

CORMORANTS IN RELATION TO FISHERIES

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BEFORE THE ADVENT of the white man in Australia both fishes and cormorants in our island continent abounded plentifully. Now after a decade of the white man's abode we find that fishes are not so plentiful, and cormorants are also less plentiful because they have been ruthlessly destroyed by man because they are seen by him to eat fish and are therefore anathema. If fish are not so numerous and cormorants likewise less numerous, it is reasonable to expect with the diminished numbers of cormorants that the supply of fishes would correspondingly have increased; but such is not the case. Therefore, let us look for the reasons why this anomaly exists and why nature has become unbalanced to some extent.

One naturally asks what constitutes the "balance in nature". Briefly, it is the result of constant striving of plant and animal life to multiply their numbers for the perpetuity of their species, but the creatures that feed on them operate continually to check their undue increase. An equilibrium tends to be realized. This action and re-action of natural forces constitutes what is known as the balance in nature.

In what way do cormorants help to balance nature and how does this bird assist in keeping up a supply of our fishes for the use of man? This I will endeavor to answer in this article and to show how unwarranted is the destruction of this bird, even though it does live principally on fish for part of the year; and I will also give my field observations which disprove that it has a voracious appetite, as some persons suggest when condemning the bird. There are several species of cormorants inhabiting the Commonwealth of Australia with which I will deal, and my remarks apply to all of them. The species are: *Phalacrocorax carbo*, *P. ater*, *P. fuscescens*, *P. varius*, and *Microcarbo melanoleucus*.

To make the statement before a body of anglers or fishermen that cormorants are among the best friends of our fishes is provocative of a retort which is summed up in one word spelled with three letters. To prevent such a retort from thoughtless persons I have considered it advisable to prelude my paper by pointing out the error held in common by anglers generally, as well as by some ornithologists and others who have made but a superficial study of the life history of some of the species of our Australian cormorants, and so conduct the thoughts of those persons inclined to make such an abrupt retort into the consideration of the sequence of my remarks before they formulate a definite opinion. We are naturally too prone to jump to conclusions, and to not only take for granted that the traditions as handed down to us from our ancestors are correct, but we judge one particular act of an animal or bird as comprising the whole method of its life history, because we happen to observe only that one phase of its habits which continually re-occurs; as for example the eating of fishes by cormorants.

I hope, therefore, in this short paper to show how unwarranted is the general opinion held that the cormorants are decreasing our fish supply. "Give a dog a bad name and it will stick to him", is a truthful enough adage, although the dog may be an excellent creature in many ways; but in common justice and equity we should judge only where we can see everything and understand it. In the contemplation of the fish-eating habits of the cormorants let us not apply the adage as applied to our canine friend, lest we do both ourselves and the cormorants an injury.

An apt simile occurs to my mind at this juncture. A naturalist was wandering through the fields with a friend who casually drew his attention to a plant, and referred to it as a weed. "You only call it weed", said the naturalist, "because you do not as yet know its value to the community." Some years later a chemist discovered that the so-called weed was an herb, whose medicinal properties cured one of the fellest diseases of the human race. I hope therefore that this essay will prove a panacea just as the lorn weed did, and that after this the cormorant will not be a friendless pariah.

For the last thirty-six years I have roamed throughout many parts of the Commonwealth, and have come in contact with cormorants in many places and under diversified conditions, and have, for many years past, made a special study of their nidification, particularly in the vast areas of the River Murray swamps and billabongs, and on certain lakes where these birds are now found nesting in hundreds, but where formerly they were to be counted in their "shaggeries" in thousands. Owing, however, to their ruthless destruction by persons seized with the idea that they were benefiting the fishing industry by destroying the shags, as they term them, they are at present but a tithe of their former numbers.

Fishermen and anglers have, of recent years, complained bitterly of the scarcity of fish, and as is natural, have blamed the weakest creature, and one incapable of defense. Blame all but ourselves—it is but human nature to do so! These persons have not, however, among other causes, attributed the short-sighted policy of the wholesale destruction of the cormorants for part of the decrease in our fish supply, but nevertheless such is undoubtedly a fact. In this paper I hope to be able to convince you that such is the case.

