# FISHERIES AND WILDLIFE

# FISH AND WILDLIFE MANAGEMENT

# Fisheries and Wildlife Division

## Introduction

Until the 1940s fisheries and wildlife activities in Victoria were mainly restricted to limited enforcement programmes and the stocking of streams and lakes with trout.

Before Federation the functions were the responsibility of the Department of Trade and Customs, and after 1901 were transferred to the Department of Public Works. In 1909 the activities were taken over by the Department of Agriculture, and in 1913 a Fisheries and Game Branch was formed, under the control of the Chief Secretary. In 1933 a 5 shilling (50 cent) trout licence was introduced and by 1940 the Branch had an annual budget of \$21,000.

The development of a research and management organisation began in the 1940s. By 1952 the Branch had a staff of 40 with a budget of \$2,000, \$5,000 of which was spent on research. Research into ducks resulted in a £1 (\$2) game licence being introduced in 1959.

In January 1973 a Ministry of Conservation was formed, and the functions and the Branch became the Fisheries and Wildlife Division in the new Ministry. By then there were 250 people on the staff and half of the \$1.8m budget was spent on research.

Conservation research had become a most important function by 1973 and there were 18 scientific officers and 45 support staff in the Marine Pollution Section of the new Division.

Research also covered a variety of other fields including commercial marine fishing, inland stream and lake stocking, and fauna control and environmental studies.

The fauna of Victoria, the fish, mammals, and birds, can be placed in two categories. The first category comprises the species which have special value as forming part of the unique ecosystem of the continent and which, because of environmental changes taking place about them, require skilled management of their populations if they are to be maintained. The majority of native freshwater fish, many of the marsupials, and some birds fall into this category.

The second category contains those which because of their abundance and capacity for survival are available for food or provide recreation for the community. Examples are large numbers of fish species, mostly sea water types, ducks, quail, and deer.

#### Wildlife research

Historically most wildlife management and research in Victoria has been oriented towards game or pest control. Work of this nature is continuing, but in recent years the need to undertake other kinds of research has been recognised. This additional requirement may be related to a general community interest in conservation.

At one time control of wild animal pests in agriculture and forestry was approached on the basis of exploring techniques of getting rid of many of the offenders as quickly and cheaply as possible. This older approach has gradually evolved into what might be called the specialised management of wildlife which requires the basic understanding of the ecology of each species, its relationship with other species, and the use of that knowledge as a basis for control. The control of rabbits by myxomatosis is an example. Studies of native fauna in Australian universities have influenced this change in approach. The knowledge gained has been of great potential value to the wildlife manager.

Research undertaken by the Fisheries and Wildlife Division is oriented towards providing a better basis for management decisions. These are now increasingly directed towards conservation, although the long established programmes such as the study of ducks and seals will continue, even if on a smaller scale.

Research, which has long-term objectives, or objectives which are difficult to define, does not easily attract the necessary funds. This type of research contrasts with that in which short-term objectives have popular appeal. Recently government support has been made available for a number of such longer term projects which would not have previously attracted financial assistance.

#### Current wildlife research studies

A survey and classification of wet-lands of Victoria is now in progress. Although this work has strong links with game management objectives, its significance is much greater because for the first time inland waters are being related to wildlife survival. From the results it may be possible to draw up a list of priorities for conservation on the basis of their value to many species beyond those of game interest.

Similarly, a general survey of the distribution and abundance of animals and birds in Victoria is a long-term undertaking which will provide the basic information for which future changes in the status of wildlife can be measured.

To accelerate the gathering of information about species requiring urgent attention, the Division has funded and supervised a number of projects being undertaken by universities and other organisations. One project is being carried out at Yellingbo Swamp on the helmeted honeyeater, while in other parts of the State the peregrine falcon is being studied. The latter has a declining world-wide population, apparently as a result of the effect of pesticides which reduce the strength of its egg shell.

Another co-operative study concerning the ecology is that on native rodents which will lead to a better understanding of their susceptibility to fire in heathland. In the forest environment it is hoped that some of the detrimental effects of commercial forestry on native animals may be reduced by a programme developing artificial lairs and nest boxes.

