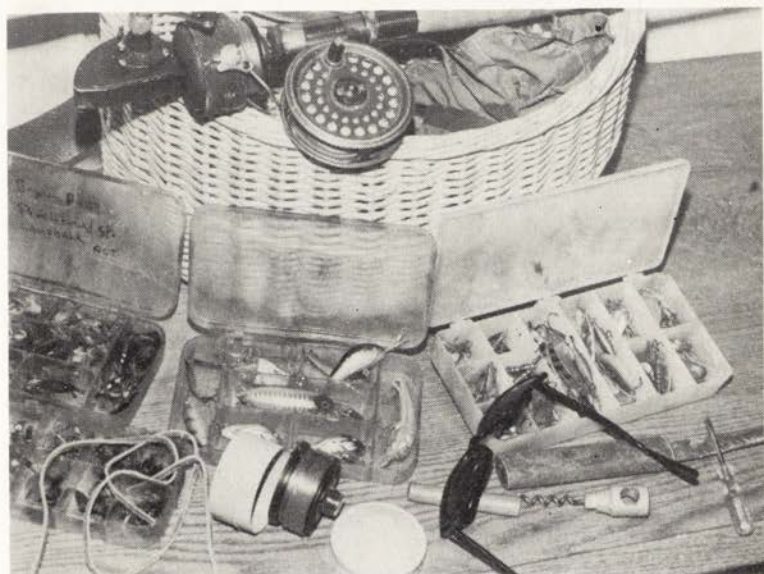
As might be expected, the quality of the tackle available varies greatly, as does the need for tackle of a particular quality. This poses something of a dilemma for the aspiring angler. Some of the tackle is inexpensive, some of it exceedingly expensive, some of it is useful and effective, some of it less so. Unfortunately price cannot always be equated with usefulness or effectiveness.

Some simple rules, however, may be of use. Cheapjack tackle may do part of the job part of the time but cannot be expected to last for more than a short period under even ordinary fishing conditions. Cheap tackle may be suitable for landing little fish, but

Tackle

may collapse under the strain on the first occasion a big fish is hooked. Above all cheap tackle is commonly more difficult to use. It is the difference between a sharp knife and a blunt knife when you are trying to cut a piece of steak. With good quality tackle there is always the opportunity and incentive to master particular skills and get better and better at a specific task. The result with poor tackle is frustration and disappointment. A good angler can sometimes catch fish with either good or bad tackle, although obviously he is likely to be more successful with the former. A lesser angler will be bewildered, frustrated and annoyed with poor tackle. It will take the edge of his enjoyment and lessen his overall pleasure in what should at all times be an enjoyable and relaxing sport.

Consequently when you are buying tackle it pays to buy the best quality you can afford and to buy products by recognised manufacturers, from a specialised and reliable tackle store where manufacturers' guarantees will be honoured and where there is a continuing supply of spare parts available for future years.



A well-outfitted angler carries fly tackle, spinning tackle and a good selection of flies and lures. The corkscrew is an optional extra but useful for survival

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Rods

In this book you will notice that there are few references to hand lines but constant references to rods. This is not unexpected. There is little scope or need for hand line fishing in most inland waters today with the possible exception of some of the native fish areas where set lining is allowed. Hand lines are less effective, more difficult to handle and their use is illegal in declared trout waters as they are automatically classed as set lines.

Fishing with a rod has several advantages. It allows lures, flies and baits to be cast and retrieved more easily and conveniently and with greater accuracy. It makes it easier to keep a line clear of obstructions, to reach into awkward spots and to hook and play a fish. In essence, a rod should be an extension of the angler's arm, providing reach and leverage.

Just a few short years ago rods were all made from wood or from various types of bamboo known as Rangoon, Tonkin or split cane. Split cane rods and occasional wooden rods are still in use today, but they are few and far between, having been succeeded in more recent years by fibreglass, which is lighter, stronger, more resilient, requires less maintenance and is generally better value for money. Glass rods may be solid or hollow. The latter are generally lighter,



Fallen trees along the river bank are favoured hiding places for native fish

Tackle

more flexible, easier to use and of overall better quality. Nevertheless, hollow glass rods vary greatly in quality. The cheaper forms are made by wrapping layers of glass cloth around a tapered metal mandrel, impregnating it with phenol resin which is then hardened chemically and by heating. A more elaborate process is used for better quality rods, where carefully calculated amounts of glass cloth and coaxial glass fibre are applied to the mandrel and placed in a mould. Synthetic resin is then injected under strong hydraulic pressure and allowed to set. This gives great strength, flexibility and resilience and by varying the thickness of the wall and the degree of taper, rods with differing action at the tip or butt and with differing strength can be produced.

