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Read again Reports from Surgeon F. DAY, F. L. S., and F. Z. S., dated September and 17th November 1868, and recorded in Proceedings of Government, 4th February 1869, No. 306.

Read also the following further Reports:—

No. 658. From the same Officer, dated 1st December 1868.

1. I have the honor to submit my third and comprehensive report upon the present state of the fresh-water fisheries in the Cauvery or Coleroon, the Kistna, and Godavery rivers, near the respective anicuts situated on each, as directed in G. O., No. 1,468, of May 27th, 1868; with suggestions as to whether any, and if so, what steps appear advisable to be taken with regard to their present condition. I have included in this much of my reports on my two tours of inspection, and have also embodied the inquiries suggested through the Supreme Government, so as to render it as complete and comprehensive as I am able, respecting the fish and fisheries of that portion of Southern India over which my investigations extended.

Country through which investigations on the Fisheries extended, and sketch of tour.

2. I left Madras on June 16th by rail for Trichinopoly, where I examined the fishes in the Coleroon, and then proceeded to the Upper Coleroon anicut, ten miles west of that station and 100 miles from the sea. From thence I went by rail to Tanjore, then on to Combaconum and the Lower Coleroon anicut, fifteen and a half miles from that town and thirty miles from the sea. After I had minutely examined this structure, and finished my inquiries into the fishes existing in the river and contiguous pieces of water, I returned to Combaconum, from whence I marched up the coast to Madras, by which means I was able personally to investigate the state of the fisheries at the mouths of the rivers, and ascertain whether they had, or had not, been affected by the irrigation works. On my arrival at Madras I returned to Arcot to see the Palar anicut, and on September 3rd left by the steamer for Masulipatam, from whence I proceeded by boat to the Kistna anicut at Bezwada, across from thence by canal to the Godavery anicut at Dowlaishweram, and after having completed the survey of that place, on to Cocanada by boat, examining the fry along the canal. On October 15th, I left Cocanada by steamer for Gopaulpore, where I inquired into the sea and fresh-water fishes, and so on to Berhampore, Chetterpore, Ganjam, and Rumbah, where I crossed the Chilka lake, and from thence proceeded to this station, to inspect the present state of the Mahanuddee above and below the anicuts. I have been engaged for the last three weeks completing my reports to Government, and, in the intermediate time, examining into the state of the river, its resources, and the effect of the irrigation works, or causes of decrease in the fish. I mention the route I have pursued, as I wish to point out distinctly the line of country to which my investigations refer. I am also in a position to observe upon the fishes in the Bowany at Mettapollium, at the foot of the Neilgherry Hills, which place I investigated two years since, and reported on to Government.

Fresh-water Fisheries and their uses. How fishing may and has been abused in Europe, and the fish disregarded in India by Europeans, where the supply is failing in rivers where there are irrigation works.

3. Fresh-water fisheries are almost universally of considerable value as furnishing an indigenous supply of wholesome animal food, a subject of great importance in national economy, espe-

cially as regards the Natives of India, many of whom rejecting the flesh of domestic animals will still consume fish, whilst, wherever there are rivers and tanks, the trouble and expense of raising fish is but small. According to the amount of care bestowed on fisheries is the return received, whilst indiscriminate fishing, as we have seen in Europe, may end in the destruction of some, and especially the more valuable kinds of fish. The result in Great Britain has been an enormous expense in ascertaining, first, the cause of the disappearance or decrease of Salmon in most of the rivers, and subsequently in restocking them by means of pisciculture, and thus rendering the water subservient to the purpose of providing food for the masses of the general population, instead of allowing the destruction of its inhabitants by the constant and indiscriminate capture of the fry. "Every man who catches a fish," says Dr. Franklin, "draws from the water a piece of money," but his drawing, if not in moderation, may continue until none of these pieces of money are left to abstract, and then a failure or stoppage must ensue. In *Gmelin's Linnæus*, it is observed, "so great is the importance of fish to the enjoyment of the rich, and "the necessities of the poor, that man might, with less inconvenience, give up the "whole class of birds, and many of the mammalia, than be deprived of the finny "tribes." The Indian fresh-water fisheries appear as yet scarcely to have attracted the attention they deserve, which may be partly because Europeans have a prejudice, as a rule, against eating fresh-water fish, whilst Native servants rarely bring to the notice of their employers the existence of good species for the table. There is in fact still much to learn in this most interesting branch of Zoology, especially respecting what fish exist in our Indian rivers, where, and when to obtain them, for the Native names differ according to the various localities and dialects. But setting aside the gastronomic uses of fish for Europeans, it forms a considerable portion of the staple food of some of the classes of the population of India, and in years of scarcity may play rather an important part. It was observed by the late Sub-Engineer at Dowlaishweram,* himself head of the fisherman caste of that place, "The "fish procured at the anicuts in great "numbers formed a great part of food to many poor classes of people in the late "famine years." Whilst in the Report of the Commissioners appointed to inquire into the famine in Bengal and Orissa in 1866, I observe, at page 79, the following observation made by Mr. Ravenshawe, Commissioner of Orissa:—"While the condi"tion of the residents of this place, where my camp is, which is called Nigghur "Bulbudderpore, or 'Kentesakee,' is somewhat easier, as living by their fisheries, "they are not so affected by the present circumstances;" and in several other places he alludes to the fisherman class in the famine being better off than their neighbours. Of course it is probable that during famines they would first feed themselves and their families, before disposing of their surplus produce. In *Gmelin's Linnæus* it is remarked: "Doubtless the immense multiplication of fish must have a "vast effect upon the population of empires, and we may observe how this vast "increase tends to maintain, in the kingdom of China for example, the multitudes "of people, heaped as it were one upon another." It appears to be only under very exceptional circumstances that purchasers for fish cannot be found in the local markets; in fact the reverse usually obtains, that the fishermen are unable to

* Proceedings of the Madras Government for May 27th, 1868.

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meet the local demands. Every article of consumption appears to be increasing in value, consequently if this rise is not fictitious, the amount of food to be obtained from fresh-water fisheries must yearly become of more importance, as fish live and grow in places which are otherwise unserviceable to man in the production of food, excepting in a secondary manner. Fish do not require food which would otherwise be usful for human beings, and they thrive in situations which, but for their presence, would probably be almost deserted pieces of water. Even Natives stock newly-made tanks with fish, in order to render the water more serviceable in the production of food. Every one who inquires into this subject must, therefore, concede the importance of these fisheries, or should there be any who discredit it, and doubt the wisdom of protecting them, I conclude such persons would not consider it any hardship to the population at large, if steps were taken to increase their importance, and make them more conducive to the general good, by augmenting the supply of wholesome food, more especially if this can be done without involving any expense. Were the amount of fish stationary, and not decreasing, any change or alteration would be unadvisable; but in those rivers in which anicuts exist, as I shall remark further on, their decrease is becoming most serious.

Religious or milito-religious customs and uses bearing upon fish.

4. If we turn to Native prejudices, and examine even into their religious or milito-religious customs, we at once perceive that Ichthyology has held an important position even in Asia; of this I will here adduce a few instances. Fish are adored by pious Hindus in some parts of Hindoostan, as they are held typical of Vishnu, who in that form is considered to have rescued the Vedas from the waters of a flood which covered the earth. On the death of one of the Hindu Rajahs of Cochin or Travancore, catching fish is prohibited for three days for fear His Highness' spirit may have gone into one of their bodies. "The cognizance of the Rajah of Benares," says Hooker in his *Himalayan Journal* (*Vol.* 1, *p.* 73,) "of two fish chained together appear on the gates "of public buildings." The capture of a fish is said to form one of the ceremonies at the marriage of a Konkanic Brahmin in Malabar. The "Meen kodah," or fish standard, was the symbol of the ancient kings of Pandya, the rulers of Malabar; the device may be traced on many copper coins which still pass current in that portion of India. To this day the Rajpoots are said to have a fish carried before their most illustrious chieftain when setting out on an important expedition. Or, if we turn to other Asiatic countries, we even find that the fish was emblematical of the Christian faith, and in many of the ancient Christian Churches, figures of fish may be seen especially on the tiles of the flooring. For the Greek word ιχθυς a fish, is composed of letters, each having a peculiar signification, ιησους Jesus; χριστος Christ; θεου of God; υιος Son; σωτηρ Saviour, or Saviour of the world. Hyder Ali enacted laws for the preservation of fish, and only allowed those who paid to capture them; and in the lease for letting the fisheries in Tanjore is an old agreement that one fish in every ten captured shall be released and turned in with his head to the west.

Division of fishes in the fresh-waters of India, migratory, non-migratory, and sea-fishes which ascend either for breeding or predaceous purposes.

5. The fishes which inhabit the fresh and brackish waters of India are exceedingly varied in form, and of widely diversified characters. During

my tours I have found, as a rule, that where there are large rivers, and means for collecting the fish, I have rarely obtained less than forty species in each locality. Some fishes are more widely spread than others, and although it will occupy considerable space, I consider that it is desired that I should give a resumé of the fishes which inhabit the fresh-waters of this Presidency, with remarks upon their habits. Some appear to be *local and stationary*, rarely changing their situations, excepting for the purpose of depositing their ova when they ascend small streams, or find their way into contiguous tanks, or otherwise only migrate short distances in times of drought, or of inundations, to escape being washed away. Secondly, we have *migratory fresh-water fishes*, which ascend and descend with the freshes in rivers. Thirdly and lastly, *sea-fishes which ascend rivers* to deposit their ova, or to prey on their weaker neighbours.

Non-migratory fresh-water fishes.

6. Of the *local and stationary*, or non-migratory fishes, we have a large number of species. As might be anticipated their breeding season is not so much affected by the monsoons or freshes as is that of the migratory varieties; for although, doubtless, all deposit their ova at such periods, there are some which appear to be constantly breeding as I shall remark upon when I come to that subject. Although there are fine fish in this division, still the smaller ones abound, and make up by constant breeding, and numbers for their deficiency in size. It appears to be mostly amongst these genera that we have the æstivating fishes, which, as the tanks dry up, dive down into the mud, where they remain embedded until the return of the rains, when their sudden re-appearance frequently leads to the supposition that they have descended in the torrents. Many of these also remain in small pieces of water, which, it appears improbable from their size, could afford the necessary amount of food for their subsistence; as soon as the rains return they wriggle down small channels and water-courses, and find their way to other and better breeding localities. First, there are the *Acanthopterygii*, or hard rayed fishes, most of which live near the sea coast. There are various species of Ambassis: 1, *A. Commersonii*, C. and V., *Cerumbi*, Tel., *Chandi*, Ooryah; 2, *A. Nalua*, H. B.; 3, *A. Lala*, H. B., *A. Dussumieri*, C. and V. They are small in size, bony, and of but slight value as food, owing to their being seldom numerous and always small; they may be found in tanks, rivers, and even brackish pieces of water. Europeans frequently appear to consider small fish as valueless because they do not like them themselves, and consequently think them useless, or perhaps only fit for paddy-birds and crocodiles. Nothing can be a greater mistake, as food which is relished by a large proportion of the population, and which if tasteless and bony is still wholesome, must be an object well worthy of attention. If nothing but what is of utility to Europeans and the higher castes, or richer classes of Natives, were worth protecting, there are many crops which might be deemed useless. It also appears to be forgotten that many of apparently almost useless little fishes are in reality the fry of larger sorts. The Gobies, *Gobiidæ*, some of which have the curious propensity of building nests at the breeding season, of these we have three species. The *G. Giurus*, H. B., *Oolooway*, Tam. is greatly esteemed by the Natives as light and well flavoured, it attains to $1\frac{1}{2}$ feet in length, and is universally distributed over the tanks and rivers of India. The *Euctenogobius striatus*, Day, is smaller and of but little value as food, and the same may be said of the *Electris fusca*, Bloch, *Cul Coondallum*, Tamil, *Kalawishi*, Ooryah, which is rarely found far beyond tidal influence, it is small but not bad eating. The French in the Mauritius consider it excellent. A small percoid fish, *Nandus marmoratus*, C. and V., *Septi*, Tel., *Budusi*, Ooryah, is good eating, but usually only found near the coast, and rarely in any number excepting in Malabar. The *Anabas scandens*, Dald., *Pauni eyri*, Tam., *Cowu*, Ooryah, have been celebrated for climbing trees, they are found in the ponds, rivers, and estuaries of India, especially near the sea coast. They appear rarely to exceed seven inches in length, and are esteemed for eating by the Natives of India, whilst owing to their great vitality out of water, from being able to breathe atmospheric air, they can be carried alive to distant markets, and the boatmen of the Ganges convey them about in wet chatties killing them as required. The little *Polyacanthus* is another fish of this family, but too small to be of much use; the same may be said of the *Trichogaster fasciatus*, which abounds along the coast from Cocanada upwards, and is dried in the sun for food. But amongst this division of fresh-water fishes are the Walking fish, *Ophiocephalidæ;* the *Ophiocephalus marulius*, H. B., *Pooverarl*, Tam. *Phool murl*, Hind., grows to three or even four feet in length. The *O. Striatus*, Bloch, *Verarl*, Tam., *Sowarah*, Tel., *Sola*, Ooryah, grows to three feet or more in length. The *O. Gachua*, H. B., *Para korava*, Tam., *Dheri dhok*, Hind., *Chenga*, Ooryah, grows to a foot in length. The *O. Punctatus*, *Korava*, Tam., *Phool murl*, Hind., *Gorissa* or *Gurrie*, Ooryah, grows to about one foot in length; all these are exceedingly valued as food. They have hollow cavities in their heads, and an ærial as well as aquatic mode of respiration, thus they can live long periods out of water, and travel some distance over moist pieces of land. They abound in almost every tank throughout India, also in sluggish streams, and to within the influence of the tides; whilst one of them, the *O. Marulius*, seems to prefer more rapid rivers. In China the fishermen are said to take them alive to market, and cut off slices as required for sale, and so long as the fish retains life the value is greatest. Some of these fish live in holes along the banks of rivers, apparently the abandoned residences of crabs. There are also the fresh-water spined Eel, *Rhyncobdella aculeata*, Bloch, *Aral bommiday*, Tel., *Thuri*, Ooryah, a spined Eel, growing to about twelve inches in length. The *Mastacemblus armatus*, Lacep, *Barua*, Hind., *Cul aral*, Tam., *Mudi bommiday*, Tel., *Bumri*, Ooryah, is found all over India. The *Mastacemblus pancalus*, H. B., *Pahparaal*, Tel., *Bahrn*, Ooryah. These nearly approach eels in their habits, and places of residence. They are also excellent as food, although somewhat rich, and by some considered heating. The largest variety is spread throughout the rivers of India, and is also found in some tanks. They can all exist for a long period after their removal from the water. Also along the coast there is a laterally flattened fish, the *Etroplus suratensis*, Bloch, *Karssar*, Tam., *Pitul kas*, Hind., *Cundahla*, Ooryah, which grows to a foot in length, and the *Etroplus maculatus*, Bloch, a coast fish, found as high as Madras, and of small size. They are both much esteemed when sufficiently large. Such are the hard rayed, or spinous fishes. We have also the Siluroids, or scaleless ones, the following of which appear to be non-migratory:—The Scorpion fish, *Saccobranchus singio*, H. B., is esteemed for eating by the Natives, and praised for its invigorating qualities, but it is dangerous to handle, as wounds from its pectoral fin set up intense inflammation which sometimes ends in lock-jaw. Mr. Taylor at Cuttack informs me

that the Natives of Upper India stock their tanks with these fish in consequence of their being such very rapid breeders, and he has seen tons in weight taken from a moderately sized tank. He also, on one occasion in the North-West Provinces, saw a dry tank dug up, on the bottom of which the earth had caked and cracked on the surface, and yet five feet from the crust many of these fish were found alive æstivating in the soft mud. The Butter fish, *Callichrous chekra*, H. B., which is considered excellent eating by all who have tasted it. A large Cat fish, *Macrones aor*, H. B., tasteless and insipid, but much prized by the Natives; and some other smaller species of the same genus, as the *Macrones cavasius*, H. B., and *Macrones tengara*, H. B., which are equally fit for domestic uses. Whilst further to the north, as in the Kistna and Godavery, the number of Siluroids commences to increase, and the *Rita katurnee*, Sykes, and the *Bagarius yarrellii*, Sykes, form no inconsiderable articles of food. It is also exceedingly interesting to observe the great size to which these Siluroids attain in rivers, such as the Mahanuddee, where the anicuts have not as yet occasioned the great depopulation of the rivers, which is seen in some parts of the Madras Presidency. The Mahomedans to the north are not so particular in rejecting these scaleless fishes as articles of food as they are in the south, whilst commencing from the Ganjam country, as far as Cuttack, I find that the Hindus as a rule, including the Brahmins, all eat fish. There is an interesting account which bears on this question, given by Major R. Leech, C. B., late Political Agent of Candahar, in his account of the Hazarah. Having procured some fish by dragging the river Major Leech remarks:—"Observing in the crowd "of spectators the village Mulla, (who are generally half read,) who evidently "regarded us as cannibals, I inquired why they did not eat fish, he replied he could "not tell me, but it was undoubtedly lawful food. A good stock of fine fish being "now laid before us, I begged the Mulla to make them lawful eating, this he "ought to have known could be done by merely dashing the live ones thrice to the "ground. He, however, looked disconcerted at my request, and hesitated. After "a short time, during which we all kept our countenances, he called for a knife, "and was about to cut their throats, when I suggested the stomach was the proper "place, and he actually, after pronouncing his solemn "Bismillah allah Ackbar," "went through this first part of a cook's duty."