#### Reserves management

Fish and wildlife require a congenial environment if they are to thrive, or in some cases even survive. Therefore, to offset ever increasing demands made by an expanding human population, areas reserved for the natural propagation and maintenance of fauna and fish must be adequate. To add to the existing 53 reserves, totalling 63,450 hectares, a further 1,297 hectares have been purchased at a cost of \$144,000. These additions mainly add to areas already reserved. In order to be self sufficient, the Division's policy is directed to making reserves large and free from undesirable influences exerted on them by surrounding land which may be used for agricultural or other purposes. A continuing land purchase programme is in operation, and about 7,400 hectares have been added to State Wildlife Reserves since they were first established in 1958.

With the development and management of reserves, attention has been given to a number of selected species for liberation into suitable areas. For the first time the bustard or plains turkey has been successfully bred and raised in captivity, and it is hoped that this species might be available in sufficient numbers to begin a liberation programme over the next ten years. Other species which have declined because of the impact of human settlement and agriculture are the Cape Barren goose and magpie goose. These species are already being bred and liberated into areas they formerly inhabited. In the animal world a similar project is being carried out for hog deer. The deer are trapped on Snake Island near Corner Inlet and transferred to the Dutson Downs—Lake Reeve region of Gippsland.

#### Monitoring habitat

Visual observation often indicates that physical interference has unfavourably affected the indigenous animal inhabitants, but at other times the interference may be much less apparent and sometimes insidious.

However, the cost of monitoring and thereby forecasting threats to all of the State's habitats is excessive. Too often, therefore, corrective action can only be taken after an adverse effect on land or water is apparent in the animal or fish populations, usually by an increase in the number of fish or animal deaths or by an easily detectable decline in numbers.

Lake Burrumbeet near Ballarat was the subject of investigation after excessive input of pollutants into the lake was first indicated by the production of dense masses of algae which caused the death of fish and livestock. Similar signs in the Gippsland lakes have lead to a comprehensive study of the lake system. This will incorporate investigations of water movement, inventories of aquatic and land species, and basic measurements of productivity, all of which are essential to the development of effective conservation policies and management techniques.

#### Fisheries management

The practical management of fisheries in Victoria is complex in the freshwater environment. Water and habitat, because of their susceptibility to physical and chemical influence, play an important role in determining the range and density of fish populations. In the sea the primary concern is the continued adequate yield of fish for either the fishing industry or recreation, or both.

Victoria's commercial fisheries provide about 20,000 tonnes of fish worth around \$11m annually and thus considerable research and management are directed towards this industry. The Division is also aware of the importance of the recreational demands on the estuarine and inshore fish stocks. Some of the salt water species which are of primary importance to the fresh fish market (which constitutes about 17 per cent of the total Victorian catch) are also sought by anglers. Snapper, whiting, and flounder are examples, and in the case of snapper it is estimated that the quantity of the commercial catch is matched by that taken by amateur fishermen.

Unlike the recreational fishermen of the inland lakes and streams, those amateurs who fish the bays and coastal waters of Victoria do not contribute to the special research and development trust funds partly financed from licence fees. Because of this, money set aside for marine fisheries investigations is mainly channeled towards commercial fisheries, which do make a contribution through substantial licence payments.

Abalone, lobster, scallop, and estuarine species, for some years Victoria's most valuable and heavily exploited fisheries, have been the subjects of intensive

management. The number of fishermen and boats in these fisheries has been limited and fixed by licensing irrespective of any change in the "health" of fisheries.

To allow some flexibility in exploitation with changes in abundance, the Fisheries Act has been amended and two joint government/industry advisory committees have been established. The first, a management committee, makes recommendations to the Minister in charge of fisheries (the Minister for Conservation) on the number of persons or units which should be licensed in each particular fishery, as well as providing referred advice on fisheries management. The second committee is a licensing panel which makes recommendations on all applications for fishing licences. It also reviews each licence every three years to check on holders who become inactive in the industry. The industry provides voting members for these committees.

To obtain data on which management strategies can be based, research is being undertaken on important fisheries. The abalone reefs of Victoria have been charted and the results indicate that there are about 6,000 hectares of productive habitat for the major reef species, the blacklip abalone. Tagging and other techniques have demonstrated that an abalone takes from four to five years to reach marketable size. About 40 per cent of those greater in size than the legal minimum length are removed each year either by fishermen, or by death from natural causes. Such information represents valuable management data. Similar life history studies are being undertaken for the edible school and gummy shark, scallops, lobsters, and eels. To complement these biological studies, statistics provided by fishermen and special fish measurers are compiled and analysed.