In more recent years high quality rods made of a carbon fibre known as graphite have appeared on the local market. Originally developed at the Royal Aircraft Establishment at Farnborough in England graphite was quickly taken up by tackle manufacturers in Japan and the USA for production of superb quality rods, mostly fly rods. Carbon fibre rods are immensely strong but more sensitive, thinner and lighter than rods made from other materials. For example they are approximately 25 per cent lighter than an equivalent glass rod and 40 per cent lighter than cane. They require considerably less effort in casting than glass or cane and enable an angler to indulge in less demanding, less tiring and more accurate casts for longer periods. Carbon fibre rods at the moment are the ultimate in quality and exceedingly pleasant and satisfying to use, but are expensive and commonly cost two to three times as much as a good quality glass rod.

Different types of rods are used for different forms of fishing. Rods of 1.5-2 m with a straight handle are suitable for use with the common eggbeater or open face reel or a light side cast reel and are used for general bait and lure fishing. Spin cast rods may be used for the same purpose but as the reel is mounted on top of the rod the reel seat and rod handle are offset in the pistol grip form. The pistol grip form is also used for bait caster reels where heavier baits or larger and heavier lures are used.

Fly rods are different. They are commonly 2.4-2.6 m in length and the reel is mounted at the base of the rod. The reason for the added length is simple. In other forms of fishing the weight of the lure, bait, sinker or float carries the line out during the cast. In fly fishing the reverse applies and the line is used to carry out the fly.

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In addition fly fishing requires delicacy, sensitivity and control of the line and the fly and a hooked fish. A rod that is too short or too long does not possess the required balance of strength, sensitivity and manoeuvrability.

Balance in tackle is an important concept. Unbalanced tackle results in casts that lack distance and accuracy. It is difficult to feel a bite or to hook and play a fish and there is less enjoyment in the actual casting and general fishing process.

Versatile fishermen who have mastered the use of one rod or a group of rods for general use often then progress to specialist tackle for use in specific areas, for example a 2.7 m fly rod for use in lakes and a 2.3 m fly rod for small streams. Rods can be one piece or be made in segments which fit together. One piece rods tend to be stronger overall with greater resilience and have a better feel for the angler and require less maintenance in the long term.

Two-piece rods are easy to carry but lack the resilience and strength of a one piece rod. Most two-piece rods manufactured in past years are fitted with metal ferrules which eventually wear, become sloppy and require replacing from time to time. These have been superseded to a large extent in recent years by glass to glass junctions with no metal ferrule, with an agreeable reduction in problems of wear and sloppiness.

If you work in a tackle shop for a short while some interesting statistics on rod breakages emerge. The proportion of breakages is markedly higher in rods of cheaper quality than in the expensive models. Rods are broken on bushes, rocks, during falls, but most commonly in car doors and rarely on fish. A salutary lesson there for all fishermen.

Reels

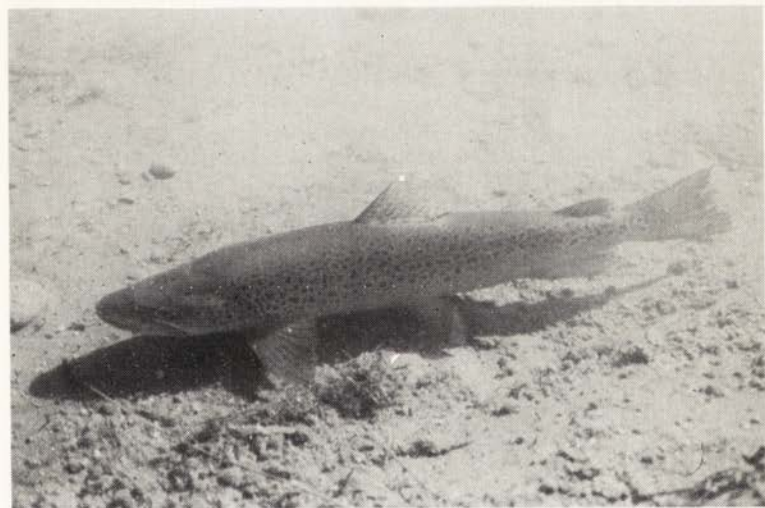
There are a number of different reels available, each with some special characteristic that makes it more useful for a specified type of fishing. The simplest form of reel is the centre pin type. These are simply made, inexpensive and require little maintenance. However, they are not suitable for casting, have a slow retrieve and therefore are unsuitable for lure fishing. Side cast reels similarly are inexpensive and require little maintenance, but can be used for casting baits. However, again because of the slow retrieve they are not suitable for lure fishing.