But the *Cyprinidæ*, or Carps, give many species of non-migratory inhabitants of rivers and tanks. This family includes many species which migrate for breeding purposes, but the following appear to be stationary:—The *Catla buchanani*, C. and V., *Botchee*, Tel., is a magnificent Carp, which, though bony, is most excellent eating and light of digestion; it inhabits the rivers and tanks of the Godavery and Kistna Districts, and the whole country northwards through Bengal. It grows to six feet in length, but the larger ones become rather coarse. Mr. Clelland observes that "there is no species of more importance than this in an economic point of view." It accommodates itself to fresh or brackish waters, rivers, or tanks, and is, therefore, capable of introduction without much difficulty. At Cocanada, as I have observed, there is a tank which had not been netted for two years, and from this, at one haul of a seine net, we captured twenty-seven large fish of this species, varying in size from 5 lbs. to 9 lbs. in weight, besides an enormous number of small fish. The Botchee is said to refuse baits, but evidently rises to the natural flies. It is found at Masulipatam, from whence it might be exported by steamer to Madras, and from thence by rail be conveyed to the station before Erode, and there turned into the Cauvery. It seems peculiarly adapted for irrigation channels and tanks, breeding rapidly, and attaining about 5lbs. in weight in the course of two years. Of the Barbels, in which I include the whole genus as defined by Günther, there are many species which are also apparently non-migratory, and are spread throughout the tanks more especially, but also in the rivers of India. Small though some of them are, and notwithstanding the reputed bitterness of two of the species, Natives are always ready to purchase them, and include them in their curries. The most minute species are prized, whilst, as I shall subsequently show, it is fortunate that the ova they deposit are large in number. A *Thynnichthys* is also plentiful in the Kistna and Godavery, and attains a good size. Besides these, there are numerous small species which make up in numbers for their deficiency in size. The *Rasboras*, or Indian minnows, are found in some localities, but in others are superseded by the *Perilampus cuchius*, H. B., or *Aspidoparia morar*, H. B., the *Muria danric*, and the *Amblypharyngodons*; besides which there are the *Danio's*, the *Barilius*, and *Rohtee's*, the last genus only existing to the north of Madras, and some of the others having a very local distribution. The *Chela* in one or other of its species is found everywhere, and though small is invariably good eating; and, lastly, amongst the Carps, are the Loaches, which are also, though small, much esteemed as food. Amongst the *Clupeidæ* is the *Notopterus*, one species of which *N. Kapirat*, Lacep, is common all over the Madras Presidency, and the other, *N. Chitala*, H. B., is also found in the districts north of Ganjam. In addition to these there is one Eel, the *Muræna maculata*, H. B. These are the common fresh-water non-migratory fish, which I have obtained in my late tours. The smaller fish, as a rule, are more relished by the Natives of Hindoostan than the larger species, whilst, besides their being employed as food, they are also exceedingly useful in affording sustenance to the larger fishes; but unfortunately amongst these small fishes the fry of larger ones are destroyed in numbers.

Migratory fresh-water fishes.

7. Secondly, we have the *migratory fresh-water fishes*, which ascend and descend the rivers at the time of the freshes. They are, as might be anticipated, generally larger and stronger than the non-migratory. The monsoon months, or during the freshes, are their breeding seasons, and at these periods thousands may be perceived trying to pass the weirs to reach their spawning beds. Amongst them we do not appear to have any Acanthopterygians or spinous rayed fishes, whilst even in the Siluroids it is only the large Wahlah, *Wallago attu*, which appears to be affected by the freshes, and even this species is found in places where it is very evident it cannot change its locality, still it must be considered one of the migratory kind. All the fishermen declare that the migratory Carps which ascend the Cauvery in the June, or south-west monsoon return down the river again during the north-east monsoon, or about October, and that it is at that period the largest fish are taken. Of this I can give no statement from personal observation, not having been there at that time, but it is not improbable. Amongst the Carps we have a considerable number which are affected by the monsoon, and at the periods of the freshes change their localities. One species of *Cirrhina* grows to about 4lbs. in weight, and

though in common with all the Carps, bony, is fair eating, and moderately abundant. Two smaller species of *Crossocheilus* are numerous, but it is amongst the *Labeo's* that the largest and most useful forms are taken. The *Labeo fimbriatus*, Bloch, and *L. Kontius*, Jerdon, are exceedingly plentiful in the Cauvery, and at times are procured of a good size, though it is the fry and immature which are most frequently seen. Some of the smaller forms of *Barilius*, as the *B. Cocsa* and *B. Bendelisis*, also appear to migrate at breeding seasons.

Migratory sea-fishes ascending to breed or prey upon their neighbours.

8. Thirdly, and lastly, we have sea-fishes which ascend rivers to deposit their ova, or to prey upon their weaker neighbours. There is one of the Sciænidæ, *Sciæna coitor*, II. B., which, however, does not attain a large size, though it is considered good eating by the Natives. Also the Mullets, *Mugilidæ*, of which several species ascend far beyond the extent of the sea water for breeding purposes, and are excellent as food : but pre-eminent amongst these fishes both in number and in value is the *Sable fish*, which has received various names in different places. Thus in Bengal it is termed the *Hilsa*, in Tamil the *Oolum*, in Telugu the *Pulasa*, and according to Westmacott the *Pulla* in Scinde, the *Dumra* in the Indus, and *Roree* in the Ganges. Since the construction of the anicuts in the Telugu districts, the frantic but unsuccessful efforts of this fish to try and ascend over these impediments has obtained for them the name of *Yekkudi chakka* from the term " Yekku," meaning " to climb." It swarms into the rivers opening along the Coromandel Coast as the freshes of the south-west monsoon pass down to the sea, their season for spawning being coincident with that period. Some few, however, appear to choose the end of the year in the Kistna for this purpose, why it is not quite clear ; but it appears most probable that they do so because the current of that river is exceedingly rapid, and probably as a rule unfit for the deposition of eggs until the great rush of the freshes have ceased, as is the case in November or December. This fish is greatly esteemed by every one ; it is only the existence of its numerous sharp \/ shaped bones which makes it somewhat dangerous to eat, but by proper carving this may be obviated ; in fact it is said to have been an indispensable requisite that the A. D. C. to the General Commanding the Southern Division should be able to carve a Sable fish ! but now there is no necessity for this accomplishment, as the anicuts have entirely prevented their ascending the Coleroon as far as Trichinopoly. Even the Natives have a saying which shows their appreciation of this fish : "As long as you have money, purchase a Sable fish, that being the best " for the health, and the sweetest obtainable for the palate." At the Lower Coleroon anicut the contractor estimated the value of the Sable as six-sevenths of the entire fishery. At Bezwada Mr. Stuart estimated the yearly value of the captures at the anicut at Rupees 7,800. In taking the Sable constant netting should not be permitted, as is the case in the Kistna and Godavery, but on the principle in use in the Coleroon the fishing should only be once daily, and the river kept as quiet as possible. All fishing for small fish is stopped there during the Sable season, and this is a most fortunate chance for the fry of the fish, so that, with a good pass in the anicut, I expect most satisfactory results would follow. The Sable fish, for the purpose of depositing their ova, ascend high up the river to situations where the sudden rise and fall of water will neither leave the eggs dry nor carry them away, and these

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portions of the river do not occur below any of the large anicuts, though sufficient spawning grounds are now found between the Lower and Upper Coleroon anicuts. At Dowlaishweram, at the only Madras anicut at which I took the fry, it appeared that the earlier ones were trying to descend to the sea in October, but unable to cross the anicut were finding their way down the irrigation channels. Now if unable to cross these obstructions, and they go down the channels which have no communication with the sea, they must all perish. Even when communication does exist the difficulties may be so great that only a small proportion survive to reach the end of their journey. Young fish, when they are ready to descend to the sea, seem to endeavour by every means in their power to pass all obstacles and go down stream, finding that at Dowlaishweram the anicut is a complete bar in that direction, they descend into the irrigation canal ; when a lock is opened to let a boat pass, continuing their course down stream they reach another lock, their heads still being pointed sea-wards, and when these gates are opened, they again pass through and descend. This is easily proved by their being netted at those spots in numbers, but still some reach the sea. I beg to call especial attention to this fact, and that I took the fry at the Cocanada or last lock ; for it is on this principle that I shall propose to construct an entirely new form of fish pass. If the young cannot descend to the sea either by the irrigation channels, or by other means, they would be constrained to remain in the water until the freshes of the succeeding year. Whether they would live through a whole season if thus prevented reaching the sea is questionable, but arguing by what occurs when Salmon fry are so prevented I should imagine they would, still it is highly desirable that such detention should be avoided if possible. Mullets ascended the Coleroon when the lower anicut was breached, but now it has been repaired none are found above that structure, either they returned down the next year with the freshes, or perished from being unable to go to the sea. During my investigations I found no young Sable in the Cauvery or Kistna rivers, nor in the Godavery below the Dowlaishweram anicut. That this fish is exceedingly valuable in an economic point of view as food, may be at once concluded from the fact that at the Lower Coleroon anicut it is estimated that one lac of fish is yearly captured, whilst all are sold. Should this species of fish be exterminated it would be most expensive to reintroduce them, as such could probably only be accomplished by means of their ova being collected and brought in ice by rail to the Cauvery. But the eggs are minute, and few in India understand the process of collecting and fecundating them, so doubtless the cheapest thing to do will be to protect the fish now when we have them, and to promote their dissemination as much as possible. I cannot help thinking that the old agreement in Tanjore to release one in every ten fish, and turn them in with their heads to the west, must have had a Hindu origin, either with a view to obtaining the favor of the deities, or else because the river was becoming depopulated, and it was considered necessary to keep up the breed. I will subsequently enter into the reason why the Oolum fish congregate at one spot, and the effect of the anicuts upon their migration. Besides these species there are a few other *Clupeidæ* but only small species, and a Pipe fish, *Sygnathus*, whilst the Saw fish, *Pristis semisaggittatus*, a Shark, and many other large predaceous kinds, ascend the rivers apparently in pursuit of their smaller neighbours. Amongst these I have found at Cuttack, in the Mahanuddee below the anicut, the *Begti*, or cock up

Lates calcarifer, Bloch, which grows to a large size; a Ray, *Trygon uarnak*, and a *Tetrodon*. These on being dissected have invariably been found to contain fish inside them.

Value of fish in the markets now, in comparison with former years.

9. The question of the value of fish as food, in a pecuniary point of view, is material in an investigation of the present state of the fisheries. During the past ten years articles of daily consumption have become much dearer. Evidence to prove this can hardly be required, or, if necessary, the range of prices, published in the *Fort St. George Gazette*, will be sufficient for that purpose. If all articles of food have risen in price it is unlikely that fish would remain stationary, and in fact in my late investigations I have found that its price has increased of late years in the same proportion as other kinds of animal food. In Rajahmundry, for instance, it has almost doubled since 1861. Now if the value of fish as an article of food has risen, this must be due either to the increase in the general value of food to augmented cost in the capture of fish, or to a decreased supply in the rivers. It has already been taken as granted that the cost of animal food has augmented, and this is, doubtless, one cause of the rise in the price of fish. As regards the cost of capture, as cooly-hire has increased, this must also act in two ways in raising its value, first by increasing the rates for the labor employed in its capture; and, secondly, by the fact that the general population being richer can afford to expend more on this variety of diet than was previously the case. It can hardly be due, in the Kistna and Godavery Districts, to a rise in the rents, as they have been abolished in these districts, and since that period (1862) the rise in price has been most apparent. Thus we come to the question, have the fresh-water fisheries of this Presidency increased, decreased, or remained stationary of late years?

Value of Fish farms, and want of information respecting them.

10. Unfortunately, from not having received the returns respecting the rents of the fisheries of each talook from any of the Collectors to the south of Madras to whom I applied for them, I am debarred from entering fully into one portion of my investigations. It appears to me of considerable importance that, in this inquiry, returns should be called for from every talook giving the increase or decrease of rents for fisheries in all rivers and tanks, they being separately shown. But it apparently requires an order of Government to obtain such returns, which perhaps should be given even more fully than those I previously requested, as I shall subsequently remark upon. It would be almost necessary to ascertain, provided the river fisheries have been let annually by public auction, what has been the effect of the irrigation works upon the value of the fish farms higher up the rivers towards their sources. I have obtained from each Tahsildar of the talooks I have personally visited a return of rents received, which will be available for the purposes of a preliminary investigation. If the fisheries are not diminishing, the rents should rise in amount in a corresponding ratio with animal food, provided they are let annually by auction. But I find that annual lettings have not been invariably the rule, in some places fisheries have been permanently let, in others for long periods, whilst in some districts remissions appeared to have been freely allowed, and in other adjacent districts these have not been permitted. Again, I have found that for years, as at Tindevanum, the rent has remained exactly station-

ary. Sometimes the excuses urged for remissions were that there had been too little rain, whilst in other adjoining places there had been too much; this is only, I imagine, to be obviated by their being let annually; for I was unable to ascertain that any fisherman had discovered that he had made more than was anticipated and had handed over any increased rent, at least to Government. It thus appears that local circumstances must be inquired into. What the annual rise should be I cannot state, as figures are wanting, and more complete investigations are necessary. In the Ganjam District, after the abolition of the Moturpha tax, rents were demanded and with the following results:—

1865-66.			1866-67.			1867-68.		
RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
2,432	2	8	4,296	6	0	4,381	4	0

This gives a gradual annual increase, and that without any apparent diminution in their productiveness, and this increase has been steady in all the various fisheries of the district whether in rivers, fresh or salt-water tanks, or swamps. At the Kistna anicut the rents have decreased in the same period—

1866.	1867.	1868.
RS.	RS.	RS.
136	100	110

But there is an increase in the general receipts for sluices, which before unlet are now farmed out, and as the irrigation works advance the extent of these farmed out portions should, doubtless, be also increased. In the Trichinopoly Collectorate the general rise has been above fifty per cent. in the last seven years, and though I have not been able to ascertain what portions are included in this return, I believe most of it to be tanks. In Tanjore again the same rise appears to be going on—

		RS.	A.	P.
In three years ending	1862-63, rents were...	18,206	12	0
,, ,,	1867-68 ,, ...	35,312	1	0

Whether this rise is due to increased value of the fish, or to a diminished supply, is a question for consideration, and one on which, owing to deficient information, I can give no opinion.

The Cauvery river and its distribution. Its fisheries decreasing in value, and fry being destroyed.

11. In short the figures I have hitherto obtained fail to be of much assistance in this part of the inquiry, and it is, therefore, necessary to demonstrate the state in which I found these fisheries at various places, with the opinions of the inhabitants as to their present condition. My investigations of rivers were chiefly directed to the state of the Cauvery and Coleroon to the south of Madras, and the Kistna and Godavery to the north, more especially with reference to the effects of the anicuts on their piscine inhabitants. The Coleroon I examined at Trichinopoly, situated between the Upper and Lower Coleroon anicuts, at both of the above anicuts, and also at its mouth. This river at its various sources in the Western Ghauts, and from thence to its termination, a distance of nearly 500 miles, is principally replenished by the south-west or June monsoon, as it reaches the Coimbatore District, and from thence to the sea it receives a large amount of water from

the October or north-east monsoon; consequently from the beginning of June to the end of December it is always more or less full, and subject to floods or freshes rarely exceeding ten feet in height, but which have been known to rise as much as twelve feet; at these periods the river, previously a sandy shallow bed, becomes filled, and assumes the character of a rapid and impetuous torrent. Above the Island of Seringham it is termed the Agunda or broad Cauvery, and is 4,400 feet wide, but at that point it divides into the Cauvery Proper 2,000 feet wide, and the Coleroon 2,400 feet in width. The first named river is the narrowest, the most shallow, and is principally distributed in the Tanjore District, where it gradually diminishes in size in its course of 100 miles; whilst the latter is termed the Coleroon, and is the deepest, having at its commencement a weir or stone dam, or wall which has received the Native name of "annicutta" or anicut, whereby a large body of water is diverted into the Cauvery Proper. Thus the Cauvery has no anicut between its division from the Agunda Cauvery and its termination in the sea, by which time, however, it has diminished to a quarter of its original size by giving off four large branches which are distributed in the province, so that on reaching the ocean it has dwindled down to about seven yards in width, and during heavy freshes it is only about four feet deep. The consequence is that large sea-fish do not pass over the bar to ascend its stream, therefore should any find their way into its waters they would have to come up the Coleroon and into the Cauvery at its division. But across the Coleroon is the lower anicut, which entirely precludes the ascent of fishes; consequently sea or estuary fish are, as a rule, absent from the Cauvery, and upper portions of the Coleroon. I examined this river, or branches of it at Tanjore, Combaconum, Myaveram, and Sheally. At Tanjore there were complaints of a deficiency of fish, and a yearly decreasing amount in the branches of the Cauvery river, and the same remark applies to Combaconum. At Myaveram the largest and best fresh-water fishes are of the migratory kinds, (paragraph 7,) which mostly appear in the rivers at the time of the freshes: of late years the numbers are stated to have much decreased, and as a consequence the rents have fallen. I obtained the returns for seven years; the average yearly receipts for the first four were Rupees 1,065-4-0, whereas the yearly rents for the last three years have averaged Rupees 864. At Sheally I found the same complaints of the decrease both in the number and size of the fish. I personally inspected all the rivers I was able to, and during the whole of this portion of my tour, I observed the indiscriminate destruction of young fish. Small water-courses are crowded with fry, and whilst being used for irrigation purposes, are also made subservient to the capture of immature fish. A basket is placed wherever water is being thrown, it passes through leaving the fish which have accompanied it in the basket. It must not be concluded that the number thus taken is small. Millions of fry perish, and are used as food by the cultivators of the soil. Even children may be seen surrounding a piece of water, and catching the fry in their cloths, whilst fishermen with cast nets are employed in the same occupation. But the means and modes of destruction I will allude to when coming to that portion of my subject.

The Coleroon river, its anicuts, and the state of the river fisheries.