The Division maintains an advisory service which provides skilled officers to assist those fishermen with problems related to fishing gear or fishing methods.

The following table shows certain particulars about the fishing industry in Victoria for the years 1971-72 to 1974-75:

Year	Registered crew members	Boats registered		Value of nets and
		Number	Value	other equipment
			\$'000	\$'000
1971–72 1972–73 1973–74 1974–75	1,534 1,573 1,530 1,533	808 806 781 772	6,237 7,090 8,805 9,469	1,329 1,390 1,597 1,633

VICTORIA—FISHERIES: MEN, BOATS, AND EQUIPMENT

The following table shows the catch of fish, crustaceans, and molluscs for the years 1971-72 to 1974-75 landed at Victorian ports irrespective of the waters in which they were caught. Up to and including 1973-74, fish, etc., landed by Victorian fishermen in South Australia are also included.

VICTORIA—FISHERIES : QUANTITY OF CATCH (tonnes)

Year	Fish (a)	Crustaceans	Molluscs	Total
1971–72	15,893	799	10,416	27,108
1972–73	10,768	859	14,380	26,007
1973–74	10,138	684	10,188	21,010
1974–75 (b)	9,445	387	9,084	18,916

(a) Includes freshwater.

(b) Collected from main points of disposal. Collected from fishermen before 1974-75.

# Trust fund projects

Trust funds now have a special relevance to the maintenance and development of inland fisheries. A recent amendment to the Fisheries Act made provision for anglers' fees to be paid into the Fisheries Research Fund. A significant increase in these fees has now permitted an annual commitment averaging \$200,000 to projects which would otherwise not have been undertaken.

One such project is the study of the Seven Creeks River System, a small tributary of the Goulburn River. In the past it has supported natural populations of Macquarie perch and trout cod which in recent times have been restricted to a limited stretch of the stream by changes in the environment and the introduction of carp. Because the Seven Creeks is one of the few remaining streams in which trout cod and Macquarie perch are known to breed, it is being used to provide the information on home range and movements of these species, their food requirements, growth, and spawning which will be used in the search for methods of artificial propagation and rearing. Both these species are regarded as endangered.

#### Quinnat Salmon

The Quinnat salmon, a north American species, has attracted the attention of some anglers since the first importation in egg form ten years ago. From these, nearly 20,000 yearlings resulted and most of these were released into Lake Purrumbete in July 1967. The balance was held at the Division's Snob's Creek Hatchery in an attempt to develop and maintain a domestic stock for the subsequent regular supplies of yearling Quinnat for liberation into Victorian waters. Another consideration was the possibility of a Commonwealth Government ban on the importation of live salmonid fish and eggs. The Commonwealth has since imposed the ban.

In 1976 sufficient progress had been made with the artificial spawning and rearing of young Quinnat salmon to permit the stocking of about 15,000 yearlings into Lake Purrumbete which was followed by a closure to fishing to allow the young fry to grow. Six months later the lake was opened and over 2,000 anglers participated in the catching of the salmon which had then grown to about a kilogram in weight.

#### European Carp

In Victoria over the past decade the introduced species known here as European carp has received considerable attention as a threat to native fish and wildlife habitat. Although the harmful effects of this species are still being investigated, their present numbers have prompted the development of a small commercial fishery. Electro-fishing techniques which send a direct current through the water stunning the carp in readiness for easy netting have been employed. In the year 1970-71, when this method was first permitted, the carp catch was 1.1 tonnes, increasing to over 500 tonnes by 1975-76.

There is now some evidence that in particular waters electro-fishing operations are reducing carp numbers considerably, making it more difficult for the operator to maintain the supply demanded by the pet food manufacturers. Thus, the use of carp fishing as a means of lowering carp numbers below the level which has a marked impact on native fish and wildlife is thought to be limited. Carp is marketed as either fresh fish for human consumption, bait for the rock lobster fishery, or for use in the manufacture of pet food. Prices in late 1976 were about \$180 per tonne.

# Angling information

One of the questions of great importance to anglers is where and when to catch fish. In many cases information regarding particular species and size is also sought. To answer these questions, the Division has published an Angling Guide which lists over 500 inland angling waters in Victoria and describes the type of water, the surrounding country, and any special problems or fishing restrictions likely to be encountered. The Guide lists the fish type, their abundance and expected size, and in some cases it also gives advice on the best times to go fishing and the methods most likely to succeed. This publication has been in great demand since the first edition was launched.