Tackle

The majority of lure and bait fishermen use the traditional open face reel, or eggbeater, as it is commonly known. These are relatively simple to use, and suitable for all types of fishing except fly fishing. Cost varies depending on the quality of the materials used and the construction, but most are within reach of the average family budget. Open face reels can be used with small and large baits and lures but have a major advantage in that they can be used successfully with the lightest of rigs.

Spin cast reels are a refinement of the open face reel. They operate on the same principle but have a protective cover over the spool of line and are used on top of the rod instead of underneath. They enable lures and baits to be cast with great accuracy and can be used with rigs of various weights although they are more suited to lighter baits and lures. They are favoured by children and novice anglers because they are largely trouble free in operation, and the only major disadvantage is that most have a more limited line capacity than other types of reels.

Baitcaster reels are another of the long list of angling items which are incorrectly named. They are in fact lure casting reels, although there is no reason why they cannot be used for casting baits. Because of their construction they tend to be more expensive than



A trout in shallow water on an early summer morning waiting for the grasshoppers to fall in

other types of reels and generally are more difficult to use. Consequently they are more commonly used by the more experienced anglers with specific tasks in mind. They can be used with large or small lures but are the reverse of the open face and spin cast reels in that they are more suited for use with larger and heavier lures.

Fly reels are used to store the fly line and backing but the reel is not used significantly in playing a fish thus it does not need to be as robust or as complicated as other forms of reels. There are several types of fly reel. The single action reel is the most common. It consists of a drum which rotates on a spindle fitted to a backing plate. Some models are fitted with a modest drag system but whilst this may be useful it is not an essential feature. Single action reels are relatively inexpensive.

Geared fly reels are constructed so that the drum rotates more than once with each turn of the handle. Because of the added mechanisms they are slightly heavier and more expensive than single action reels.

Automatic fly reels are fitted with spring loaded mechanisms which allow the line to be rewound on the reel by depressing a lever and releasing a tensioned spring. Because of the added weight and expense they are not as popular with anglers as single action and geared reels.

Floats

The great majority of bait fishermen know surprisingly little of the use of floats and consequently miss some valuable opportunities to get more fun and success from their fishing. There are various forms of floats available, but all have the same basic purpose of suspending the bait at a predetermined distance below the surface of the water. In addition they add to the mobility of the bait by allowing it to move freely with the wind or current and provide a technique which adds a pleasurable sense of anticipation to angling. Anglers the world over from youngsters to seasoned veterans respond in the same way to the delicious thrill of watching a bobbing or suddenly descending float, and it seems unlikely that float fishing will ever be replaced by other techniques.

Floats are particularly useful in weedy or snag-strewn areas where normally weighted baits tend to lodge in difficult areas where they cannot easily be found by fish, or retrieved for subsequent casts.

Tackle

Floats come in all shapes and sizes, but there are three basic types. The first is a fixed float which, as the name suggests, is fixed to the line with a specified length of line below the float. This is commonly used where the bait is fished in relatively shallow water and relatively close to the shore. For deeper waters or where longer casting is required a sliding float is used. With this tackle the float remains near the terminal end of the rig during casting but then settles to a predetermined depth by the use of stoppers on the line. Sliding floats commonly are pencil or quill types which have little wind or water resistance. The third popular type is the bubble float. This consists of a plastic bubble which can be partially filled with water for ease of casting. It can be fished as a fixed or sliding float and is particularly common with bait fishermen fishing for trout in larger rivers and lakes.