12. The Coleroon, as already observed, becomes the main channel of the Agunda Cauvery, and continues its course direct for about 100 miles to the sea. I examined it at Trichinopoly, at the lower anicut, and near Chellumbrum, in an extent of nearly 100 miles; this gave me an excellent opportunity of inquiring into its present state, and personally observing the effects of the anicuts. The upper anicut* was erected in 1836, and finally completed in its present form and height in 1843; thus for twenty-five years it has existed as a barrier across the upper portion of the Coleroon river, cutting off its fishes from the upper 400 miles of its course. But it must be remarked that there is no impediment to fishes ascending by the Cauvery channel, which communicates pretty freely with the Coleroon even below the upper anicut. The fishes in the river; however, are exceedingly few, whether at the anicut or even at Trichinopoly, in fact as low down as the Lower Coleroon anicut which spans this river. At Erode, I should suppose 100 miles above the upper anicut, I made inquiries respecting the fish in the Cauvery river near that railway station, and was told that they had almost entirely disappeared, and that the river had become nearly depopulated. It would be exceedingly instructive to ascertain what rents have been received for the last thirty years in this portion of the river, as they would show whether the report of this failure is correct or not. I applied on July 25th, 1868, to the Collector of Coimbatore for such a statement, but his answer appears to have miscarried, as I have not received any. Prior to the erection of the lower anicut, the Sable fish ascended as high as the upper anicut, and they are known to have been captured formerly even miles above the place where that barrier now exists. Subsequently, however, to the construction of the lower, they have never ascended as high as the upper anicut, excepting during a breach which occurred in the former a few years ago, when they immediately re-appeared, but since this has been repaired they have not been taken. As regards the general state of the fisheries the inhabitants all admit that they never knew so few fish, whilst the decrease is rapidly year by year becoming more apparent, and the river more and more depopulated. Large fish are now very rarely taken, which used not formerly to be the case. I personally saw thousands of fry captured by cast and other nets. It was perfectly useless pointing out to the Natives that, if the fry were thus destroyed, they could not expect subsequently to obtain large fish; the only answer was, that if they did not kill them some one else would, as there was no one to look after them, the contractor having failed, and they liked little fish which were still cheap. At Trichinopoly I found the same state of affairs; the amount of fish taken from this river, and daily brought to the bazaar is most insignificant; I should say one cooly could easily carry the whole of them, whilst formerly the yearly captures of Sable fish at or near this station is computed by the fishermen to have been two lacs, or double what is now admitted to be taken at the lower anicut, which now prevents their ascent. In fact near the lower anicut it is not considered worthwhile fishing with nets above that structure, whilst below it netting is most remunerative. Undoubtedly the best fishery on this river is at the lower Coleroon anicut, fifteen miles from Combaconum. In this portion of the river, and from it to the sea, the fishing for Sable was very immaterial until after the construction of the anicut, when it immediately increased and has been carried on to a considerable extent ever since. When the anicut was first constructed the Sable were taken in great numbers below it, and though the fishery

* Described in Report No. 1.

has continued up to the present time, and the rents have risen, the contractor attempts to show he is farming it at a loss. When the breach occurred in the anicut the fishery was evidently much diminished below the anicut, but some Sable were taken above it, showing the reason to be that their ascent was no longer entirely impeded. Since that time it is admitted that the numbers have greatly increased, doubtless from their having had one full season in which to deposit their ova. Other sea-fish are also detained by this structure. At Chellumbrum, still lower down this river, the accounts were the same, that the Sable fishery began there coincident with the erection of the lower anicut, whilst for the last two years it has improved owing to the breach having taken place.

The Palar Anicut.

13. The Palar anicut at Arcot is not worth alluding to here, as the river is frequently dry, and sea-fish do not ascend it in any numbers, in fact for upwards of a year previous to my visit water in any quantity had been absent.

The Kistna river and Fisheries.

14. The Kistna river at Bezwada is 1,350 yards broad, across which stretches a wide anicut. Below this I found that sea-fishes ascend, but otherwise the numbers of migratory and non-migratory fresh-water fishes was but small and insignificant for such a fine expanse of water. The Sable fish comes up here at the end of the year, and I found a few in September, evidently just proceeding up the river to deposit their ova. It appears that, for two years after the erection of the anicut, the Sable were captured in large numbers, being unable to continue their ascent past the weir, whilst previously their range had extended fifty miles above Bezwada; so great were the captures that at first not only were the whole of the fish-eating population supplied, but a large quantity were salted and sent elsewhere for sale. As the freshes subsided in December and January, those fish which still continued attempting to ascend over the anicuts became entangled amongst the rough belt of stones at the rear (sea-face) of the anicut, and in the early mornings and at night time when the fishermen were not employed in catching them, the wild animals, such as jackals and the like, took their share, assisted by the pariah dogs which came down and destroyed numbers. Since these two years there has been a gradual diminution of Sable as well as of all other kinds of fish, whether strictly fresh-water or partially marine, whilst the fishermen complain that they cannot now supply half the local demand. Whilst they abuse the anicut as the cause of this, they will not perceive that they are doing quite as much mischief by destroying the fry, and that it is their doing that the fish are thus taken and reduced in such great numbers. On personally investigating the state of affairs, I saw little boys sent out to fish, whose duty it was to bring home a daily supply for their families, the size being no object, and a sufficient quantity the only criterion, the stimulus of a threatened beating from their mothers being added to prevent any laziness. Hundreds of small fry are thus daily destroyed by the nets of each of these little urchins, whilst the adult fishermen also assist in this work of destruction. Above the anicut, or in the irrigation canals, sea-fish appear to be entirely absent, conclusively proving that they can neither pass over the anicut or under the sluices. In fact the river above the anicut is in a miserably depopulated condition, although the fry of excellent and large non-migratory species exist in its waters only requiring time and opportunity

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for developing into large fish. Unless a fish pass be erected the fishery of the Sable will be destroyed.

Godavery river and the state of its Fisheries.

15. Across the Godavery is the magnificent Dowlaishweram anicut, four miles in width, including the lunkas or islands. The large station of Rajahmundry being on the river a few miles above it, I there first commenced my inquiries. Before the construction of the anicut, marine species of fish were by no means uncommon as high as the town of Rajahmundry, but now they have become comparatively rare, whilst large fish are of very unfrequent occurrence above the anicut. Anglers complain of having no sport there now, whilst the price of fish appears to have risen above 100 per cent. during the last seven years. Still I found a few Sable fish and their fry opposite to, and above the town, also the *Sciæna coitor*, distinctly proving that marine species may and do ascend the river. The Reverend Dr. Murphy, who has resided there for the last seven years, and has paid much attention to the subject, considers that they have decidedly decreased, which decrease has been most apparent during the last three years. At Dowlaishweram the fishermen state that the number now captured is far inferior to what it used to be, and they consider the fisheries evidently decreasing since the construction of the anicut. They assert that they could sell three times what they now take without the slightest difficulty. Here I observed, as at the other rivers, the fry and immature fish being captured in myriads, and as any lad can capture a considerable number, this keeps down the price of the better sorts of fish, for no native will buy good large fish if he can get enough of the fry without payment. Doubtless, prohibiting this destruction would temporarily raise the price of the article, but it must lower its value in two or three years subsequently. The fishermen apparently will not suggest anything being done, as they do not wish attention to be drawn to the fishing for fear rents may be imposed.

Tanks and their fisheries.

16. In tanks the number of fish appear to vary greatly in different years, evidently this has some connection with the monsoon of the previous year; and whether sufficient water has fallen to fill up the tanks, so that the various molluses may come out of the surrounding mud, and become their prey. Amongst them there are many luscious morsels for fish, such as the ampullariæ, or apple snails, and other allied genera, which, in dry seasons, never emerge from the earth where they remain in the dried-up mud with their shells securely closed, until a rainy season sets in. Should the season, therefore, prove dry and the tanks continue only half filled, the fish, which inhabit them, appear to lie close under weeds, or in sheltered places, and are consequently captured with great difficulty. But in this rapid tour of inspection, I had no time to visit, as I should have wished, many of the various tanks, excepting in the Ganjam District, where there are no complaints of any decrease of fish. To the south of Madras there was a general complaint that the tank fisheries were less valuable than formerly. As many of the tank species are migratory, only retiring to these places during the dry season, it is not improbable that they have been affected in a primary or secondary manner by the irrigation works in localities where there are anicuts across rivers.

The state of the fisheries generally in rivers which have anicuts across them.

17. I think it may be considered without doubt a correct statement that the fish of the Cauvery or Coleroon, the Kistna, and the Godavery, are much less numerous above the anicuts than they were prior to their construction. That the marine species, as the Sable, which come up to deposit their ova, have also decreased below these obstructions. Also, in many tanks in the irrigated districts, it is well authenticated that fish have diminished in numbers. It appears undoubted that, although large fresh-water fish may be, and are taken above anicuts, they are much more rarely obtained in such situations than formerly. It is also unquestionable that towns which possess a fish-eating population situated on rivers above anicuts, cannot now be supplied with fish in sufficient numbers to meet the local demands, and even in towns where there are anicuts, as over the Kistna and Godavery, the local demand is above the supply. As the rivers fall some fish are left in the pools below the anicuts where they are destroyed.

Causes which have produced destruction of fish.

18. The causes which have produced this general decrease of fish in the irrigated Collectorates, have been laid solely to the effects of the anicuts by some of the fishermen, and as the decrease is most apparent in such districts, we must at once perceive that they have some bearing on one another, especially as this diminution is universally asserted to be coincident with their construction. But after minute personal investigations, I cannot admit that these anicuts are the sole cause of the destruction going on, for fish (although not so freely as previously) are still able to cross the Dowlaishweram anicut, but the diminution above that structure is very considerable. It appears to me that the principal reason for this decrease of fish, is that the fry are taken in excessive numbers, owing to the minuteness of the size of the mesh of the nets employed. That irrigation works act deleteriously by more or less checking the ascent of fishes to their spawning grounds, and so preventing or decreasing the production of young for future years' supply; and they also cause great destruction by producing an accumulation at the places where the obstacles occur, and thus assisting men and other predaceous animals to capture them in numbers; whilst they also impede or prevent the descent of the fry to the sea. Lastly, I believe the system of indiscriminate fishing to be most disastrous to the fresh-water fishes of this Presidency.

Remarks on the destruction of fry or immature fish.

19. One cause is without doubt the destruction of the immature fish, or the fry which is carried on to an excessive extent. This must be patent to the most casual observer who travels in India during the monsoon months, or when local irrigation is going on. I have already alluded to this subject under the head of the Kistna river, (paragraph 14). In the Godavery I observed the same destructive process, whilst at Bezwada, having purchased nine Pie worth of sun-dried fish, I found upwards of 200 small ones, and I was subsequently informed that both at this place and at Ellore several persons support themselves by capturing these fry, drying them in the sun, and disposing of them. At Combaconum, I sent out some fishermen for two days to see what

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specimens they could collect for me, and during that time they brought me upwards of 5,000 young fish, these being, as they informed me, the quality they were capturing in, and near that station. But it is useless to multiply examples. Down the irrigation canals, at the various locks, and impediments made for the purpose of diverting water, young as well as adult fish are impeded in their passage, and, whilst waiting for the means of passing the obstruction, become the prey of the fishermen who there take them in thousands. The destruction of the fry is one, if not the chief causes, of the decrease of adult fish, the small size of the nets employed capturing everything they enclose.

Remarks on anicuts and their effects on the fish supply.

20. Anicuts and irrigation works, in general, by impeding the progress of fish, obstruct and detain them at spots where they are subject to destruction in many ways; but here it will be necessary to advert to the various anicuts as each differs in construction. I must premise that sable fish cannot, especially when in roe, jump great heights, neither can they ascend gentle slopes, if the bed of the stream is very rough, and the current strong. Neither will they rise to go over perpendicular walls, even when those walls are covered for several feet with water, at least when the current is strong, nor will they proceed by bye-channels; whilst it must be remembered that the young require to descend when the river is low. The Upper Coleroon anicut crosses the river about 100 yards below the division of the Agunda Cauvery; it is 750 yards broad, and divided by a small island, 650 feet wide, into two portions. The height of the barrier to the passage of water rises perpendicularly from five to seven feet above the bed of the river, with a substantial apron of cut stone in its rear (sea-face), which for thirty-eight feet next to the anicut is perfectly smooth. The anicut has numerous under-sluices consisting of vents of from six to nine feet in width. The centre of one portion of the anicut is one foot lower than the rest, but may be raised by means of planks to the same level. As the freshes or floods come down the river, the migratory and marine species of fish ascend for the purposes of breeding, but none of the latter ever reach this anicut now. Also, if the vents are opened, and an increased rush of water is permitted, the ascent of fish may be at once seen to occur. This anicut is crossed by a bridge, and standing on this I have frequently seen both large and small fish leaping up against the anicut wall, vainly attempting to surmount it. Some of them strike against the piers of the bridge, others fall into the cascade below, but none cross the obstruction; they leap until they are too fatigued to leap again, and when they are taken in nets they are usually, if large, found to be greatly bruised, and in many places scaleless. When very high freshes occur, so that the water above and below the anicut are nearly on a level, fish *might* pass over the wall, but this appears to be of rare occurrence. The under-sluices are more on a level with the bed of the river, and it has been surmised that fish pass up them. Perhaps it is not impossible (but I believe it to be so) that a large strong fish, not heavy in roe, might thus ascend, but a breeding fish in roe could not possibly do so; some males and barren females alone *might* if very strong. The sluices are closed when the water is low, and only opened when the floods are coming down, and it appears to me that the cause which has led to the belief that fishes go up the under-sluices, is that they may be caught in them when

they are closed, and that directly they are opened the fish swarm up the river to their mouths. But the very use of these sluices is to force the water down with the greatest impetuosity in order to keep the bed of the river clear, and prevent its silting up; consequently in these narrow passages, where sand and even stones are carried down with a terrific rush, it would require fish, stronger I believe, than any existing in the Coleroon to pass up such torrents. Below the anicut a pool becomes formed, and as the river dries up in the hot season, the fish, which are constantly and fruitlessly attempting to ascend, are detained below, unable to go forwards because of the anicut, or backwards from the drying up of the river, and here they are netted by the fishermen, whilst could they have passed up they would have deposited their ova, and many of them perhaps have returned to the sea. The Lower Coleroon anicut is of rather a different construction, it is situated about 15½ miles from Combaconum where it stretches across the river, being divided into two portions by an island: the northern portion is 410 yards wide, the intermediate island 526 yards, and the southern portion 410 yards, or a total extent of 1,340 yards; its rear (or sea-face) consists of a perpendicular wall, formed in two steps, the lowest five feet the upper three feet three inches high, or a total height of eight feet three inches; whilst each is four feet wide, or a total of eight feet. It has an apron, of much the same construction as in the upper anicut, between it and the sea. Between this anicut and the ocean there are no other stationary obstructions to the ascent of fish. Above this anicut no sea-fish could be taken, neither were the fry of any sea species found there, still the contractor asserted that, when the level of the river above and below the obstruction is nearly the same, or in very high freshes, the fish were able to pass over, but he never had seen them do so, and every one else maintained such to be an impossibility. He objected to a fish pass, however, alleging that, if the fish had the means of ascending, it would decrease his profits below the anicut.

Effects of the breach in the Lower Anicut on the Sable Fishery.

21. It is here necessary to refer again to what occurred when the lower anicut breached, although this only happened in one of the arches on one branch of the river. The Sable and other species immediately swarmed up to that portion of the river above the anicut, and were subsequently taken as high as the upper anicut, seventy miles higher up the river, the consequence being that the rent of the fisheries above the lower anicut immediately increased in value, whilst the contractor below the lower anicut says he lost in like proportion. Granted that such was the case, the result has been that, owing to their having been able to breed for one season, the number of fish in the river has greatly increased since that period; this was more especially observed upon by the Chellumbrum fishermen. A fish-pass would, I believe, eventually be even remunerative, for, though it must tend at first to reduce the captures below the anicut, it will increase the fishes in the river above that structure, and thus improve them for an extent of seventy miles; as the fish would be able to breed, the numbers in the whole extent of the river would greatly increase, and the fisheries below the anicut would soon recover themselves. It is distinctly apparent that the Lower Coleroon anicut has caused the retardation of the ascent of fishes, as the fishery immediately below it, as well as two others between it and the sea, have sprung into existence since its construction. It is equally evident that the fish have decreased above that structure, and that marine

species are absent. Also, that a breach in the anicut which allowed the Sable to ascend as previously, as far as above Trichinopoly, permitted them to breed in the Coleroon, whereby the supply has been subsequently increased. Conversely it may be considered certain that should no fish-pass be constructed, the Sable at least must be entirely destroyed from the Cauvery and Coleroon rivers.

Bezwada Anicut on the Kistna, and its effects on the fresh-water Fisheries.

22. The construction of the Kistna anicut differs entirely from those on the Coleroon, which present a dead wall as an impediment to the ascent of fishes. At Bezwada the Kistna is 1,350 yards in breadth, where the anicut crosses it in the form of a broad wall, of upwards 15 feet in height, having a rough stone apron at its rear (sea-face) which gradually ascends to the level of its summit. This apron is 200 feet long, and the rough stones are kept in their places by retaining walls. On either side of the anicut are the sluices, whilst a long lock on the Bezwada side leads to an irrigation canal, which divides into two branches, one going to the Godavery at Rajahmundry, and the other to Masulipatam. The velocity of this river is very great, but it would have been imagined that, as the anicut forms a long slope from its summit to the bed of the river, there could be but a slight impediment to the ascent of the fish; but such is not the case, not a single marine species is said to have been taken above it since its construction, and there were evidently none there when I examined the river. In fact, the fish in attempting to ascend up the rough stones in the face of an impetuous current, apparently become so bruised and injured that they are unable to cross the anicut, and even could they do so their ova would probably be irretrievably lost. But these rough stones do not exist in front of the under-sluices, and as the river is frequently five feet above the level of the wall above them, it might have been thought that they could cross at that spot, but they evidently do not do so, which is due most probably to the great force of the current, for they would have to rise sixteen feet at least to clear the wall, no doubt they pass along the bed of the river until they reach the sluice, where, finding an impediment, they probably rise to surmount it, but as they rise the strong current must take them backwards downstream, and they do not reach the top of the wall which the muddy water prevents their seeing; for it is only during the freshes that this wall is covered with water. In addition to this, about the month of October the sluices are closed, and a wall of rough stone about three feet high is raised on the summit of the anicut wall, to preserve all the water which can be retained, for the November and December crops. Through this rough wall the water trickles, but it rarely overflows. This wall is kept up until March, when it is used to strengthen the apron. It appears to be about October and November that the Sable come up the river to breed, the current being previously too strong for them. The barrier over this anicut is quite impassible for all kinds of fish.

Dowlaishweram anicut and irrigation channels.

23. The Dowlaishweram anicut, about forty miles from the sea, again differs from either of the others, as it neither offers a blank wall nor a rough apron to impede the ascent of fishes, but forms a smooth curve, twenty-nine feet in length, with a descent of 8·6 feet. The anicut wall rises fifteen feet from the bed of the river and is fourteen feet six inches

broad at its summit. In the month of October its height is further augmented by two feet of boards. I have already observed that fish pass over this obstruction, or up the irrigation channels. These channels are broad, with a series of locks between their entrance into the river at Dowlaishweram, and their exit into the sea: these locks are of a good width and constantly used by boats passing up and down, so that each are opened daily about ten or twelve times.

Indiscriminate fishing and its effects.