Most of our fresh water fishes spawn in places where there is some cover or protection for their ova, which is usually deposited among the vegetation in swamps or back-waters, where there is a gentle current flowing or rather filtering through, or in streams among the water weed and other aquatic growths that prevent it being swept away into the swifter parts of the current; also the ova may be placed under logs and stones. On account of the immobility of the ova, it is readily preyed upon from below by many kinds of crustaceans, such as yabbies (crayfish), while water tortoise and eels and other fishes dispose of vast quantities of it as well as of myriads of the small and almost helpless fish fry. Statistics collected by expert pisciculturalists and ichthyologists indicate an astounding mortality among the fish ova and fish fry, to an extent almost incredible. The small number of fish that arrive at maturity is out of all proportion to the number of ova deposited. This dire mortality is due to the enemies of the ova and fry, and, if the enemies are not held in check, then there is a serious diminution in the available supply of mature fish. To destroy those creatures that prey upon the enemies of the fish ova and fry is tantamount to destroying the fish themselves, and in the destruction of the cormorants this procedure is exemplified.

To destroy the balance of nature in one direction is merely setting up an evil in another place. We should be sure of our attitude towards a particular animal or plant ere the consequences of our act recoil unpleasantly upon us. The destruction of the cormorants is an example of this contention. Neither ethical nor sentimental regard for birds sways my judgment in this. We must also remember that cormorants are limited in numbers by the law of nature, and do not increase beyond that limit, and we are therefore able to gauge their effect on our fish supply. Cormorants have their natural enemies just the same as other birds and animals, and their increase above the normal number is consequently checked. When approached closely, the shags that build on the reefs and rocky islets in the ocean, take fright and fly away, and should there be any silver gulls (*Larus novae-hollandiae*) and skuas about, the shags' departure is immediately followed by an invasion of these birds; and it is indeed a

sight to see them swoop down upon the shags' nests and demolish both eggs and young birds. The gulls smash the eggs by dropping them on the rocks, after which they eat the contents. The cormorants that nest in inland waters also have their enemies, and it is a remarkable coincidence that a whistling eagle's nest is usually found overlooking their rookeries.

Special observations made by me at the cormorant rookeries situated on inland waters show that they feed their young almost entirely on yabbies (crayfish), frogs, shrimps and young water tortoise. One must remember that at this period the swamps, particularly in the Murray River basin, the greatest waterway in Australia, are annually inundated, and what is dry land for part of the year is then covered with water. It is at this period that the large and mature fishes retire from the main stream and deposit their ova among the aquatic vegetation of the swamps. Crustaceans of many kinds repair also to the swamps at this time, and prey upon the ova and minute fry in an appalling manner, billions of either fishes' eggs or young fishes disappearing into their hungry maws. Water tortoise likewise lay their eggs in the sand adjacent to the swamps, so that their young, when hatched out by the solar heat, can readily find their way to them and banquet upon the bounteous supply of fish eggs and fry.

It is precisely at this period that certain species of cormorants, namely, *Phalacrocorax ater*, *P. fuscescens* and *P. carbo*, nest together in rookeries in these swamps, well knowing that an abundant harvest of crustaceans is to be reaped from them at this time. The instinctive knowledge of this fact is a necessity to them, since their energies are taxed to their utmost to satisfy the voracious appetites of their young ones. At this period there are no fish of suitable size, such as is commonly captured by cormorants, to be found in the swamps; with very few exceptions, only the large spawning adults are to be found. It is obvious that destruction of fishes by cormorants in these localities does not occur at the nesting period, cormorants disdaining the capture of the small fry when there is a plenteous supply of larger sized and more readily captured, slow-moving forms of life suitable as food for their young ones. Hence the cormorants at this period allow more fish to be hatched out than are eaten by the adult birds throughout the balance of the year, when they prey upon them in their more advanced stages of growth, and when the fishes have a better chance to escape.

Owing to the small size of the ova of fish, a crayfish can easily dispose of 1000 of them each day, and if we take the spawning season, that is, the period that spawn is available, as 30 days, we have a total of 30,000 of potential fishes destroyed by one crayfish in a season. If we again take into consideration the fact that a cormorant captures ten of these crayfish for each of the 30 days, we have the enormous credit to the cormorant's account of 300,000 ova that have the chance of hatching. Now if we take the quantity of fish a cormorant could devour daily as 6 and multiply it by 365 days of the year, we find that a cormorant could dispose of only 2190 fish per annum. The total yearly credit in favor of the cormorant is thus 297,810 fishes: truly a splendid credit balance! It is during the nesting period that cormorants and their young are destroyed wholesale, owing to their being more easily approached at this time—a time at which their usefulness is greatest.