#### Water pollution

The sea has been the ultimate destination of the debris of weathering for millions of years. Common salt (sodium chloride) represents 3.5 per cent of sea-water. Small amounts of heavy metals have accumulated, so that around the coasts zinc, copper, lead, copper-nickel, cobalt, and chromium are measurable in parts per thousand million, and other metals such as silver and cadmium at about one-hundredth of that level. Insignificant though these levels may appear to be, on a world-wide basis they represent the sea as a repository for many hundreds of thousands of tons of metallic residues.

The animals and plants of the sea have evolved in this environment, and in many cases have developed mechanisms to make use of the elements. Examples are the incorporation of vanadium and copper into respiratory enzymes of marine organisms and of bromine into shell pigments. Many marine fishes and molluscs also have the ability to concentrate (or perhaps an inability to excrete) heavy metals such as mercury, zinc, and cadmium, to levels far in excess of need, and thus represent a toxic hazard to consumers. There are two groups of marine animals that have this characteristic. One is the group known colloquially as shellfish (molluscs and crustacea). The other is a broad grouping of active, long-lived, predacious fish—most of the sharks, snapper, tuna, and similar species.

Even in unpolluted waters, the mercury content of fin-fish may be relatively high, and in the case of molluscs and crustacea, the levels of zinc, copper, and cadmium are higher, by about one hundred thousand times than the concentration in the sea itself. In areas that receive industrial waste, the levels are even higher, and in recent years the contamination of fish has caused concern in many parts of the world.

The need for water quality management in both marine and freshwater environments, of little concern a hundred years ago, has been increasingly recognised in recent years. Continued population growth, urbanisation, and rapid technological change have increased demands for water supplies. The same factors have increased the output of pollutants, tending to reduce the capacity of clean freshwater resources to meet such increased demands.

Although it is possible to purify contaminated water sufficiently for almost any purpose, the costs are high. It is far better to prevent water pollution, or to limit it to levels that do not cause environmental problems.

In considering the suitability of water for fish and wildlife, there are a number of paradoxes. Water that is chemically pure will not support aquatic life. Water that is quite suitable for drinking purposes may be toxic to fish because of the presence of minute quantities of zinc and copper. Water that contains negligible amounts of mercury or pesticide residues may support healthy populations of fish, but accumulated amounts of these residues in the fish make them unsuitable or even hazardous to human health if consumed regularly or in large amounts.

In any broad grouping of animals, there are certain species which depend for their food supply on what is known as a food chain. These predator groups include eagles, hawks and owls (amongst the birds), snapper, sharks and barracouta (among the fishes), and carnivorous mammals including, of course, man himself. Accumulation of residues through the food chain may eventually lead to physiological changes, reduced activity, and impaired reproductive success. At a point short of these effects, the animals may appear normal in all respects, but this normal appearance can change suddenly with seasonal changes or shortages of food.

It is necessary to understand the range of synthetic materials that man uses for control of diseases, pests, and weeds in agriculture, and the inorganic and organic waste products of industry that are discharged into the air, the streams, and estuaries. Nearly all of these, often at minute levels, will have undesirable effects on the environment.

In 1965, the Environmental Studies Section of the Fisheries and Wildlife Division undertook an investigation of residues of pesticides in fish, birds, and mammals. This work has provided a unique collection of data on pesticide residues in wildlife and fish populations in Australia.

Research into the accumulation of heavy metals in marine and freshwater species has become increasingly important. From the data accumulated so far there is no suggestion that the abundance or distribution of any wildlife or fish species is at present threatened by pollution, except in restricted areas close to heavily industrialised areas. However, there is enough evidence to suggest that the accumulation of heavy metal residues is a significant problem in one or two locations, and a potential problem in others.

The Marine Pollution Section became involved in the study of Port Phillip Bay in 1967. The work intensified in 1969 and culminated in the report *Environmental Study of Port Phillip Bay* published in 1973. The other participants in this Study were the Melbourne and Metropolitan Board of Works and the Port Phillip Authority. A similar study of Western Port Bay was undertaken in 1973-74, and the *Westernport Bay Environmental Study* was published in 1975.

Environmental research has also been intensified in areas where water storages are being constructed (the Dartmouth Dam, Thomson River storage) and where power generating stations are proposed (Newport and Loy Yang).

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