24. The third main cause of the destruction which I would adduce is indiscriminate fishing. Here I do not allude solely to the size of the mesh of the net, but to the practice of allowing the inhabitants of a whole district to kill or take fish by any means in their power without the least let or hindrance, as is now the case in the Kistna and Godavery Districts, owing to the orders of the Revenue Board, quoted in the commencement of my second report, which has been construed into an order for giving up rents for fisheries to the general population. This I cannot help believing to be one of the main causes of the destruction going on, for the anicuts, (as in the Kistna for instance,) prevent the sea-fish from reaching their spawning grounds, whilst indiscriminate fishing destroys the fry of those species able to breed, and thus not only prevents their attaining a large size, but also decreases the number of breeding fish for future years. In an economic point of view, I would suggest that this universal freedom to net or otherwise destroy the fish is a mistake, and that, unless a change is instituted in this respect, it will be almost useless to go to the expense of making fish-passes, for they would be invariably fished, (as there are no restrictions,) and would only serve as a trap for taking the adults.

Means of capturing fish.

25. The means of destruction are numerous, those most commonly used may be divided into netting weirs, traps, baskets, tickling, noosing, hand-fishing, shooting, spearing, rods and lines, torch or night lights, poisoning rivers, damming streams, and draining off tanks. In addition to these the vermin destroy their share. Nets are employed by a number of individuals together by a few, or by one alone; the most common methods I observed were as follow:—*Drag nets:* these are peculiarly adapted for the capture of the marine species of fish, and may be used either alone, or in conjunction with stake nets. They are floated in different ways, but generally by pieces of reed or pith being attached to the upper rope of the net. In very heavy freshes these large nets cannot be used, especially if with very small meshes, as they would be too heavy. At Dowlaishweram these nets were used alone, either end being attached to boats, and in this manner a considerable space of water is enclosed and netted. At Bezwada the net is fastened by one end on shore, and the other extremity is taken round a wide sweep, and gradually drawn on to the land. At the Lower Coleroon anicut stakes were placed across a branch of the river, and the drag nets towed down between boats from below the anicut to the places where the stake nets cross the stream. *Cast nets* are the most common form employed by the fishermen in the Madras Presidency; their value is about 4 Rupees, and they are computed to last one year; the mesh is rarely at the bag portion above three-fourths of an inch in diameter. *Purse nets*, or a mongrel description of them, which are apparently a most worthless contrivance, in practice, are most destructive. They are, in fact, cast nets with the leads and ropes removed, and held either by one or two men; they are employed for netting the under-sluices, when the vents are closed, the fishermen generally commencing about four feet from the wall, and capturing whole shoals of young fish; sometimes a man is sent up the vent to drive down any which may be there: a smaller description is used by a single person. This fact, that the fish are generally taken up the vents when the sluices are closed, and a sufficiency of water exists to admit their ascent, I wish to be borne in mind, as it is one of a series of observations which have led to my contrivance of the new fish-pass. *Round nets* I have only seen in the Cauvery; they are mostly employed for fishing under bushes, and are like huge landing nets, the skeleton of which is a bent bamboo. *Pursenets* are also placed in small water courses, especially in irrigation channels, and are very destructive to the fry of fish. Another method of fishing, which I have only seen on the Malabar Coast, is said to have been copied from the Chinese, who have a similar contrivance for taking fish. They are usually situated on the banks of rivers or estuaries, and are as follow:—The net, which is square at the opening, is a species of bag, about sixteen feet square at the mouth; this is suspended by four bamboos, one being attached to each corner, and meeting together some distance above its centre, where they are fixed to a long bamboo which works on a fixed and elevated pivot; it has a counter weight on the shore side of stones, and is worked by two men who constantly let it down into the water like a bucket, where, after remaining a short time, it is pulled up again. *Weirs* are rare; as far as I have observed in the Madras Presidency, I only saw two in my tour, and those were at Gopaulpore in an estuary which opens into the sea. They are four feet high and consist of labyrinths with the entrance on the land side, or up stream, the walls of these labyrinths being formed of split rattan cages, each about four feet long, and two wide at their bases, where they are flat; whilst the bamboos are joined together above, excepting at one extremity where there is a hole. Along their face up stream, each of the cages has three openings near the base, like the entrance into a wire rat-trap, so that what enters cannot return. These cages are taken up daily at low tide, and replaced before the next high tides, whilst there are nets on their sea-faces. The keepers live alongside these weirs to look after them. The same description of trap is also employed in some tanks, and even in the form of labyrinths in the Chilka lake. *Baskets* for taking fish are of very varied forms and uses, the most common is made of rattan, and is of a simple egg shape, open below, and above, the upper opening being much smaller than the lower; this construction is jammed down in spots likely to contain fish, especially eels or murrul; when it is expected that a fish is inside, the hand is inserted through the upper opening, and the capture withdrawn. Whole rows of persons provided with these baskets sometimes fish the estuaries at Cuddalore. Another form of basket is employed for fixing in irrigating channels, when it is necessary to throw up water from below to a higher elevation. These baskets are placed where the water falls, and all the minute fish thrown up with the water, are retained in the basket. Since the construction of the anicuts another form of basket fishing has sprung up; twigs are fastened sideways into the basket so that the leaves of the boughs cover the top, this is then lowered over the wall of an anicut, and fishes jumping up in their efforts to ascend, fall into it, and cannot get

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out; these are very destructive when the freshes are coming down, and the fishes fruitlessly springing up against the walls. *Tickling* or *capturing by the hand* is also a common mode of taking some species, especially the Ophiocephalidæ, in moist situations, for, as previously observed, some of them live in holes in the banks just above the level of the water, and when discovered there, they are easily caught. Even children, when there are many immature fish in a river, canal, or pond, may be frequently seen making use of a cloth as a net to catch the fry. *Nooses* are also used in some of the hill districts of Bengal, but I am unaware whether they are employed in Madras. *Hand-fishing* I also saw practised at Gopaulpore; a quantity of mullets were jumping out of the water, and making off in all directions, alarmed by the bearers crossing a stream, who, on perceiving them, rushed back again into the water, and began clawing up with their hands the thick black mud which forms the bed of the river, and in this way took a great number, about ten a minute being the average which each man captured, whilst the fish were of moderate size. *Spearing fish* is not an uncommon method in some places: at Cuddalore a piece of blue rag is trailed by a string at the end of a boat, which is paddled slowly through the back-water. At its stern stands the spearman, holding his weapon head downwards towards the water; the head of this spear is of iron, with a long central barbed point, and two lateral curved pieces of iron, like the prongs of a pitch fork, but barbed at their extremities, and crossing each other at right angles at their bases, thus it has five barbed extremities, the handle is made of heavy wood, and a rope is attached to the centre of it, the aim of the spearsman is said to be almost unerring. In a large tank near Berhampore, covered with weeds, spearing is also resorted to, but the form of the spear differs, as it has only four barbed iron points, and these are all on a straight line. Shooting with *bows and arrows* I have only seen in Malabar: a cross bow is employed, and the bolt attached to a string, the sportsman stations himself in a tree or bush closely over-hanging the water, and in this way obtains many fine fish. Shooting with a *Chittagong bow* is also employed, it consists of a hollow tube through which the missile is blown. *Rods and lines* are used in various ways, either for sport or as a temporary or general occupation. At the mouths of large rivers, fishermen use small fish as baits for larger species in trolling, and thus often gain their livelihood. This mode of fishing is also pursued high up in the Godavery and Kistna, and I have even seen line fishing thus practised at Kurnool. A living bait, such as a frog or a rat, is often employed for siluroids and murrul, (Ophiocephalidæ). A curious instance of this was related to me by a gentleman, and I mention it again here, as illustrating both the method employed, and the destructiveness of snakes. A fisherman having provided himself with a long flexible bamboo as a fishing rod, with a line attached to its end, fixed on to the hook a bull frog as a bait. Hardly had the frog splashed into the water, when a moderate sized murrul made a dash at it, and was firmly hooked, the fish was then left as a bait, and before long a large water snake was seen swimming towards it, and soon had it in its capacious jaws. In the Kistna and Godavery Districts congealed blood is used by Mahomedans as a bait, and is said to prove very effectual. A green weed is also commonly employed for carp. In the Cauvery the boats in use for line fishing are similar to the coracles employed at Home. Rod and line fishing from the banks is also carried on as in Europe and elsewhere. *Night lines* are generally laid

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where there are large siluroids, and no crocodiles. A very destructive kind is used in the Cauvery, the line is fixed to a tree leaving a large portion of it ready to run out if required; above the water a stick cut like a fishing rod is loosely thrust into the ground, and the line is twisted round its extremity, and bobbing into the water keeps the bait in constant motion. *Torch or night lights* used as a mode of decoy are also employed in various ways in different places. Large torches are carried in boats, and the fishes attracted by them speared, or they are floated down and the place netted, or, as I see at Cuttack, a boat with very low sides is paddled about at night time, with a light in it, and the fish jump into it and are captured. In the Travancore Hills the Reverend H. Baker informs me that hundreds on hundreds of large carp are killed by striking them at night with knives as they rise to a torch held close to the surface of the water. *Poisoning rivers or streams* is carried out in Malabar, and probably almost everywhere by means of nux vomica, cocculus indicus, croton-oil seeds, and other deleterious substances, the captures thus made are dried and sent to distant markets for disposal. Hooker, in his "Himalayan Journal," remarks, on entering Sikkim, that "the chaulmooga, whose juice is used to intoxicate fish," was very common, showing that this practice is also carried on in Bengal; whilst Lieutenant Tickle in the "Journal of the Asiatic Society," No. IX., Part 2, page 705, observes that the coles poison water to obtain the fish. Major Leech also remarks in the "Journal of the Asiatic Society," No. XIV., Part 1, page 339, 1843, upon the poisoning of fish in Candahar; whilst in Northern Cachar, Lieut. Stewart, in the "Journal of the Asiatic Society," No. VII., 1855, page 643, states "another "poison called deo-bi is used by the Kookies to kill fish, and has an intoxicating effect "upon them, forcing them to the surface when it is thrown into the water. The "Kookies also spear fish, but have not much idea of catching them by hook or "net." The custom of damming up small streams is very common, the water being laded out, and the fish captured for food, and in this manner the fry are being continually destroyed after the rains have fallen. Tanks, I was also informed at Cuddalore, are occasionally drained off to enable persons to take their finny inhabitants with facility.

Vermin which destroy adult fish.

26. Besides the foregoing means of destruction I must allude to the *vermin;* these are most numerous, and I shall only mention those which destroy the adult fish. I would first allude to crocodiles, although I did not observe any during my tour in the Madras rivers, I saw the remains of one at Bezwada taken below the anicut. Here, (Cuttack,) however, I see them luxuriating on the fish below the anicut, no rewards are given for their destruction, and, with the exception of a few killed by Europeans either going out shooting or returning home, they do not appear to possess any enemies. Last year two were below the Cuttack anicut, now nine large ones and numerous little ones. Some are the long-nosed fish-eaters, the others the man-eaters, but both revel on fish. The existence of nine monsters from ten to sixteen feet in length daily feeding themselves at one spot, must be most injurious to the fishery. If crocodiles find they can feed themselves without molestation below these anicuts, which impede the passage of fish, they will certainly find themselves some day in equally happy quarters in the Madras Presidency, and I, therefore, consider that the remedy should be ready in anticipation of such

an event, not that I deny they are there now, I only observe that I did not perceive them, perhaps their absence was due to the freshes coming down, when they usually forsake the beds of rivers for contiguous tanks. *Otters* also are not uncommon in some parts of India, and are very destructive; for, although small, they merely eat the choicest portions of the fish they take, so that it requires several large ones to afford them a single meal. Hooker observes, that in the Sunderbunds he "saw canoes with fishermen who use tame otters in fishing," (Himalayam Journal, vol. ii, p. 355), showing that the Natives are well aware of the destructive powers of these animals, and turn them to account to their own advantage. *Snakes* appear to be most destructive at the Upper Coleroon anicut; as the freshes began to subside, and only a little water was going over the apron, then they came to light, watching for the fish which were attempting, but in vain, to ascend. I should imagine I never saw less than twenty large snakes every evening at the sea-face of these anicuts, and I understand there is generally one in every little sluice where it awaits its prey. Fishing-hawks, gulls, and terns abound at the Cuttack anicut, whilst herons of various kinds and king-fishers are spread over the country.

The fresh-water fishermen.

27. The fishermen, or the legitimate capturers of fish, for the purpose of obtaining food for the general population, differ considerably in various parts of the country; they may be divided into the regular and the occasional fishermen. It will be unnecessary to enter on all their sub-divisions which are infinite. The fresh-water fishermen are those who employ themselves in estuaries, or at places within the influences of the tides, and in pieces of fresh-water, but do not go into the sea beyond their depth, and the inland fishermen strictly so speaking. The subject of their caste I will not enter upon, as they are low in the scale, and like all low caste people intolerant, and always fearing or pretending to fear doing something to infringe their caste rules. Owing to their occupation, they are generally inveterate drunkards, and dissipate all their earnings in drink. When one of them, as at Combaconum, farms a fishery, he obtains all the good fishermen, and renders it useless for any one else, of another caste or religion, to bid against him, whilst teaching the work to new hands, or importing fresh ones, would be an expensive process. The fishermen appear to be the owners of the nets employed, and probably make them themselves; no doubt, in Indian fashion, the contractor often advances the money for purchasing the cotton, from which they spin the thread for netting, and thus keeps them in his debt. It seems most usual for the farming of the fisheries to get into the hands of one family, and so continue for generations. It is also curious why, (unless the circumstances of the fishermen have improved of late years,) they will not act now as formerly as palanquin bearers, in consequence of which the number of bearers has greatly decreased, and in Combaconum, for instance, only two sets are available for travellers; but the reason generally given is, that since they have cultivated their crops they find them so much more remunerative, that they do not care to act as bearers. It is here necessary to allude to the mode in which they fish in gangs, for upon it depends, in some measure, the rent which is obtained, for when it is to the interest of all parties to conceal the amount of the captures, it is unlikely an accurate estimate could be arrived at without the greatest difficulty. In a tank near Berhampore several persons club together to farm it, and they all

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fish in it, and divide the proceeds. In most places there is a headman amongst the fishermen who decides all disputes, and they agree amongst themselves as to the disposal of the fish, and their proportionate shares. At Dowlaishweram, where the fishing is free to all, they have divided themselves into gangs, each with a headman, whose decision appears to be supreme. In the south of Madras a different and apparently a better system prevails: one, who is the richest of the class, hires out the fishery from Government, and gives a certain proportion of the captures to those who take them, the same as those who farm land give only a share of the proceeds of the soil to the laborers, but no money. Thus, at Chellumbrum, the fishermen stated (but they always exaggerate) that 100 of them are constantly employed, receiving half the captures as their pay, and that when the fish are very numerous the assistance of the villagers is called in, who receive the same rate of remuneration; this gives them an interest both in taking all they can, and in preserving the fish from depredators. At Combaconum the contractor who farms the fishery within two miles below the Lower Coleroon anicut, has also two or three other fishing stations near. He is the chief man of the fisherman caste, and the manager, or part owner directly or indirectly, of the small Ammon Covil Pagoda in Combaconum. Two-thirds of the proceeds of the fishery go to this contractor, who asserts that with the three fisheries, when they pay, he purchases jewels for the Pagoda, and when he is in arrears for his rent, he pawns these jewels to pay it. The third, which goes to the fishermen, does not appear either to be paid in fish or in money, but they resort to this Pagoda where they sleep at night-time, eating and indulging freely in stimulating liquors, &c.

Hindu ceremonies.

28. Certain Hindu ceremonies appear to be yearly or oftener gone through with respect to the fisheries; some of these I purpose detailing. Not far from the bungalow, near the Lower Coleroon anicut, stands a colossal elephant, about thirty-six feet high, fully caparisoned, and with several large figures around it. Beyond this again, and covered by the sacred peepul tree, are two small temples at right angles to one another, in one of which a sacrificial light is constantly, if not invariably burning before the figure of an idol. Inside this little temple I saw three sacrificial knives, one with a handle to the left of the figure, and the snout of Saw fish, on which the god is said to ride. Passing near this place late one evening, I heard a tinkling of bells, and going quietly up, I perceived that they were about to sacrifice a black goat. A native was vainly trying to induce it to proceed towards a large solid block of stone, force was then resorted to, and the victim's head placed over the block, when down fell the executioner's sickle-shaped sword. The blood of the sacrifice was offered to the idol; the executioner received the head; the priest 4 Annas, and the worshippers, whom I saw were fishermen, bore away the body. On questioning them, subsequently, as to the meaning of what I had witnessed, they informed me that every fortnight the fish contractor sacrificed a black goat for the purpose of propitiating the idol, and getting him to let the freshes come down to increase his captures of fish. They eat the body of the victim. In the Godavery, at Cocanada, there is a yearly ceremony, when the fishermen go in a body to the river's banks, and there boil milk and rice together; they then worship, and end by a feast off some goats killed for the occasion.

Observations on the breeding of Indian fishes, and arguments against fence months.