Fly lines

The traditional silk fly line of yesteryear has today been almost entirely supplanted by the modern fly line made from a braided nylon core with an outer covering of plastic of various types. These lines are designed to carry the fly out during the cast with no weight other than that of the line itself. The lines are constructed in various forms to suit different conditions and different forms of fishing. The most common type is a double taper line which has a thickened middle section and tapers equally at each end. It is used by the majority of anglers for all general purpose fishing and facilitates flexible and accurate casting and smooth, gentle presentation of the fly. The lines are generally 27 m in length and being double tapered can be reversed each season to ensure even use and wear and of the line.

A forward taper line has a taper at one end only and is not reversible. It consists of a short sensitive tip section then a thickened section where much of the weight of the line is localised, tapering to a long thin section. The line lacks some of the flexibility, gentleness and sensitivity of a double taper line, but facilitates long distance casting and easier casting in windy conditions.

Lines can be made in floating or sinking patterns. Floating lines have a specific gravity lighter than water and float on the water surface from which they can be lifted easily for casting, and are used by most anglers for general purpose fishing. Sinking lines have a specific gravity heavier than water and sink beneath the surface.

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They are used most commonly in deep lakes where fish are stationed at the lower levels, particularly in winter. They are more difficult to use because they cannot be lifted easily from the water and casting is a more demanding and tiring process. A modification of these two types consists of a floating line with a sinking tip section only.

Lines are usually classified using a system known as the AFTM scale, named after the Association of Fishing Tackle Manufacturers in the USA. Lines are classified on the basis of the weight of the first 9 m of line excluding the level tip length. Lines are numbered 1 to 12, with 1 the lightest and 12 the heaviest. In addition other codes are used to describe the line as follows: DT for double taper, WF for weight forward, ST for shooting taper, S for sinking line, F for floating line and L for level line. Thus, for example, a label DT 7 F on a line indicates that it is a double tapered floating number 7 line. Knowledge of these codes enables an angler to match a line with a particular rod specifically designed for use with that type of line, thus achieving the balanced tackle combination which should be the ideal of every angler.

Leaders

Flies are not attached directly to the thick fly line, but to leaders or casts made up of monofilament nylon attached to the fly line. The use of a leader facilitates gentle and accurate placement of the fly which reduces the risk of scaring a wary fish. The length of the leader can be varied to suit the conditions and the skill of the angler. Long leaders are used on still clear waters where presentation is of the utmost importance. Leader length can be reduced where the water is rougher as on a severely wind-ruffled lake or in a fast tumbling stream or at night. Short leaders are the easiest to use and become progressively more difficult to handle with increasing length. Leaders commonly used are about 2.5 to 3 m in length, but an experienced caster may be able to handle leaders of up to 4.5 metres.

Leaders may be one piece tapering from a thick butt section down to a specified line thickness and breaking strain, or a composite type consisting of a series of short lengths of decreasing thickness joined together. Tapered one piece leaders have a satisfying curvature and flexibility, lie smoothly on the water and cause little disturbance to the water surface because of the lack of knots.

Tackle

The major disadvantage is that the cast loses its integrity on the first occasion that it is broken by a fish or as a result of a casting accident. Composite casts are clumsier but can be fitted with new tip sections known as tippets as required without altering the character of the leader. The strength of the leader of course sets the breaking strain of the entire fly outfit.

Backing

A backing line, usually monofilament or braided nylon, is used to fill the drum of the fly reel and is tied to the end of the fly line. This provides an additional margin of safety should a trout manage to remove all of the 27 m fly line from the reel. Whilst the latter happens only rarely in river fishing it is not an uncommon occurrence in lake fishing where larger fish are encountered.

Miscellaneous items

Fishermen are like magpies, or more correctly, like bower birds. They tend to collect things. Some are useful, efficient and functional, others appear to have been chosen on the basis that they looked good in a tackle shop. The list is endless, but some of the more commonly encountered items require brief mention.