At Lake Wendouree, a large artificial lake in the State of Victoria, English perch and varieties of American trout have been introduced for the benefit of anglers. Cormorants frequent this lake and prey upon the slower moving species of fish, namely the perch. Repeated shooting of the cormorants has proved that the quicker moving fishes escape the attention of the cormorants, which naturally favor the slower moving forms which it is easier for a cormorant to catch. Never once has a trout been found in a cormorant shot on this lake. If you notice a cormorant diving after a shoal of fish in a river or in the sea, you will observe that he reappears many times without

having achieved success. The number of times it dives is out of proportion to the number of fish caught, probably once in six tries being a fair average. This shows that, being a bird, the cormorant is not equal to a fish in its own domain, and that only the weakest and physically unfit fish are usually caught, fish that probably would not be competent to propagate their species, or if they did so, that would beget a decadent stock. This is a question, then, simply of the survival of the fittest. The cormorant is one of those aids to nature by which her balance is kept level as regards the fishes. Cormorants have, therefore, together with other fish eating birds, been evolved by nature for the special work of eliminating those fishes which are unfit to live, and which are unnecessary in her economy.

Other aids are utilized by nature to keep certain species of fishes from increasing in numbers beyond a proper limit, and so other fishes have been ordained to destroy more of their brethren than the cormorants do. Were statistics collected showing the number of fish destroyed in other ways besides being eaten by cormorants, the number tabulated against these birds would be insignificant. "Do not muzzle the ox that treadeth out the corn," is an old time proverb, and one universally admitted to be correct. Why then muzzle the cormorants after they have destroyed such vast numbers of the enemies of fishes? Cormorants are but safety valves in the boilers of nature.

Why don't our anglers utilize the cormorants as do the Chinese, who train these birds to fish for them? The method adopted is to capture the birds when young, so as to accustom them to handling, and then they are taken out in the boat with experienced adult birds which teach them how to catch fish. After the younger birds have become expert fishers, the Chinaman slips a rubber ring over the cormorant's neck to prevent the bird swallowing the fish when it captures it, and when it finds it cannot do so it returns to the boat and allows its keeper to abstract the fish from its beak.

Erroneous ideas are rife as to the quantity of fish that a cormorant can consume. Some persons assert that these birds eat as much as 21 pounds of fish daily. However, when their assertion is investigated it is found to be only conjecture. The digestive power of a cormorant is regulated by the bird's size; and the quantity of food demolished at one meal by a bird of a given species varies according to the size of its gullet, which limits its capacity for swallowing, being greater in the larger species than in the smaller. In dealing with the voracity of cormorants I might state that one hears most extravagant statements made in regard to their gluttony which, when investigated, prove to be old shiboleths more or less enlarged by the present generation and to which credence is readily given.

As an illuminating instance I may be permitted to mention that on one occasion I engaged in conversation with a representative appointed by a fishermen's association, whose members depend on catching fish for a living. In reply to my interrogatories this fisherman stated that cormorants were able to kill and swallow fish up to 7 pounds weight, and to eat up to 21 pounds weight per day; and that the cormorant could digest a fish in a few minutes. A bird was shot and identified by him as the species referred to (*P. ater*). This bird was placed on a scale in his presence and it weighed $2\frac{3}{4}$ pounds. When asked if he still maintained that a bird whose total weight was $2\frac{3}{4}$ pounds could engulf a 7-pound fish, he said that he had never thought of the relative proportions of the bird and the fish before. When further pressed to produce evidence that a cormorant could devour 21 pounds weight of fish per day, and asked to consider the fact that man himself consumes barely 3 pounds weight of food per diem, he stated that his knowledge was mainly obtained from stories which were in circulation when he was a boy and, although he had observed cormorants catching fish almost daily, he had never supposed these stories to have been incorrect.

Observation made by me by frequent and intensive watching of birds proves that cormorants rarely exceed three meals a day, and that the average weight eaten per day is $1\frac{1}{2}$ pounds. The cormorant, *P. carbo*, a species which is sparsely distributed compared with the other species, can, however, dispose of a larger quantity, since it is the largest of all the species frequenting the Australian region. The species that are numerically strongest here are *P. ater* and *P. fuscescens*. The weight of the bodies of these species is between $2\frac{1}{2}$ and 3 pounds, and it is questionable whether they are able to eat their own weight of fish daily. My observations disprove this. Their digestive organs, which comprise but a small portion of the mechanism of the bird, can only cope with a given quantity of material, certainly not more, in the vast majority of instances, than $1\frac{1}{2}$ pounds.

On several occasions I have observed cormorants catching eels, and in one instance a bird was observed, early in the morning, sitting on a log with a length of eel hanging out of its mouth. To prevent it slipping out of its gullet, the bird had to keep its head up in the air. It had swallowed the eel head first, a customary method adopted when swallowing a fish. It was waiting for the fish to be digested. When passing the same spot later in the afternoon, part of the fish was discerned still projecting from the bird's beak, and it would have been dusk ere the bird had finally swallowed its prey, while the process of digestion would have still proceeded during the night.