29. I now come to the various objections which have been raised against doing anything; the propositions which have been advanced by those who admit the present state of things; with my own views on the subject, including the question as to whether fence months, or protection from capture; during the breeding months of the year, is advisable or not. But a few preliminary remarks on the breeding of fish will be necessary. The ova of Indian fishes, as a rule, are very minute, rendering the subject of the cultivation of fish a very questionable proceeding, for any one who has attempted the artificial propagation of such is aware of the difficulties which attend it. Now, although I consider that the preservation of the fry, and full facilities for the breeding of the adult fish, are what is required, I do not imagine that "simply depositing "at intervals along the coast, in rivers, lakes, &c., sunken brushwood as shelter for "the fish to spawn in," as suggested by Colonel Hayley, would be of the slightest utility. The great breeding season is during the monsoon, and the brushwood would have to be put down before the freshes came, and any one acquainted with Indian rivers must at once understand how it would all be swept away before the face of the first descending torrent. The marine species appear to deposit their eggs in the sand, and the fresh-water species mostly in the grass at the sides of rivers, and up small water-courses. I will here give the number of eggs which I personally found to exist in several species of Indian fishes. In one Walking fish, *Ophiocephalus punctatus*, there were 4,700; in a Siluroid, *Callichrous canio*, 47,444; amongst the Carps, *Barbus chrysopoma*, 410,745, this is the largest number of eggs I have observed in any non-migratory species, and I have sometimes doubted whether it is not also occasionally migratory at least when it resides in rivers. *Barbus stigma*, C. and V. 1,850 mature, and many immature ones. *Crossocheilus reba*, 41,500; in a Loach, 2,500; and in a Sable, *Clupea palasah*, 1,023,645. The less migratory a fish is, the fewer are its eggs; but it appears to breed oftener in the year, not being so much affected by the freshes; whilst of the migratory varieties, the marine have many more ova than the fresh-water, especially when the latter breed more than once in the year. The foregoing few examples show how bountifully nature has provided for the diffusion of fish, for were it not for these numerous offsprings, the race would soon be exterminated. The marine species which ascend rivers have the most natural enemies, being destroyed in the sea, and followed into the rivers, where their eggs, deposited in the sand during the freshes, are liable to be washed away, or left high and dry when the sun would destroy their vitality; it is very evident they would require a vast number of ova to keep up the breed, but nature apparently never took measures to obviate such obstructions as anicuts without passes, erected below the breeding grounds; fruitless to deposit their ova below, and unable to do so above, their eventual extermination, unless some change occurs, must be self-evident. The parents are being destroyed, whilst the offspring remain unborn. *Fence months* have been proposed, but after my late extended inspection of the fresh-water fisheries of this Presidency, I cannot advocate them for the following reasons:—The Sable fish is the most valuable of those in our Madras rivers, and it is only during the breeding season that it is good for the table, the same as the Mackerel at Home. Prior to the breeding period it is absent, and after it has

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deposited its ova it becomes flabby and scarcely fit for food, and then returns to the sea. Now, if taking it were prohibited during the breeding season, the entire fishery would be destroyed. Again, the breeding months of the Sable evidently varies in different rivers—in the Cauvery, are then from June to September; in the Godavery, from July till the middle of October; and in the Kistna, from October till December; thus, were general fence months instituted for the protection of the Sable, they would have to be from June to December, or half the year, whilst nothing would be gained, because the fry could be taken in February or March, whilst these also it will be necessary to protect for future years' supply. No doubt the season of the monsoons, which is coincident with the freshes, is the breeding period with fishes; but with regard to those varieties which pass their time almost entirely in ponds, I have in numerous dissections satisfied myself that they also breed at other seasons of the year. Different plans must, therefore, I consider, be devised for the preservation of the Indian fresh-water fishes. But a certain amount of protection will be necessary when the young fry pass down to the sea along the irrigation channels, and for the present I would strongly advise all fishing being prohibited in these channels from October to February, inclusive; and I also strongly urge a general rule being passed, prohibiting all fishing, except with rods and lines, within 100 yards of any anicut, weir, dam, locks, or masonry works, extending across streams or canals of fresh-water.

Objections to fish passes answered.

30. Many observations respecting the use of this inquiry, and the manner of carrying out remedial measures, have been made in this country; some it is hardly worthwhile to advert to, others I will make a few remarks upon: "It is not fishes but freshes which are required," says one public writer, showing more facetiousness in his observation, than knowledge of a subject on which he is, in his own opinion, enlightening his neighbours, for increased freshes bring increased fishes, and the very fact of receiving the former must necessitate the presence of the latter in an increased number, to the benefit of the general population, by affording "additional means of food. The Sub-Collector of Arcot* remarks respecting fish passes, "the chief point for consider-

* Proceedings of Government, May 27, 1868.

"ation, however, is, whether the water that would be required for running over them "is not too valuable to be expended in that way. It is simply a matter of what a "gallon of water at the anicut is worth, and whether it is better to use it in irri-"gating the land, or in flushing these fish ladders, for the sake of the fish to pass." The whole of the views here advanced are so entirely erroneous, shewing such ignorance of the construction of the present form of fish pass, and the manner of using it, as well as of the habits of the fish which ascend them, that I think it advisable to shew their fallacy, because I have heard others, who have not given the question a thought, advance the same opinion. First, valuable water could not be expended in going down fish passes, because all at present known are raised to a level with the summit of the anicut, and it is only during the freshes, or when surplus water is going over that structure, that, instead of its all running entirely to waste, some of it is guided down a fish pass. Also, as fish passes are not flushed, the water could not be thus wasted; as regards the ascent of fish, it is when water is coming down in

a fresh, or in a suddenly augmented amount from any cause, that they swarm up the rivers; those who have observed on the effect of the under-sluices being opened, would at once perceive the correctness of this remark. Lieut. Vibart, R. E.,* says, "It has been suggested to me that "the Government should institute an establishment to catch the fish below the "anicut, and place them in the river above if it is found that the supply of fish is "really largely diminished by the fishery below the anicut." This plan was favored by the Board of Revenue. When at the Upper Coleroon anicut I personally tried this experiment, to ascertain how many fish I could catch in a certain time, and transfer from below to above the anicut; these, it must be remarked, were not of large species, whilst they came close up to the anicut wall, and a bridge spans the construction. After three hours' fishing I took about 1,319, which I transferred, as caught, over the wall, and about 200 were suffocated; these were young fish, and it would be very different with breeding ones. First, at the Kistna there is no bridge across the anicut, and the fishing must be carried on for at least 250 yards below that structure, therefore the fish would have to be captured, landed, and carried up above the anicut. Doubtless some would survive the process if a sufficient number were taken, but the ova would be injured and probably almost irretrievably so. For anything to succeed it must be a natural pass, up which the fish struggles with more or less difficulty. Besides this, it may be taken for granted, that a Sable fish once captured by a native fisherman below the anicut, will not find its way back again into the river above that structure, unless under strict supervision.

* Letter dated 5th November 1867. Proceedings of Government, May 27, 1868.

European fish passes require slight changes to be adapted to Madras rivers—one in the Lower Coleroon, another in the Kistna, advised at once.

31. Fish passes have only of late years come into use in Europe, where the fish were gradually decreasing in numbers, and are for the purpose of allowing the breeding species to ascend over obstacles to their spawning beds; and under slightly altered circumstances we might attain the same object in India, where anicuts represent the British weirs, detaining the fish, and permitting their destruction. A considerable difference, however, is that the freshes which come down in Indian rivers are very impetuous in their force, and therefore the passes which might succeed in Europe would not, if unchanged, be suitable for the rivers of the Madras Presidency. The desiderata is, that fish should be able to ascend a given height, but never have above one or one and a half feet of ascent, or step to pass up at one time, and at the top of each of these steps have a comparatively quiet bason of water to enable them to rest after the ascent of one step, before attempting the next: even in Europe I see one foot in ten is advocated, but the current should not be too strong. At the foot of the pass the water should be deep to give them a good run, and with a smooth bottom to prevent impediments, and preclude their being injured; and for the same reason it is necessary that the floor of the fish pass should be as even as possible. I will now observe upon the different fish passes, what is required in each, and the manner in which they can be constructed. The best materials, and whether they would, or would not interfere with the anicut works, I leave for the consideration of the Engineer Officers. The Inspector General of Irrigation Works, in his letter, dated 23rd June 1868, observes, "When it is shewn that any relief is needed, it can "easily be given, as, on English rivers, the best form of Salmon ladder may be obtain-"ed for our instruction." I must premise that as I found sea-fish above the Godavery anicut, I do not propose adverting to that structure, which leaves three places in which it will be necessary to erect fish passes—the Upper and Lower Coleroon anicuts, and the Kistna at Bezwada. I would suggest that, should my views be coincided in, it would be advisable, first, to erect fish passes on the Lower Coleroon and Kistna anicuts only, in order to test their working, because the Upper Coleroon anicut, although it certainly impedes the ascent of the fish, is only across one branch of the river, and fish may consequently ascend by the Cauvery on the other side of the island of Seringham. When a fish pass is erected at the Upper Coleroon anicut, it should be between the 24th and 27th arches from the Cauvery side, for there the river is deepest, and flows longest over the dam. This portion includes two sets of under-sluices, one of three, the other of two arches. If another pass be erected on the north, or small branch of this anicut, it should be placed on the fifth arch from the island end; but it would be highly advisable to see how those on the Lower Coleroon and Kistna anicuts, (which are indispensable,) act before commencing the others; and I would urge that both of these should be completed before the next south-west monsoon.

Coleroon Anicut, and where the proper place exists for erecting a European fish pass, and plan of doing it.

32. The Lower Coleroon anicut, as already observed, spans two branches of the river, and is separated by an island; one arch in one branch breached, the Sable freely ascended the river. This, I consider, conclusively shews that only one pass is needed at first, and if the construction of a European fish pass is preferred, it should be as follows:—It should be erected where the bed of the river is deepest, but never in a side channel. The most appropriate situation in this river is either on the south side of the north branch, or on the north side of the south branch. As it will only be used by the fish during the freshes, the lowest three feet, three inches of the pass, as in the accompanying plan,* (No. 1,) might be made of a single slope, with a three feet rise; this would only leave about five feet in height to be ascended, or five steps; between each step should be a basin nine feet long, whilst the thickness of the wall of the step I calculate at one foot at its base, or a general total in length of the pass of fifty feet, and three feet for the lowest rise, about fifty-three feet in its entire length; whilst the width of the fish pass should be twelve feet. The anicut apron of cut stone is twenty-four feet, and beyond that are twenty-four feet more of rough stones; thus the length of the pass would not be above three feet beyond the end of the apron. Each of the one foot walls, or steps, must have an additional foot in height, extending one-third of the distance across its face, and these must be on alternate ends of each successive step. The basins between these steps must be gradually deepened on the anicut end of each, where each should be three feet deep, becoming shallower anteriorly, as seen in the side view of the plan. The sides of the pass should have lateral walls two feet in height to retain the water in it. Having explained my views, and the reasons which have led to my adopt

*Sent by book post.

ing them, to Mr. Faulkner, at Cuttack, he has been good enough to have plans drawn out from my rough sketches and models, and these I append to my report.

Kistna Anicut, and where to place a fish pass.

33. The Kistna river, as already observed, has a rough stone apron leading up its face, and about 1,000 yards from the Bezwada side is the best place in which to place a fish pass; or should any engineering difficulty or danger exist, then a space of eighteen feet in width is present between the sluices and the lateral retaining wall of the apron, where it would doubtless act, though not so efficiently. The rush of the water in this river is more impetuous than in the Cauvery, and though the general construction of a fish pass should be the same, it would require modifications: thus, its width should be eighteen feet, and the basins thirteen feet long instead of nine, and four feet deep each instead of three. This pass would have to be carried over the rough stone wall which was erected in November, or if insuperable difficulties would thus arise, I would only suggest the upper basin be thirty-six feet long, with a lock, one door of which should be placed across its face up-stream, and the other door cutting off the posterior twelve feet of its length. The lower doors should be only closed twice a day, when the upper ones should be opened; but I almost think it would prove a regular trap for taking fish, and great difficulties would exist in opening and closing the upper shutters. The Engineer Officer suggested the erection of a temporary pass, to be yearly renewed, up the face of the anicut, and formed of rough stone walls, covered with mats to retain water in it, as mentioned in my second report. I cannot advocate its adoption.

Proposed new form of fish pass owing to difficulties and expense in constructing them in the European form.

34. Without presuming to offer any opinion upon engineering subjects, I may mention that Officers of the Public Works Department appear to consider any permanent structure erected on an anicut, which impedes in the slightest degree the free rush of the water, may tend to weaken contiguous parts by the formation of eddies. On the other hand, it has yet to be ascertained by actual experiment the length of the basins which will be found efficient for fish passes in such rapid currents as exist in Indian rivers. So soon as I found that fish passes would be necessary, I commenced investigations to try and discover some new mode of construction, suitable for Indian anicuts, which should fulfil three intentions—a free passage for breeding fish up-stream in the floods; a free passage down-stream for young fish in the dry season; and the whole construction to be of less expense than the present form of fish pass. Due to my investigations and travels having been extended to so many fishing stations, and having watched how the fish try to ascend from the sea or descend from the rivers, I think I can offer the required desiderata for the consideration of Government. I believe the operation of the pass I have to propose will be superior to the European fish pass, and though, so far as I know, it has never been practically tried, I will fully give reasons why it must succeed, even though doing so causes my recapitulating observations already given. The *principle* I propose to go upon is that of a lock, for I found the fry of the Sable descending the irrigation channels through the locks from Dowlaishweram to Cocanada to obtain an exit to the sea. I have also observed that fishes wishing to ascend the river go even up the vents of the

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under-sluices when the shutters are closed, which prevents the current being too strong. In anicuts there is no difference worth mentioning between the levels of the bed of the river above and below those structures, so the desiderata is simply to enable fish, if possible, to continue their course up or down-stream unchecked. The rush of the water over the European form of fish passes may, as I have observed, prove deleterious to the anicut, too strong for the fish, whilst the pass becomes inoperative in the dry season for the descent of the fry, besides expensive in its construction.

New fish pass in the form of a simple lock. The time, and how to use it.

35. The new fish pass I propose is as follows:—It should be constructed across two vents, the outer piers being extended about twenty-four feet down-stream if lock gates are used, and only fifteen feet if a door is slipped in at its extremity. I will first remark upon the simple lock principle erected on the sea-face of the apron, and having, at its lower end, a pair of shutters exactly identical with those used in canal locks, and which when open are flush with the masonry work by being let into the extended portion of the piers, and having a strong iron bar across the floor of the vents to prevent their being carried outwards down-stream. I see an objection to this, that the pressure of the water in the lock may throw down the piers near the hinges of the lock shutters, unless the piers are very strong at that place, whilst if they are, this enlarged part may check the free current of water from the contiguous vent. The down-stream shutters, for easy reference, I term the *lock shutters* in contradistinction to the upper or *anicut shutters*. The upper edge of these lock shutters must be on a level with the upper edge of the anicut shutters, consequently if the anicut shutters are opened the water could not descend further than the closed lock shutters. The action of this lock would then be that, if the anicut shutters were open, fish could descend into the lock—a most important gain, as the fry want to descend at periods when no water is going over the anicut wall. After a few hours the anicut shutters could be closed, and then on opening the lock shutters the water from the lock and the fish would be carried down into the river below, and would thus have passed through the anicut. On the same principle, in moderate freshes, the lower or lock shutters are mostly to be kept open, fish will then ascend up to the closed anicut shutters, then on closing the lock shutters and raising the anicut ones, there will be an entrance into the river above the anicut. This plan cannot be carried out to any extent: thus in the Bezwada anicut, where the rise is nearly sixteen feet, double locks would be required of eight feet high each; not only the piers would have to be extended to a great extent, but I fear such would interfere with the construction of the under-sluices. I would point out that a single sixteen feet high shutter placed across the lower end of the lock, and having its interior one and a half feet in the form of a trap-door moveable on hinges, (as I shall explain in the next paragraph,) will succeed; whilst the whole of the large shutters may be wound up by Mr. Faulkner's contrivance, (Plan No. ,) so as to be completely out of the way during heavy freshes. Whichever plan were carried out would enable the Engineer Officer to have a free exit for the water from the under-sluices whenever he wished to scour the bed of the river, as explained in my first report, for either the single shutter may be drawn up, or the lock gates can be thrown open so long as may be considered necessary. I now come to the time

when it will be necessary to keep open the lock or the anicut shutters, and how to work them. In very heavy freshes the lock shutters would have to be left fully open, or the single lower shutters drawn up, for at those periods no fishing can go on, but as the force of the current abates, and fishing commences, the following plan should be carried out. I place it in the form of a table for easy explanation; one shutterman will be required to work it under the orders of the Monegar in charge:—

Season.	Lock or new shutters.				Anicut or old shutters.			
	Open.	Closed.	Open.	Closed.	Open.	Closed.	Open.	Closed.
15th June to 15th December	8 A. M. to 4 P. M.	4 P. M. to 6 P. M.	6 P. M. to 6 A. M.	6 A. M. to 8 A. M.	6 A. M. to 8 A. M.	8 A. M. to 4 P. M.	4 P. M. to 6 P. M.	6 P. M. to 6 A. M.
15th December to 15th June	6 A. M. to 8 A. M.	8 A. M. to 4 P. M.	4 P. M. to 6 P. M.	6 P. M. to 6 A. M.	8 A. M. to 4 P. M.	4 P. M. to 6 P. M.	6 P. M. to 6 A. M.	6 A. M. to 8 A. M.

I have here given the seasons, thus dividing the year into halves; but if no rains occur between March and June, this pass need not be worked at all. Another great advantage is that if such a season could occur that the little water required for the lock became an object, it need not be opened, or only once a-day, or even once a-week. From this lock a simple moderately smooth channel, as wide as its breadth, should be carried across the rough stone apron to the river below, or thus the fry from the lock would be washed down, whilst such a smooth place would be most frequented by ascending fish. There is one subject to be guarded against in this fish-pass, the same as in all other forms, which is that it may be poached; but if Government do not permit fishing within one hundred yards of the masonry work of any anicut as I propose, such poaching could only be carried on with the connivance of the Native who is in charge of the anicut, and the shutterman who works the shutters. To obviate this, in some degree, I would suggest as follows:— In the stone-work above the two vents, or up-stream, a dozen tenter hooks driven into the wall would so destroy any nets that I doubt second attempts being tried. I would also suggest driving a few of the same description of hooks into the stone-wall of the locks and vents. The lock shutters will require a trap-door to let out some of the water before the shutters can be moved, as is done in locks; or, what would be better, the lowest one and a half feet of the shutter should be in the form of a movable trap-door, which can be elevated by chains from the inside if any contrivance can be made to enable the upper portion of the gates to resist the pressure of the water in the lock, and this brings me to what, I think, will prove the cheapest and best form, though the principle is the same, only the lock doors do not open, but are made in one piece, slipping down grooves into their position.

Immovable lock gate proposed, with lowers one and a half feet in the form of a trap-door which can be raised as required.