Landing nets

Little fish, even on the lightest tackle, can be landed with ease without a landing net. Similarly big fish can be landed perhaps with less ease, but more fun and trepidation, without a net, using feet or hands to move the fish up the bank. Many anglers try to rush a fish out at the last minute which is an error. Fish should be played out gently and quietly to the last. Trout can be eased up to the bank gently with a foot or grasped gently around the head and neck. A favourite trick is to walk a played out trout through the water for a few metres keeping pace with it until it can be grasped gently behind the head, gradually tightening the grip and removing the fish from the water. The fish rarely resists and often will not splash or kick until it is placed on the bank.

An equally favoured trick for landing bulkier fish such as golden and silver perch, redfin and Murray cod is heart-stopping to watch, but remarkably effective. When the fish is played out and resting quietly in the shallows or alongside a boat, one hand can be slipped under it, and the point of balance can be determined by tentative

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A redfin perch taken on a slow worked bottom lure

liftings. Then one arm is raised to lift the fish clear of the water. The fish must not be grasped but simply let lie balanced across the hand. The angler can then walk ashore or lift the fish into a boat without placing any other restraint on the fish even if this takes several minutes. Incredible as it may seem, if one or two hands are held under the belly or sides and no other pressure is placed on the sides or dorsal surface of the fish it will remain perfectly still and will not move until it is placed in the bottom of the boat or on the bank. As soon as it is placed on the ground or in the boat, of course, it will proceed to thrash around violently. The reason for the fish remaining quiet when handled in this way is not known, but it may be associated with the effect of the gentle and reassuring pressure exerted on the swim bladder through the fish's belly. Anglers have developed this technique in an attempt to find a way of gently removing big fish from the water on light tackle without using a landing net and without getting spiked by the fish or the lure. Some have used the technique for nearly 15 years on fish up to 10 kg in weight, and have never dropped or lost a fish. The technique has been taught to many colleagues and acquaintances, albeit with some heart-stopping reactions during the teaching process when live fish were used.

Tackle

From this you may assume that some anglers regard landing nets generally as unnecessary. They do present problems. They are extra weight, they get in the way during casting, they snag in fences and bushes and are forever forgotten and left at camp sites and temporary stops and have to be retrieved at the expense of long walks back searching along the tracks and shoreline. Based on experience some anglers believe there is now a trail of lost landing nets stretching clear across southern and eastern Australia, hanging on fences, bushes, stumps and assorted sharp objects. It is argued that scabbards can be used to contain a net, but these are an ungainly answer to the problem and tend to make an angler look more like a piscatorial Robin Hood than a fisherman.

Gaffs

For most freshwater fishing, gaffs are an abomination of the same order as landing nets, unwieldy to carry, constantly becoming lost, and unnecessary because of the small size of most fish. Nothing looks as comical as an angler in a trout stream gaffing a 1 kg trout — 'putting the steel in' as some are wont, romantically, to say. A possible exception is where they are used on large Murray cod. On a big cod the single-handed technique described above cannot be used because of the weight of the fish and attempting to pull the fish ashore by the traditional method of inserting several fingers into the gills will result in sharply abraded fingers from the gill rakers which carry an abnormal number of fine cutting edges.

Fish bags

In years past the Australian fisherman traditionally favoured a sugar or wheat bag as a fishing bag. Many anglers still use them today, or any hessian bag equivalent, as they are cheap, reliable and effective ways of carrying tackle and storing fish. They fit the contours of the body well and can be wetted from time to time to keep fish fresh, or tied in streams to keep fish alive. Many modern fishing bags are based on the same principle of tough, open mesh, but are now made from more long-lasting materials such as nylon.

Fish and fishing tackle should not be stored in plastic bags, particularly those with little aeration, for long periods. They sweat, the fish do not keep well, the plastic rots and breaks down quickly and it is difficult to keep clean and deodorise.

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Cane creels, conversely, are excellent for carrying tackle and for keeping fish fresh for long periods. They are well aerated, light, they keep the flies at bay and they are robust and resilient.

Tackle boxes

Expensive, large, multi-compartmented, plastic tackle boxes are useful for boat fishermen, but are less useful for shore fishermen unless they are near to a camp site or a vehicle. Small plastic tackle boxes are suitable for carrying small items which are otherwise easily lost, and are far more useful to the average fisherman. Lures are usually carried in separate compartments in small boxes to facilitate easy handling, particularly where large numbers of treble hooks are involved. Flies are usually carried in aluminium or plastic boxes with separate compartments or magnetic sections to hold the flies in place. Fly wallets consisting of a wrap-around leather, wool or synthetic material are popular with many fly fishermen.