It is not generally known, but nevertheless it is a fact, that the squabs or nestlings of cormorants are excellent eating, and in slaying them we are simply throwing away part of our food supply. Why the squabs of cormorants are so edible is due to the sweet-fleshed food with which they are fed by their parents, which, as before stated, feed them on crustaceans.

We must also remember that before the advent of the white man in Australia, cormorants preyed upon our fishes, and there was no serious diminution in the fish supply. The fishes were then as plentiful as they ought to have been, and were in the correct quantity so far as the law of nature allowed. White men, in their ignorance, have taken from our waters more fishes than the reserve fertility of Dame Nature could replace, or have destroyed their spawning grounds by draining them, or have deposited noxious materials into or onto them, or have rooted them up with nets, and have as ignorantly expected mother nature to replace them as formerly. But there is a limit, as I have before mentioned, to the reserve fertility of Dame Nature, which, if overstepped, leads to serious trouble in the shape of want of balance. Therefore, see to it that the balance is kept level, and by restocking our waters with those varieties of fish which we are continuously abstracting from them, prevent the undue displacement of nature's balance.

My remarks, so far, have been applicable to the inland breeding cormorants that nest principally in the trees. The following notes apply equally to the inland breeding forms as well as to those which nest on rocks in the sea. I have watched cormorants at sea and in our bays and estuaries, apparently following up shoals of fish fry; but never was I able to discern them devouring the fry, which owing to the insufficiency of their size are not satisfying enough to them. I have often observed them capturing the voracious predatory fishes which were following up the shoals of fish fry and destroying thousands upon thousands of immature fish.

So, after all, we find that in another instance the cormorants were allowing more fish to remain alive than the fishes preying upon the shoal of fish fry would have done had these cannibals not been destroyed by the cormorants. It is therefore safe to assume that the ratio of fish in the shoal that would have been destroyed, but which had been given their lives by the action of the cormorants in killing their enemies, would be in the proportion of several thousands to one. Then again, the cormorants

destroy a large quantity of eels in our estuaries and streams, especially when there is an eel fare, or migration of eels from the sea to the rivers; and it is universally conceded that eels are very destructive to fish ova. Here we have yet another instance of the benefit the sea cormorants are to us. They attack the enemies of our fresh-water fishes' ova at the threshold of their onslaught on their habitats.

Another good point regarding cormorants is that they love to capture the succulent but non-sporting lamprey, that enemy to some of our best fishes, especially the fresh-water varieties, such as the Murray cod and blackfish. The lamprey is an eel-like fish which is provided with a suctorial mouth, devoid of teeth, with which it is able to attach itself to a fish; by rotating its harsh tongue it makes a hole in the skin of a fish, through which it sucks out its life's blood. Lampreys are more plentiful than is generally supposed, and are called "eels" by persons unacquainted with their structure. It is not an uncommon error for such persons to make when they announce that they had captured eels in the River Murray, in which stream none up to the present has been found to exist. Pisciculturalists complain that cormorants destroy young trout in their hatching ponds, but if these are wire-netted overhead a cormorant cannot enter them. Preventive measures are easily adopted in such instances.

The main complaints regarding the destructiveness of cormorants are directed principally to those forms that frequent inland waters. The sea-roaming fish-eating birds, such as penguins, gulls and certain species of cormorants, are not condemned because they do not so readily come under observation.

The great fighting capacity of a trout constitutes the chief pleasure to fly-fishermen, and, if these fish lost this characteristic, trout fishing would lose most of its charm and would be but a mediocre sport. If the weaklings of trout were allowed to propagate their species, these fish would become decadent, and would eventually evolve into sluggish and slow moving creatures, if their natural enemies, which eliminate the least fit to live, were destroyed. It is simply the application of the well-known law of disuse inheritance, causing deterioration and atrophy in the structure. This is instanced in the flightless inactive birds of New Zealand, which, for centuries past, on account of having no ground enemies to cause them to fly up off the ground out of danger, have gradually lost the power of flight, and have become decadent, and are thus consequently disappearing. In our wisdom, therefore, let us prevent, as far as we can, the decadence of our fishes, allowing nature to use its aids to this desirable end, and by so doing, the now despised and outcast cormorants will be relegated to their proper sphere of usefulness.

South Camberwell, Victoria, Australia, February 15, 1927.