36. I have, in the last paragraph, given my plan of erecting a fish-pass across two vents of the under-sluices of an anicut in the form of a lock, which, if it

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can be carried out by the Engineer Officer, will be as efficacious as another form which I have now to propose on the identical principle. The lock should be formed in the same way as proposed in the last paragraph, only the piers need only be extended fourteen feet down stream; whilst, instead of a gate to open at the end of the lock, there need only be one door slipping down into a frame or grooves, thus closing the end of the lock; but these grooves should only permit it to descend to within one and a half feet of the floor of the lock; consequently for one and a half feet there will be a vacant space between the floor of the lock and the lower edge of the lock gate. This space I propose filling up by means of a movable door, attached by hinges to the upper door, but which will only open inwards, having a strong iron bar fixed across the floor of the lock, thus totally precluding its being carried outwards by a descending current of water, whilst it must be shod with iron sufficiently heavy to prevent its floating. Thus we have a movable trap-door which can be opened inside the lock for the lowest one and a half feet below the fixed lock gate, I propose iron chains being attached to the inside of this movable door, so that the shutterman can elevate it as required; whilst a narrow board should be fixed along the outer side of the lock gate for the cooly to walk on when thus engaged. This movable door obviates the trouble and expense of lifting or opening the whole of the lock gates. I have proposed these gates being made in one piece, and slipping down in grooves, so that they can be raised or removed if necessary, as will be the case during heavy freshes, whilst the time of opening the movable door should be the same as proposed in the last paragraph for lock gates. I have seen an ingenious apparatus at the Cuttack works, which would act efficiently, and do well with slight alterations. The whole gate goes down in a groove and works by a screw, whilst, to enable it to run up easily, there are wooden wheels in the frame (see plan) for it to run easily upon; thus the whole of the gate can be raised by one cooly in two hours as high as the top of the piers and so be out of the way of freshes. This apparatus and its necessity, however, the Engineer Officers will be best able to give an opinion upon; only it will be necessary to have the movable door, as I have detailed at its lowest one and a half feet, for daily use. The machinery would enable the whole construction to be easily raised, for it could be wound up during heavy freshes, being lowered down again into its place as they begin to subside.

Observations on the farming of fresh-water fisheries.

37. I now come to the question of farming fisheries before entering, upon which I beg to observe that excellent reasons may exist for not letting the fisheries, but with which I am unacquainted. My remarks have solely reference to the economic question, and how best to increase the food productiveness of the various pieces of fresh-water in this Presidency, and observations upon certain questions which have been raised. All European Governments, I believe, let out the fresh-water fisheries when they remain in their own hands, as do also private individuals possessing such property. Indian Native Governments are also reputed to have made a revenue from this source. In Mr. Nelson's report to the Madras Government on the Madura country (1868) is the following:— "The "repairs of tanks, or at all events the more important repairs, seem to have been

"executed by the Government, and to have been paid for out of the proceeds of "the fishery of the tanks when drying up. "A letter* dated 1713, states that "the "fishing of a single tank produced occasionally as much as 2,000 ecus (crowns), "and that sums so realised were invariably applied to the execution of repairs. "The writer is speaking of the Marava country, but no doubt the system was the "same in Madura." Lieutenant Vibart, R. E., observes,† at Bezwada, "I think "Government should rent out the fish-"eries annually, or put a stop to them altogether, should it after further observation "be deemed necessary." I entirely agree with the first proposition, and will first examine the reasons which have been adduced against farming out fresh-water fisheries. The Revenue Board in their Circular Orders on November 27th, 1848, observed, "Collectors are requested to let out all fresh-water fisheries," but on certain Collectors demurring, the Board in their subsequent reading of these orders entirely changed their action. In Arcot the renting system was not to be pressed: in Guntoor it was not considered advisable to revive the practice of renting tank and channel fisheries: at Kurnool the fisheries were not to be let, the same with regard to Bellary. In the Kistna Collectorate, the Collector observed he had been offered Rupees 942 yearly for some fisheries not heretofore let, but a contractor had come forward who wished to farm them out and sublet them to the fishermen. The Board ruled that none of these fisheries were to be let, as reimposing the Moturpha tax, and evidently fearing the contractor might grind down the fishermen by excessive sub-rents. I first come to the effect of these orders on the fisheries; secondly, provided these fishing grounds were let to contractors, its bearing on the fishermen; and, lastly, my proposition which has solely reference to the fishes themselves to prevent their indiscriminate destruction. The fisheries in the Kistna and Godavery Districts, above anicuts, may be considered as nearly exhausted. Magnificent pieces of water do not contain sufficient fish for the few inhabitants along their banks, and none are available for export to distant markets except in the Godavery District. As I have already remarked, any one may fish, in whatever way best suits his individual views, and ignorant Natives, who never look beyond to-day's wants, take what they are able, irrespective of size, and fish where they please, no matter how. As the larger fish are cleared off, smaller meshed nets are employed, until at last the fry, as a rule, become the sized fish which are taken. What appears required, is a head or responsible man, whose interest it is, (as to the south of Madras, and in Ganjam to the north,) to prevent constant and indiscriminate fishing. It would be exceedingly expensive if a staff of keepers had to be kept for the purpose; and it is more than doubtful whether they would be of the slightest practical use. If the fisheries are let, the contractor becomes their keeper, his people the watchers, self-interest would never allow his permitting every little boy to have and use a net, wherewith he is destroying the small fish, and frightening away the larger ones. I do not propose this theoretically; I have seen it practically in the Coleroon and in the Ganjam District. I have heard it asserted that it would be hard on the poorer classes not to permit them to capture these little fish; it seems to be thought that fish come of themselves, and, like the birds of the air, should be sport to all. But how have such pseudo-philanthropic views answered in practice? By decreasing the fish and consequently diminishing the supply of food in whole districts. Thus, when famine years come round, the water is found depopulated, the little fish have been eaten by the poorer classes, and consequently larger ones are sought for in vain. I deny the philanthropy of such proceedings; but, on the contrary, hold such views, when carried out in practice, will eventually be found amongst the most cruel which could be devised. Who knows how many may perish in hard times for want of fish, which will be absent owing to indiscriminate fishing and destruction of the fry having been thoughtlessly permitted. I do not deny the increase of *quantity* captured at first by such provisos; but I maintain that this is done at a permanent loss to the fisheries, decreasing future years supply, and, if continued, annihilating the fisheries. Water should be as valuable as land for producing food, and indiscriminate farming is not permitted; were it, any farmer could easily foretell the result; how the strong would farm the richest soils, and when exhausted move on somewhere else. Doubtless, if the fisheries are farmed out, the price of fish will be temporarily raised but such will only be the case for the fish two or three years; as the fish increase in quantity their value must diminish, whilst the temporary good of the few should give way to that of the many.

* M.S.S. Jesuit's Administration Report, 1713.

† Proceedings of Madras Government, May 27th, 1868.

Effects of letting fisheries on the fishermen as distinct from the contractor, and proposal respecting annually farming them out.

38. It appears to be imagined that farming out the fisheries would be hard upon the fishermen; that the contractor would sub-rent them on hard terms to the men who have to capture the fish. But how is it in reality? No contractor could act in an extortionate manner to the fishermen in the Kistna and Godavery Districts, because, owing to the price of labor being there very high, they could easily obtain other employment, especially as boatmen, consequently they could exact their own terms from the contractor, and either work as daily laborers under him, receiving their proportion of the captures, or else they might farm the fisheries themselves direct from Government. Annual public auctions of all the fisheries should, I consider, be the rule until their value increases to such an extent that Natives would find it profitable to erect salting places. Such a time it will apparently take a long period to reach in this Presidency, so it may be left to future discussion. Yearly auctions would entirely prevent excessive exactions, because the fishermen might, if they thought it worth their while, save money and become the contractors themselves. This might be answered by the correct assertion that they are improvident and lazy as a class; but, perhaps, giving them an object to work for, would make them more provident, for it is a general remark that they now only work exactly for what they require, and do nothing till want makes them re-exert themselves. It is only these fishermen who can take the fish, and if the contractor cannot obtain their services he cannot capture them himself, or by the aid of common coolies. I would propose, that, unless some special reason exists to the contrary, (as the existence of fishing weirs,) that all pieces of water, if of sufficient size for fishing, and which are not navigated, as a rule, by sea-going vessels, and all rivers above the points where such navigation ceases, be farmed out annually by auction to the highest bidder. In five years the annual value of the fisheries would be ascertained, and, as the price of food goes on

augmenting, they should not be let, except under peculiar circumstances, below the average of five years' auction.

If no lessees come forward propose to give Fisheries a rest.

39. The demands for laborers are so much in excess of the supply in the Kistna and Godavery Districts, especially near the anicuts, that 6 Annas a-day is not an uncommon rate of hire for a cooly. As a consequence the people have become rather independent respecting work, and I am informed, if Government were to demand rents for the fisheries, the fishermen would possibly, if not probably, decline to pay anything, and thus no tenants would be forthcoming. I should personally doubt this, if the Tahsildars were to clearly and distinctly inform the fishermen that if fisheries were unlet, fishing (except angling) would be prohibited; still individuals living on the spot must be better acquainted with the habits and ideas of the Telugu people than a stranger can be. However, should they decline to pay rent, I hardly think it affects the question in the least degree, for they would not be thrown out of employ; they could turn to other sources of work for their living, whilst the unlet fisheries would obtain an entire rest, except from angling; the consequence would be that the fish must increase, the depopulated rivers become stocked, and after one or two seasons lessees would be doubtless forthcoming. The rents first obtained would of course be small, but when it becomes evident that they are to be as regularly levied as those from the land, they must rise to their market value. Thus a staff of keepers would be raised without any expense, whose interest it would be to look after the fisheries, and with an agreement respecting the size of the mesh employed, the preservation of the fry, and also the construction of a fish-pass at the Bezwada anicut, the yearly value of the fisheries must improve. The non-renting system has had six years' trial in the Kistna and Godavery Districts, and evidently with the most disastrous result to the fisheries, farming them out and placing fish-passes might now have their chance for an equal number of years, and I venture to suggest that subsequently a comparison may be instituted. There is also another aspect of the question, that, supposing fish-passes are expensive, how ought they to be paid for? I would suggest the fish-eating population, who obtain the benefit, are the proper persons to pay for it, and the easiest way to do this would be by farming out the fisheries, which I am firmly persuaded will, after a few years, decrease the price of the fish in the market by producing an increased supply in the rivers and tanks.

Size of the mesh of nets employed and proposition.

40. I now come to the size of the mesh of the nets employed by fishermen, and whether anything could not be done respecting it to improve the state of the fisheries. That the destruction of fish is excessive is admitted on all sides, but the Natives assert that they like the little wee fishes the best. The only way to stop this will be by not permitting the employment of nets which capture these baby-fishes. The nets at present in use only last one year, and perhaps it would be necessary to give one year's notice prior to the general introduction of an alteration in the size of the mesh of the nets; should such a measure be carried out, it is one which every Tahsildar, whose opinion I have asked, informed me could be easily managed. In England netting fords is prohibited; but as most Indian rivers at certain seasons are fordable, such could not be

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enforced in this country. The legal size of the mesh of nets in England is eight inches in circumference, whilst in my recent tour three-fourths of an inch has been by no means an unfrequent size, and one inch no less common. I would recommend fishing being prohibited in any piece of fresh-water which is let by Government, with a mesh of less than four inches in circumference, and even this would take very small fishes. Instead of making any observations on the size of the mesh of the nets I give (Plan No. 3) a rough diagram of the sizes employed. No. 1 is considered by Native fishermen only applicable for heavy rains, or high freshes; when young fry are about, they assert that they can then only fish from the banks, and, therefore, only catch little ones. No. 2 is the size employed when the freshes begin to subside, and they can wade waist deep, but it is continued all through the year. No. 3 is the smallest size used for drag nets as the river clears; and No. 4 is the size which I propose should be the smallest admissible at present.

Agreement in letting Fisheries.

41. In letting fisheries I recommend that certain rules and regulations should be explicitly stated in all agreements. The renting (except where weirs are necessary, or some considerable outlay desirable,) should be put up to auction every year, and should no one bid, all fishing, excepting with rods and lines, should be strictly prohibited, unless the Tahsildar could collect and sell the fish as I find is sometimes done; but this is a proceeding to be disapproved of. The size of the mesh of the net should be distinctly laid down, and under penalty; neither the lessee, nor any of the people under him should employ one of a smaller size, and any person taken using such, the contractor should be obliged to prosecute. As to whether a simple agreement under a penalty would succeed I do not give an opinion upon, for, unless some one as an informer has an interest in ascertaining the size of the mesh of the net employed, there may be a difficulty in practice. Tanks should never be drained for the purpose of catching the fish, and all poisoning of rivers should be prohibited; I believe it now comes under the Penal Code, but the penalty should be enforced.

Destruction of vermin proposed.

42. Vermin should be destroyed; thus I would suggest offering rewards for all crocodiles killed in the Cauvery, Coleroon, Kistna, and Godavery rivers, within three miles of all anicuts. Perhaps Rupees 5 for each above ten feet in length; Rupees 2-8-0 for all between two feet and ten feet; and one Rupee for every small one, with 4 Annas for each egg, would be found sufficient for this purpose. Others also should be destroyed, and 4 Annas a head would probably be a sufficient reward, whilst the snakes should be killed in the Cauvery, and Coleroon, as they are evidently very destructive, especially to the fry.

General result of inquiries.

43. In my investigations I have endeavoured to ascertain whether the fish are generally decreasing in the Cauvery, Kistna, and Godavery, and I think there can be no doubt that such is the case above the anicuts, and that this decrease commenced coincident with their erection, whilst at the same time the fisheries below them first commenced owing to the fish being impeded in their ascent. I consider that some remedy is highly desirable, and should be brought into force with the

least possible delay, to prevent several valuable species of fish from being exterminated.

General remedies proposed.

44. The remedies I suggest are fish-passes in the Lower Coleroon and Kistna anicuts, and if the result of their erection is satisfactory, also in the Upper Coleroon and Dowlaishweram anicuts; the letting of all fisheries, so that it is to the advantage of the contractor to stop the present mode of destroying the fry; the annual letting of fisheries, except when much expense is incurred in erecting weirs; a prohibition against using nets with a mesh under four inches in circumference; no netting being allowed within 100 yards of all anicuts, weirs, dams, locks, or masonry works extending across streams, or channels of fresh-water, and also no fishing in the irrigation channels from October to February to allow the fry to descend to the sea, until such time as a fish pass has been placed in the Dowlaishweram anicut.

Final considerations.

45. I have not entered into the question of the sea and coast fisheries of the Madras Presidency, as I am not quite certain whether it was intended I should confine my investigations solely to the rivers; but in case it may be desired, at a future date, to have this most important subject enquired into, I venture to enclose a series of questions for circulation, nearly similar to those I furnished in accordance with G. O., No. 2,468, to the Supreme Government. The sea fisheries appear to require as much stimulus as the fresh-water ones do conservation. The two species of sea fish *Sciæna coitor*, (not of much value,) and Sable, *Clupea palasah*, which I find breeding in the Madras rivers, I have never obtained in the sea, except at Cocanada, at the mouth of the Godavery canal where I found the latter. At Madras I have collected nearly 400 species, but the Sable has not been amongst them, although another nearly allied species is found there, which however does not breed in the rivers. An extended inquiry along the coast would, therefore, be necessary to solve the problem; but my idea is that the Sable is a deep sea fish, and comes to the Coromandel Coast to breed in the rivers, after which it returns to the deep sea. One of my reasons for this belief is, that I have not found it along the coast; this, however, may be due to the destruction of the species, or rather to their inability to breed. I venture to suggest the circulation of the accompanying questions, and from what I have seen in my tour of inspection, I cannot but express my belief that, should Government institute a full inquiry into the whole of the fisheries in the Madras Presidency, at the same time removing local obstacles to the breeding of fish, and preventing the destruction of the fry, that it might be the means of effecting much good by augmenting the food of the people at large, whilst I am also fully convinced that, in a pecuniary point of view, all expenses would soon be reimbursed by the increased value of the fisheries. Whole districts are now unlet, and, most probably, the same destruction is being carried on, as in the Kistna and Godavery Collectorates, due to the order for not farming them out. In regard to the sea fisheries, full information would be desirable respecting the uses to which the sea fish are put, as in salting, drawing, extracting fish oil, preparing isinglass or fish fins, &c., &c., for they are employed in numerous ways. If the oil sardines have not reappeared on the Western Coast, it would be useful to ascertain where the shoals have gone to. Where means of salting fish exist, and the trade is not carried on, it appears that a stimulus might be advantageous. As regards medicinal fish oils, if it could be furnished at Home on a profit cheaper than the Cod liver oil, it might be worthwhile to have its therapeutic effects tried on a large scale in London Hospitals. Although the isinglass I have as yet obtained from fish on the Coromandel side has been inferior, that from Malabar may be of a better description, and worth exporting to Europe for fining liquors; whilst an investigation might disclose that the pearl oysters have migrated, and thus their present absence may not be entirely due to deficiency of spat. I only suggest these as a few of the inquiries which it might be considered advisable to institute.

(Signed) FRANCIS DAY,
On Special Duty.

From the Revenue Board.

1. Return of yearly receipts from fresh water fisheries for the last 20 years.
2. Return of yearly receipts from exports and imports for the last 20 years.
3. Return of yearly receipts from export and import of fish oil for the last 20 years.
4. Return of yearly receipts from export and import of fish maws, or sounds, for the last 20 years.
5. Return of yearly receipts from export and import of fish fins for the last 20 years.

From each Collector.

1. Return of yearly receipts from river fisheries for the last 5 years.
2. Return of yearly receipts from tank fisheries for the last 5 years.
3. Are there any large portions of fresh water over which Government do not possess the right of letting the fisheries in your Collectorate?
4. Are any other portions of the rivers and tanks in the district unlet?
5. What rule exists why any of the fisheries should be unlet?
6. Does any reason exist against their being let?
7. When fisheries are let, is it done by the year, or by a term of years?
8. Does any reason exist against letting them annually.
9. If any anicuts exist in your district, what effect have they had on the fisheries?
10. Have the fish decreased in rivers above the anicuts?
11. Are fish stopped at the anicuts?
12. Are many fish taken below the anicuts?
13. Are fish, when very young, destroyed to any great extent?
14. Is the size of the mesh of the nets employed very small?
15. Would there be any difficulty in regulating the size of the mesh of the net in all fisheries which are rented out?
16. How long notice do you consider it would be necessary to give, provided it were deemed advisable to prohibit fishing with very small meshed nets in waters which are let?
17. Would six inches in the circumference of the mesh be too large?
18. Is there any reason against prohibiting netting or capturing fish, excepting by hooks and lines within 100 yards of all anicuts, weirs, dams, locks, or masonry works extending across streams or canals of fresh water?