Many anglers tend to err on the side of too much tackle in too large a box on their fishing trips. An experienced angler knows the benefit of taking as little gear as possible, preferably that which can be fitted into small boxes which can be placed in jacket pockets or into a creel.

Footwear

Most fishermen progress through predictable phases with footwear for stream and lake use. In summer in lowland streams some prefer to wade barefoot or use gym shoes or the equivalent. Attitudes usually change, however, with increasing altitude, the annual onset of winter and advancing age. Anglers exposed to any of these situations generally progress to gumboots and thigh boots then waist waders and finally to chest waders which they then commonly continue to use throughout summer and winter.

Waders are warm, secure, comfortable, dry and snake proof. If you get too hot you can walk or sit in the water. Chest waders avoid the constant hassle of trying to dry boots and socks over a fire after the inevitable venture into deeper and deeper water. They enable walking and wading to be undertaken with confidence and those which are well made allow for a good grip on the bottom using ribbed soles.

There is an oft-repeated story that you can get into serious trouble if you fall into the water while wearing waders. I have done

Tackle

it on several occasions, sometimes in exceedingly deep water and in flowing water, but I must say that I have never had any real trouble in getting to the shore. The worst that has happened is that the waders fill or partially fill with water and make it difficult to emerge from the stream unless the waders are slipped off. The story about the legs of the waders filling with air, raising the legs and forcing the head under water has not yet been realised in my experience. Nevertheless, on the assumption that I may one day have a need to quickly emerge from the waders I prefer those with a quick release clip on the braces, and I do take care at all times, especially in cold or fast water.

Experience soon teaches anglers to buy good quality waders. Most anglers over the years have experienced those brands which perish at the end of one season or are filled with minute pinholes at the start of the next and are most uncomfortable in the opening part of the season, particularly when fishing in cold water. The value of waders in keeping an angler warm and avoiding circulatory problems in later life, in addition to providing a modicum of creature comfort on fishing outings, should not be underestimated.

General tackle items

There is an inordinate number of other items which could be discussed in this book. Many are popular with anglers and could each be the subject of a separate chapter. Nevertheless, suffice to say that I am aware of these and expect anglers to know something of them or to obtain the information with ease from their acquaintances. Thus, I see no need at this time to write more on folding scissors, nail clippers, big knives and little knives, fish tethers, tip-pets, hats, polaroid glasses, waterproof matches, the need for a waterproof holder for fishing licence, maps, compass, wind jackets and spray jackets, insulated socks, jackets, ski pants, tourniquets, emergency belts, band aids, snake bite kits, headache tablets, shoe laces, wader glue, plastic bags, watches, cameras, or above all, a corkscrew.

I wish you well in your reading of this book and the companion tomes of my esteemed colleagues who have seen fit to put pen to paper in relation to their chosen hobby, and I wish you success with your fishing.

Tight Lines.

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The Canberra region contains a wide variety of lakes and rivers and more than twenty species of introduced and native fish. This book describes in detail the angling resources of the region. It contains detailed descriptions of the fish, their distribution, feeding, breeding and migratory habits and the special characteristics which make many of them unique in the angling world. It is written for the estimated 70,000 Canberra anglers but is applicable to angling throughout Australia. It is designed to be enjoyed by anglers of all ages, dilettante or serious sportfishermen, naturalists, scientists, conservationists, or people who simply enjoy reading another fascinating chapter on Australia's remarkable native and introduced aquatic wildlife.

Dr Bryan Pratt is best known in the scientific world for his work on soil-borne fungi which affect a range of crops in Australia. He is also well known in the angling world for his many authoritative works on amateur fishing. He is an expert fish and wildlife photographer and many of his photographs have been published in a wide range of publications. In his travels Dr Pratt has developed an expert knowledge of angling and fish behaviour in a wide range of marine and inland waters throughout Australia. He has been closely associated with a number of angling organisations and has held a number of Australian records for fresh- and saltwater sportfish taken on fly and line tackle.

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Jacket photograph shows a Murray cod taken by the author on a deep diving minnow line