19. Are the fish curers allowed to use the salt earth in your district untaxed ?
20. What are the restrictions respecting salt earth being employed in curing fish ?
21. What is the quality of the salt earth ?
22. May it be purified before being used, or must they employ the salt earth uncleaned ?
23. What is the quality of the salted fish ?
24. Would the Natives prefer a superior quality of salt fish to what they now obtain ?
25. Is Government salt purchased to any great extent for curing fish?
26. How do you consider the trade of salting fish could be augmented ?
27. Is there a good market for fish in your district, or is it fully supplied ?

From each Tahsildar.

1. A return showing the yearly receipts from river fisheries for 5 years.
2. A return showing the yearly receipts from tank fisheries for the last 5 years.
3. A return showing the number of tanks in which the fishing is let.
4. A return showing the number of tanks in which the fishing is unlet.
5. Are there any fisheries in your Talook, or District, which might be let ?
6. What are the number of fishing villages ?
7. What are the number of occupants in each ?
8. Do they only employ their time in fishing, or have they any other trade ?
9. What castes fish in the sea ?
10. What castes fish in the backwaters and rivers ?
11. What castes sell fish ?
12. What castes salt fish ?
13. Is fish taken any long distance for sale ?
14. What is the general rate of renumeration given by contractors to the fishermen ?
15. What are the average daily earnings ?
16. Are there any taxes on the fishermen ?
17. Are fish taken in sufficient quantities to supply the local market ?
18. Are more fish taken than can be sold ?
19. If more fish were taken could they be sold ?
20. What castes eat fish ?
21. Do they prefer it fresh or salted ?
22. What is the fish-eating population of your talook or district ?
23. Have the rents for fisheries increased or decreased of late years ?
24. Have the fish increased or decreased of late years ?
25. Have the fishing population increased or decreased of late years ?
26. How many fishing boats go to sea ?
27. Have they increased or decreased of late years ?
28. Have the nets decreased or increased ?
29. Are very small fish taken in any quantity ?
30. What is the usual size of the mesh of the net ?
31. What are the best fishing months in the sea ?
32. What are the best fishing months in the fresh waters ?
33. Are fish salted to any great extent ?
34. How is the salt obtained ?
35. Is salt earth employed ?
36. Where and how is it obtained ?
37. What is its value ?
38. Is sea water taken to obtain salt from by the fish curers ?
39. Is the present quality of salt fish considered good ?
40. Could an improved quality be sold if the price were not raised ?
41. Is there a good market for salt fish, or could more be sold ?
42. What classes eat salt fish ?

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43. Could the salting of fish be increased, and if so, how ?
44. What are the chief fish salted ?
45. Is salt fish exported ?
46. Are fish cured by smoking ?
47. Are fish roes salted ?
48. Are fish dried ?
49 Are fish fins preserved ?
50. Are fish maws, or sounds, preserved ?
51. To what other uses are fish turned besides being eaten fresh, or salted ?
52. Are fish used as manure, and if so, how and for what sort of crops ?
53. Are fish used for obtaining oil from, and if so, what sorts ?
54. Is the oil obtained from the whole fish, or only from its liver ?
55. Are fish used as medicines or charms ?
56. Give the native names of the most useful fish in your talook, with the size they grow to, and the months they breed.
57. What are the various modes of fishing ?
58. What baits are employed ?
59. Are rivers ever poisioned to obtain fish ?
60. Are tanks laded out to obtain the fish ?
61. Do crocodiles, otters, or other animals destroy many fish in your talook ?

From the Curator Madras Central Museum.

1. A return of the Indian fresh-water fishes in the Museum, with the size and the district from which they have been obtained.
2. The same of the Indian salt-water fishes.

No. 659. From the same Officer, dated 7th December 1868.

1. I have the honor to forward my third and concluding report upon some of the fresh-water fisheries of the Madras Presidency, with remarks upon whether they are increasing, decreasing, or stationary, the reasons for the decrease where it is apparent, and what I believe would be the most effectual remedies.

2. In giving my plans of a new fish pass, I have not mentioned employing it in a single vent of an under-sluice, for I doubt its succeeding in such situations for *Marine* species of fish, but doubtless it would act thus efficiently for migrating fresh-water species, and it might be tried in the Upper Coleroon anicut. I understand the cost would not exceed Rupees 50 for each vent.

3. I should be obliged by Government being so good as to pass my bills for expenses incurred, which accompanied my two former reports.

4. I shall also be obliged, should my reports be put in type, by Government furnishing me with six copies of them to circulate to gentlemen particularly interested in fisheries for the purpose of obtaining their opinions, as in this way valuable information is often elicited, and should I obtain such I shall be happy to furnish it to Government at a future date.

5. The plans alluded to in my report will be sent by book post, being too large to go by letter tappal.

(Signed) FRANCIS DAY,
On Special Duty.

No. 660. ORDER THEREON, 30th April 1869, No. 1,185.

Miscellaneous.

THE attention of Government having been drawn to the injurious effect of irrigation works on river fisheries, the Collectors of Godavery, Kistna, and Tanjore were called upon for certain information on the subject in the Proceedings of Government, under date 11th September 1867, No. 2,140.

2. The reports of these Officers were forwarded to Government by the Board of Revenue, with their Proceedings, under date 28th January 1868, No. 656, and disposed of in the Order, under date 27th May 1868, No. 1,468. The Government expressed their opinion that, from the information contained in the papers submitted, there could be no question that in all the great rivers, which flowed out on the East Coast of the Presidency, there were certain kinds of valuable fish which came up from the sea to deposit their ova in the head waters of the rivers, but were intercepted by the anicuts, and then easily captured and destroyed in large numbers, with the roe in them. The diminution of the food-supplies of the people was an inevitable result of this method of fishing, and the Government deemed the evil, one of sufficient magnitude to justify their interfering to avert it.

3. As, however, the Board had requested Mr. Fraser, the Collector of Godavery, to inquire, while on leave in England, as to the best means of furnishing the fish with the means of surmounting the obstacles to their reaching their breeding waters, the Government deemed it advisable to await his return before undertaking any works for this purpose; but they resolved, in the meantime, to depute Dr. Day to inquire into, and make a comprehensive report on, the whole subject in all its bearings.

4. Subsequently, a letter from the Government of India was received, requesting that Dr. Day's attention might be called to the practical aspect of the question as well as to its scientific bearings, and that information might be obtained, (1), as to what fish constituted a practically important portion of the food of the people; (2), which of those migrate for the purpose of depositing their spawn; (3), among migrating fish what are those which live entirely in fresh water, and what are those which pass from the sea or brackish water into the fresh river-waters; and, (4), what are the precise habits of each of these classes of fish as to their migrations, both in respect to their extent up the rivers, and the season at which they occur; and also the season at which the young brood of fish are developed, and at which they descend the rivers. The Government of India also requested that Dr. Day might be directed to extend his inquiries to the rivers of the Orissa Coast in the Bengal Presidency, and they inquired whether any wanton destruction of fish took place in the inland rivers of the Madras Presidency.

5. In the Order of Government, under date 12th August 1868, No. 2,151, Dr. Day's special attention was drawn to the points for inquiry indicated by the Government of India, and he was directed to visit the rivers of the Orissa Coast. The Board of Revenue were also requested to ascertain from Collectors of districts whether any wanton destruction of fish took place in the inland rivers.

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6. In conformity with these orders, Dr. Day has now submitted three interesting and valuable reports, summarising in his third the information contained in his first and second. He examined the Coleroon and Cauvery rivers in the south, then returned northwards to Madras, inquiring into some of the tank fisheries on his way, and making a short detour to the Palar river in North Arcot. From Madras he proceeded by steamer to Masulipatam, from which place he investigated the fisheries in the Kistna and Godavery rivers. From thence he passed to the Ganjam District, landing at Gopalpore where he inquired into the sea and fresh water fisheries, and proceeded to the Chilka Lake, *via* Berhampore, Chetterpore, Ganjam, and Rumbah.

7. Though Dr. Day does not give any precise information as to the particular fish which form any material portion of the food of the people in each locality, the result of his inquiries shows that in all parts of the country which have been visited by him, there is usually a ready market for fish, and that it frequently happens that the fishermen are unable to meet the local demand.

* Dated 7th December 1868.

8. In paragraphs 5, 6, 7, and 8 of his third report,* he gives an interesting account of several kinds of fish which fall into the three classes: Non-migratory fresh-water fishes; Migratory fresh-water fishes; and Migratory sea-fishes which ascend the rivers; but precise and detailed particulars of the character, desired by Government of India in regard to the habits, etc., of each class, have not apparently been obtained, though much information of a general nature is submitted.

9. It seems from Dr. Day's inquiries that there is a general decrease of the supply of fish both in rivers and tanks, except in the Ganjam District; that the decrease in the Cauvery and Coleroon rivers and in the Kistna and Godavery is to be ascribed, in a great measure, to the construction of the anicuts, which undoubtedly have the effect of preventing the fish generally from proceeding up the rivers to their breeding waters, and also act as obstacles to the young fish when returning seawards. It appears also that large numbers of fish are caught close under the anicuts in their endeavours to ascend. Dr. Day, however, does not ascribe the decrease in the supply of fish solely to this cause. The principal reason he considers to be the wanton destruction of fry, which takes place owing to the small mesh of the nets used by the fishermen, and the indiscriminate fishing which usually takes place.

10. The remedies suggested by Dr. Day, are, (1), that all pieces of water sufficiently large for fishing, which are not navigated, as a rule, by sea-going vessels, should be leased out, in order to give a distinct interest to some person in preventing indiscriminate fishing; (2), that provision should be made in the contracts for the protection of fish in regard to the size of the mesh used, the periods and localities for fishing, the draining off of water in tanks, and the poisoning of rivers. He also recommends that fish Passes, of which he submits an improved pattern, should be constructed at the anicuts to enable the fish to pass over them, and that rewards should be given for the destruction of vermin which are known to destroy fish. He is not in favor of prescribing fence mouths, as some fish are best suited for the table during the breeding season. He would, however, prohibit

fishing during certain months in the irrigation channels, through which the young fish pass downwards towards the sea.

11. In conclusion, Dr. Day recommends that a complete inquiry into the whole of the fisheries of the Madras Presidency, both sea and inland, should be undertaken; and he appends a list of questions which he proposes should be circulated to certain Officers.

12. The Right Honorable the Governor in Council considers the adoption of Dr. Day's proposals to be highly expedient, and accordingly resolves to direct the Board of Revenue at once to take steps for putting his suggestions in force in all districts from the 1st of July next. The Board will also be instructed to combine the three sets of questions proposed in such a manner as to obtain from Collectors all the information which Dr. Day seeks.

13. The subject of the Fish Passes which Dr. Day proposes to erect for the present at the Bezwadah and Lower anicuts only, on the Kistna and Coleroon rivers, will be referred to the Public Works Department for their opinion, as to whether Dr. Day's improved Pass is the most suitable that can be devised for the purpose intended, and should such be the case, orders will be issued from that department for the construction of a fish Pass of this pattern at each anicut.

14. The Government resolve also to refer to the Board of Revenue for inquiry and report Dr. Day's remarks in his second Report,* (paragraphs 8, 18, 21,) regarding the renting of fisheries by the Department of Public Works, and the taxing of the fishermen at Rajahmundry and Dowlaishweram.

* Dated 17th November 1868.

(True Extract.)

(Signed) R. A. DALYELL,

Acting Secretary to Government.

To Surgeon F. Day, M. D.
,, the Board of Revenue.
,, the Public Works Department.

Exd. F. R. Bantleman.

From

SURGEON FRANCIS DAY, F.L.S., & F.Z.S.,
ON SPECIAL DUTY,

To

THE SECRETARY TO GOVERNMENT,
REVENUE DEPARTMENT,
FORT SAINT GEORGE.

SIR,

1. I have the honor to forward my second report on the present state of some of the fisheries in this Presidency; this continuation having reference to those north of Madras, whilst the former was devoted to those existing in the south. In this report I have not included Nellore, as the time which would necessarily have been occupied in that inspection would have precluded my visiting the important anicuts on the Kistna, Godavery, and Mahanuddee prior to the dry season. For the same reason I had not time to remain longer in the Kistna and Godavery Districts, but I believe the information will be sufficient for practical purposes.

Masulipatam fisheries only partially farmed out.

2. At Masulipatam I was detained a few days completing the report of my Southern tour, which I despatched from thence, and I took the opportunity of inquiring into the fisheries. I there ascertained that some of the most eligible fishing-grounds have not been farmed out for some years, and I was thus enabled to see an excellent practical illustration of the effects of non-preservation. The same practice of not renting out the fisheries I may mention exists in the Godavery Collectorate.

Board of Revenue's Circular Orders respecting the letting of fisheries.

3. It may be as well to give some extracts here, from the *Circular Orders of the Board of Revenue*, to prevent repetition in reference to each locality, as well as in my final report. On November 27th, 1848, Collectors were requested "to take measures to introduce, in future, the system "of disposing of the village, tank, and channel fisheries on rent, should such a "course not have been hitherto adopted." But to the Collector of North Arcot, on receiving his letters of December 8th, and January 29th, 1849, the Board observed, they "will not press the extension of the renting system in respect to the tank "fisheries of North Arcot, but will leave it to the discretion of the Acting Collector "to continue the management of that branch of revenue in the manner which "appears to him best suited to the circumstances of his district;" whilst, in reply to a letter from the Collector of Guntoor of January 29th, 1849, the Board did "not "consider it advisable to revive the practice of renting the tank and channel "fisheries in Guntoor." The Agent in Kurnool was directed "not to take any

"measures for renting the fisheries in his district," and the Collector of Bellary was "not to make any demand on this head upon fisheries which have not hereto-"fore been subject to tax."

Board of Revenue's Orders respecting the letting of the Kistna fisheries.

4. In 1862, the Collector of the Kistna District reported to the Board of Revenue that he had been offered Rupees 942 as rent for fisheries which had never heretofore been given in rent but where the fishermen used to pay moturpha, the applicants intending to sub-rent them to the fishermen. He received the following answer:—"The Board are decidedly "opposed to any extension of the fishery rents, and more especially so where "involving in any form the reimposition of the burden from which the abolition "of the moturpha tax relieved the poorer classes. The Collector will unlesitat-"ingly reject the tenders." A copy of this was sent to all Collectors, and was immediately followed by the remission of the rents for the fisheries on the Kistna river, at Bezwada, and elsewhere. I propose leaving my remarks upon this subject until the next report, but have placed these extracts here to show the reason why these fisheries have not been let.

Returns of rents of fisheries in the Kistna District.

5. The Acting Collector of the Kistna District has furnished me with a return showing the rents received from the fisheries for the last ten years, from which I take the following in Fuslies:—

Fusly 1271.	Fusly 1272.	Fusly 1273.	Fusly 1274.	Fusly 1275.	Fusly 1276.	Fusly 1277.
Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1,244 5 2	4,641 7 4	5,357 11 4	3,525 0 0	4,927 7 10	6,698 13 4	6,864 12 0

This, however, does not coincide with the following return, dated October 12th; neither does this second agree with the return from the Bunder or Bezwada Talsildars, or that from the office of the Department Public Works, (see paragraphs 7 and 8.) In fact the accounts of the fresh-water fisheries appear to be complicated, possibly by their being included in other returns; but as I only received the following at Cuttack, I have been unable to retransmit it for further information:—

Statement showing the Fish Rents in the undermentioned Talooks of the Kistna District.

Fuslies.	Gudivada Talook.			Bunder Talook.			Bezwada Talook.			Total.
	Tahsildar.		Department of Public Works.	Tahsildar.		Department of Public Works.	Tahsildar.		Department of Public Works.	
	Collair Lake.	Tanks and Swamps.		Rivers.	Tanks, Salt Creeks, and Swamps.		Rivers.	Tanks and Swamps.		
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1271...	3,934 15 0	... ...	... ...	... ...	685 8 3	... ...	... ...	... ...	... ...	4,620 7 3
1272...	4,185 3 4	... ...	... ...	... ...	381 4 0	... ...	... ...	... ...	75 0 0	4,641 7 4
1273...	4,968 0 0	... ...	... ...	... ...	389 11 4	... ...	... ...	... ...	... ...	5,357 11 4
1274...	2,303 8 0	... ...	... ...	... ...	305 7 0	... ...	... ...	... ...	... ...	2,608 15 0
1275...	4,920 0 0	... ...	... ...	... ...	340 3 7	... ...	... ...	... ...	... ...	5,260 3 7
1276...	4,920 0 0	... ...	... ...	... ...	365 7 4	... ...	... ...	... ...	... ...	5,285 7 4
1277...	4,920 0 0	... ...	... ...	... ...	334 12 0	... ...	... ...	... ...	... ...	5,254 12 0

(Signed) W. McQUHAE,
Acting Collector.

Fisheries of Masulipatam.

6. At Masulipatam there are three castes who are principally employed in capturing fish, or are in the fish trade, the Pulla, the Besta, and the Uddee. The salt-fish trade appears to be insignificant, and the article produced very inferior. Its value in the local market is, however, rather high, being about 4 Annas per pound. The Mullet, *May shappah* (Telugu), the Lates calcarifer, *Pundu kopah* (Telugu), and the Polynemus, *Maga* (Telugu), appear to be held in the greatest esteem. In the fresh-waters around this station I found the *Botchee* (Telugu), Catla buchanani, C. and V., very abundant; but owing to the indiscriminate slaughter which obtains there I could not procure one of more than quarter pound in weight, (see paragraph 26.)

Fisheries of Bunder Talook, and Tahsildar's estimate of the extent they could be increased.

7. In the Bunder Talook there are, according to the Tahsildar, ten places let, of which two are portions of the river, six tanks, and two salt-water swamps. The Tahsildar estimates that, if permitted to do so, he could at once double the revenue by letting all those portions now unlet, especially branches of rivers, only one-third of which are at present rented out. Those fisheries which are let are annually put up to auction. As, during the late cyclone, all the old records were destroyed or injured, the Tahsildar could give no information prior to that period. The following are the rents he stated to have been received in this Talook since 1863:—

	1863-64.	1864-65.	1865-66.	1866-67.	1867-68.
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
Rent	379 11 4	300 1 5	322 0 0	414 8 0	383 0 0

Rent of Bezwada fisheries.

8. At Bezwada (to which place I next proceeded up the canal) I requested and obtained returns from the Tahsildar, and from the Department Public Works, of the rents received, as the latter lets out the anicut and some of the sluices. As they do not correspond with the Collector's accounts I give them in full, as I am unable now to ascertain with whom the error lies.

The Tahsildar's return shows he received the following:—

1861. Rupees 100 for a portion of the Kistna river.
1862. „ 150 „ „ „ „
1863. Rents given up under Proceedings of the Board of Revenue already quoted in paragraph 4, conveyed in the Head Assistant's order, dated January 8th, 1863.

The Department Public Works collected as follows:—

Years.	Anicut.	Sluices, &c.	Total.
	RS. A. P.	RS. A. P.	RS. A. P.
1866...	136 0 0	... ...	136 0 0
1867...	100 0 0	105 0 0	205 0 0
1868...	110 0 0	258 14 0	368 14 0

The portion of the river, given under the head of Anicut, consists of about 200 yards of the river below that structure.

Kistna Anicut. Fish unable to pass it.

9. At Bezwada the Kistna is about 1,370 yards broad, and crossed by the anicut. This differs entirely in its construction from those on the Cauvery, as the amount of stone obtainable here is unlimited. It consists of a broad wall upwards of fifteen feet high, having a short apron in front of it, and one two hundred feet long of rough stone at the back, or between it and the sea; these rough stones are kept in their places by retaining walls, &c., &c. On either side of this anicut are the sluices, whilst a long lock on the Bezwada side leads to the irrigation canal, which divides into two branches, one going to the Godavery at Rajahmundry, the other to Masulipatam. The velocity of the stream in the Kistna is great; the freshes commence in June, and continue to the end of October, after which the river subsides, but it is not fordable until the middle or end of January. About the end of September the sluices are closed, and a wall of rough stone, about three feet high, is raised on the summit of the anicut wall, so as to preserve as much water as possible for the November and December crops. Through this rough wall the water trickles, but it rarely flows over it. About March these stones are employed for strengthening the apron of the anicut, repairing the waste caused by friction, &c. Even if the anicut itself were not an insuperable obstacle to the passage of fish at this part of the river this additional three feet wall would most certainly be so.

Fishermen's account of the effect of the anicut upon the fisheries.

10. At Bezwada, amongst the fish which ascend from the sea, the most valuable economic species is the *Palasah* (Telugu), or Sable fish, Clupea palasah C. and V., which come up the Kistna during the months of October, November, and December to deposit their ova, and entirely disappear about April. The fishermen informed me that, for two years after the erection of the anicut, these fish were taken in great numbers being unable to continue their ascent past the weir; whilst their efforts to do so were so frantic as even to attract the attention of the Natives who renamed them *Yekkudi chakka*, from *Yekku* "to climb." In the Kistna one mode of taking them is by hanging baskets over the anicut, so that the fish jumping against the sluices fall down into them and are thus captured, as at the Coleroon anicut. Owing to the construction of the anicut over the Kistna the numbers of fish, which had previously extended their range for at least fifty miles of the river, became arrested at Bezwada where they were taken with little difficulty. So large were the captures that not only were the whole of the fish-eating population amply supplied, but many were salted and sent elsewhere for sale. As the freshes subsided in December and January, those fish which still continued trying to ascend to their spawning beds became entangled amongst the rough belt of stones at the rear of the anicut, (see paragraph 9,) and at night, and in the early morning, when the fishermen were not employed in catching them, the wild animals, such as jackals and the like, took their share, assisted by the pariah dogs who came down and destroyed numbers. It is universally denied that they were ever "left to rot, or to be destroyed on the banks," as those remaining unsold were salted by the inhabitants of the bazaar, and sent to distant markets. Since these first two years there has been a gradual diminution of this

species, as well as of all other kinds of fishes, whether strictly fresh-water or partially marine, and the fishermen complain that they cannot now half supply the local demand. They universally asserted the impossibility of any fish going over the anicut, or ascending up the under-sluices.

Obtaining specimens of Sable fish.

11. Judging from the habits of the Sable fish it appeared to me very improbable that none of them were in the river, (which was in full fresh,) although the fishermen asserted that this was the case. I accordingly offered a Rupee for the first fish brought me, and half that sum for the second. This had the desired effect, and in forty-eight hours I obtained a pair of them, and subsequently more. The ova was not quite ready for depositing, but it evidently would soon have been so, and they had ascended the Kistna to reach their spawning beds.

Effects of non-letting of fisheries, and their value in the Kistna.

12. Owing to there being no contractor, (for the fisheries are not let,) they are most imperfectly, although constantly, worked. Every one appears to act on his own account, and morning, noon, and night nets are employed in every available spot. Thus the fish are scared away, and the captures are far inferior to what they would be were there some organized system adopted, as in the Coleroon. Admitting, as we must, the great decrease of fish in this locality, it appears that, irrespective of the small size of the mesh of the nets employed, two causes have induced this result, viz., the presence of the anicut without a fish pass, and the indiscriminate fishing, greatly the result of non-letting the fisheries. Now even little boys are sent out to capture whatever they can for the use of their family; the size is no object, and thus the fry are destroyed, leaving future years to take care of themselves; this would not be the case were there a contractor, (at all events to such an extent,) as in self-defence he would prevent this indiscriminate fishing for some months in the year, whilst the Sable was in the river. Seeing two lads fishing on one occasion, I questioned them when each showed a moderate sized chatty, which they said they must half fill before they went home, or, as they expressed it, their mothers would beat them. I found hundreds of the fry of the Catlas, Barbel, Labeos, Siluroids, and other fish, which might attain a good size if allowed to grow. In the bed of the river, irrespective of the destruction going on along the banks, were the regular fishermen who use cast nets. About November or December, the local fishermen are supplemented by as many as forty more from Dowlaishweram and its neighbourhood, who come over to assist in catching the Sable, and earn about eight Annas a day each, remaining for from one month to six weeks, (see paragraph 23). I think Mr. Stuart's estimate, (in his letter, dated Bezwada, October 21st, 1867,*) that 3,300 cavady loads of fish, weighing 14,600 maunds, of the value of Rupees 7,800, are annually taken below the anicut, is too high; but as he has resided some time on the spot as Acting Head Assistant Collector, his opportunities of correctly ascertaining the amounts captured were superior to mine. Mr. Stuart, apparently from personal observation, states that the Dowlaishweram fishermen, who come in November and December, a period I was unable to be present, (see paragraph 1,) bring nets of from 300 to 400 yards long, and from 12 to 14 deep;

* Proceedings of Madras Government, May 27th, 1868.

that "the greatest quantities of fish are caught in the deep pools below the anicut, the net being first fastened at one end then taken round a wide sweep, and gradually drawn in. At one haul these large nets will bring to land five cavady loads, and five or six hauls appear to be the usual day's work. In each haul (say thirty-six cavady loads) there will be some dozen or two of other kinds, but almost the whole haul consists of "Yekkudi chakka," "Sable fish." As the usual computation appears to be that Government should receive one-fourth of the value of the fish taken, this would give a yearly loss on this one spot (according to the Head Assistant Collector's calculations) of Rupees 1,950, to Government, and as this has gone on for six years the rents which could have been raised would have been amply sufficient to defray the cost of a permanent fish pass. The small white fish, alluded to by Mr. Stuart as taken in the canals, appear to me to be a *Chela*, which abounds, and is somewhat similar in appearance to the Sable fish. The difficulties for fish to obtain an entrance from the Kistna river into the canal are great, whilst the latter is too dirty for this species (the Sable) to reside in.

Reasons why fish cannot ascend over the anicut.

13. As regards the anicut itself, although the height of the wall above the bed of the river is considerable, the rough stones forming the apron on its sea-face have a gradual slope in their descent of 200 yards, and up this incline it might have been imagined the fish could easily pass, but such is not the case; the velocity of the current is great, and in passing over these rough stones the fish apparently become so bruised and otherwise injured that none cross the anicut. As I have already observed, amongst these rough stones numbers were taken soon after the construction of the anicut. On either flank are the sluices where this rough apron does not exist, but even over this they cannot pass, although the water is sometimes several feet above its summit. The reason appears to be that fish pass along the beds of rivers towards torrents, and if those beds are rough they cannot ascend. At the sluices they evidently go against the base, and will not rise sufficiently to pass over the wall; for as they rise the current takes them down the stream, and they do not find the obstruction overcome. It appears unquestionable that no Sable or other sea fish are ever taken above Bezwada now, although they used to be prior to the construction of the anicut.

Necessity of a fish pass.

14. The anicut for want of a fish pass is thus preventing fish from ascending the river for the purpose of breeding, and doubtless, unless some remedial measures are adopted, the fisheries, which are now very inferior, will be entirely ruined, requiring at least two years of rest for even partial recovery. As regards the anicut, it seems questionable whether a permanent or temporary fish pass would be least expensive; for the officer in charge considers it unadvisable that, for the sake of the stability of the works, any permanent structure should be erected up the face of the apron. These, however, are all subjects for the Department of Public Works, and therefore I shall only subsequently allude to the form required, leaving the method of construction to the consideration of the Engineering Department. Colonel Winscom suggested a temporary pass, which he considered could be erected for about Rupees 50. On this subject I addressed him a letter the day I left Bezwada, in which I offered personally to defray the cost on that amount, as the Sable fish were just arriving, and thus one season would have been saved; but his

answer has apparently miscarried, as I have not yet received it. I doubt if it will succeed, but considered it worth the trial, especially as the Engineer Officer proposed it.

Some of the remedies proposed.

15. The fisheries here are only partly let, and afford a good illustration of the effects of indiscriminate fishing, which I maintain must be as destructive to the fisheries in India as it has been to those in Europe, rendering it more economical and beneficial to the community to let out all fisheries, at the same time restricting the size of the mesh of the nets. If Government would consent to let out all these fisheries, in addition to the service it would be to the fish, I believe an increased revenue would result, and even if the fish passes prove expensive the rents would, I expect, amply reimburse the outlay. The value of the river fisheries above the anicut would be increased, the fish would multiply, and subsequently the fisheries below the anicut would improve. I trust it will be conceded that, when I use the term "increased revenue," I allude not so much to the money which would be received as to the increased value of the fisheries. The non-letting of the fisheries, or indiscriminate fishing, has been tried for six years, and I would now suggest the adoption of the renting system, with rules respecting the size of the mesh; the prohibition of fishing, excepting with rods and lines within 100 yards of all anicuts, dams, locks, or masonry works extending across streams or canals of fresh-water; and the construction of a fish pass over the anicut.

Examples of the destruction of the fry of fishes.

16. It will be as well to give some instances here to show that the fry of fish are destroyed in numbers, not wantonly for the sake of destruction, but because larger fish are unobtainable. I have already alluded, in paragraph 12, to two lads fishing, whose only directions were to bring home a sufficient supply, irrespective of size or condition. I examined the baskets of several of the fishermen, and still saw the same predominance of small fish taken, and fry in quantities destroyed without compunction either for food or for sale. Now this constant netting, if the fisheries were let, would be prohibited by the contractors, not for the sake of the fish, as they do not seem ever to look beyond the present day, but because they would be taking his fish and disturbing his fishing. Thus the non-letting is one of the causes of the destruction of the fry, and the consequent decrease of the mature fish. Miles upon miles of the river are thus left to chance, or rather not to chance but to the certainty of depopulation. One day some sun-dried fish were brought me, and on purchasing nine Pie worth I found I had upwards of 200 small fish for my money. Several persons, I was informed, in this and the neighbouring Talook live upon capturing the small fry, drying them in the sun, and disposing of them!

Ellore and Collair Lake.—Value of fish in the local market.

17. On leaving Bezwada I went by the canal to Ellore, in the Gudivada Talook. Here, as I have already shown, (paragraph 5,) the Collair lake brings in a fair revenue to Government. Except in the rainy season this lake or tank was formerly salt-water, but owing to the bund erected of late years it is now kept fresh. It is computed to cover 100 square miles, and the Burdwan river flows into it. For the last three years it has been farmed out to a Mahomedan and a Brahmin in partnership, and they sub-let most of it in portions to various individuals. In the town of Ellore the fish sold realize about Rupees 1,700 yearly, according to the Tahsildar. The persons who dispose of it purchase it at the Collair lake, or at Bezwada from the fishermen, charging one-third more for the risk and expense incurred in bringing it. Fish, in common with other provisions, is now much dearer than formerly. A *Botchee*, Catla buchanani, of about 5 lbs. in weight, is worth three Dubs, or about one Anna at the present rates. I could not obtain many species from this lake, but the Wahlah, the Ophiocephalidœ, and the Barbels appear to abound.

Rajahmundry.—Former taxes on fishermen. How fish have decreased since the construction of the anicut at Dowlaishweram.

18. From Ellore I proceeded by canal to Rajahmundry on the Godavery, some few miles above the Dowlaishweram anicut. The fisheries are not farmed out nor let, but the following is an account of what was received for ten years, to Fusly 1271:—

	Fusly 1262.	Fusly 1263.	Fusly 1264.	Fusly 1265.	Fusly 1266.	Fusly 1267.	Fusly 1268.	Fusly 1269.	Fusly 1270.	Fusly 1271.
Rent	RS. 137	RS. 137	RS. 139	RS. 24	RS. 24	RS. 24	RS. 24	RS. 24	RS. 24	RS. 24

It appears to be a common scramble who can take the fish, irrespective of their age or condition. At present there is a tax of one Rupee on every house inhabited by fishermen, and about twenty in number; this they appear to consider gives them a right to the fisheries. I applied to the Tahsildar for further information respecting this, and he explained that, since Fusly 1271, "the tax on them was "inflicted, and is being collected by the Municipal Department." About thirty persons fish with cast nets, and it appears to be a tacit agreement that the fishermen from Rajahmundry do not go to Dowlaishweram, and *vice versa*. Before the construction of the anicut, sea fish were by no means uncommon opposite the town, but now they have become comparatively rare, and it is quite futile to expect to obtain large fish above the anicut. The anglers appear to have but little sport, they sit hours and hours on the stone wall or elsewhere baiting their hooks from time to time with coagulated blood, but they as frequently return home without, as with anything worth catching. This great dimunition in the number and size of fish taken by angling is said to be only of very recent years. I obtained a few Sable fish, *Clupea palasah*, C. and V., which had evidently deposited their roe, and about 100 fry of the same species, apparently about a month old, and also the *Sciæna coitor*, H. B., thus distinctly proving that sea fish may either ascend the river over the anicut, or come up the irrigation channels. There appears to be a large demand for fish, and the Sable and other species ascend during the south-west monsoon when the freshes come down.

The Reverend Dr. Murphy's account of the fisheries in the Godavery, from 1861 till the present time.

19. I applied to the Reverend Dr. Murphy at Rajahmundry for any information respecting the fishes of this magnificent river, which he would be good enough to afford me, as he has been residing either at Rajahmundry or at Dowlaishweram since 1861, the year before the Revenue Board ceased accepting rent for these fisheries. The following is a synopsis of his reply:—That he considers the fish have decidedly decreased, which decrease

has been more apparent during the last three years; that this has been due to excessive destruction of fish below the anicut, and also to the universal and unrestricted capture of the fry in the river and irrigation channels; that the price of fish has more than doubled. With regard to the anicut he observes, that it facilitates the destruction of fish by causing them to collect in large numbers whilst awaiting a fresh, to enable them to pass over it on their way to the spawning grounds. Since it was raised two feet higher (that is, within the last four years) it prevents the return of the later fry to the sea, and causes them to pass down the irrigation channels where they are mostly captured by nets, or being carried out into the small channels they become lost in the paddy-fields. The early fry began to pass down to the sea in November or December, but after the latter month they cannot cross the anicut. Dr. Murphy also agreed with me on the advisability of compelling the fishermen to enlarge the mesh of their nets. All the Natives, and most of the Europeans whom I questioned on the subject, considered that the fish had greatly decreased both in number and in size; some assigned one cause for this, others another. It appears to me, however, as I propose showing in my final report, that it is produced by several circumstances, all acting deleteriously, which, if left unchecked, will probably end by totally destroying the fresh-water fisheries.

Dowlaishweram anicut, over which it is asserted the Sable fish ascend when the freshes are high.

20. At Dowlaishweram there is a magnificent anicut across the Godavery river. It was constructed in 1847, and in its formation differs considerably from those on the Coleroon or the Kistna. It is four miles in width, but has three islands or lunkahs in its course as "points d'appui." Rising fifteen feet from the bed of the river its wall is 14·6 broad at its summit. From its rear, or sea face, it forms a smooth curve technically called an "ogee curve," this is twenty-nine feet in length, having a descent of 8·6 feet; whilst beyond this portion are large racked stones, terminating in a retaining wall, the whole of this latter being thirty-five feet in length, having a descent of three feet; whilst still further from the anicut is a rough stone apron 114 feet in length, with a perpendicular descent of 6·9 feet. It will, consequently, be seen that for the last twenty-nine feet, prior to reaching the anicut wall, the ascent is a curved and perfectly smooth wall. It is asserted that up this the Sable ascend when the freshes are so high that there is no perceptible ripple over the top of the anicut, and this, although theoretical, is probable. As to their ascending up the under-sluices it is simply impossible. Since the construction of the anicut the fishing for the Sable at Dowlaishweram has greatly increased, for they are now detained and captured in large quantities below that structure, whilst waiting for a fresh to enable them to ascend.

Abolition of the Moturpha Tax, &c.

21. The fishermen stated that, prior to the abolition of the moturpha, they paid 15 Rupees yearly, which tax included the whole of those of their caste who resided in Dowlaishweram, and that from the period of its abolition they have paid 30 Rupees to the Moonsiff at a feast which takes place in February, ostensibly that they may have a good fishing season, and to prevent any complaints being made as to their interfering with the stones of the anicut. This money, the Moonsiff asserts, he spends in oil, lights, &c., and that this sum has been given yearly since the construction of the anicut as a voluntary gift, but at the same time he complained of having only received 10 Rupees out of the 30 Rupees for this year; the fishermen not having yet paid him the difference. They, on the other hand, deny this and say they have never had any account of the money spent. It is a pity that on these occasions the ignorance of the people prevents their applying for redress to the proper authorities, in which case, if this is an extortion, it would be immediately inquired into and stopped. I allude to it here, because it is very rarely that Natives ever say anything of these petty exactions, or if they admit them in an incautious moment do not deny having ever said so, if questioned again on the subject.

Mode of capturing fish and best market for their disposal. How the young Sable fish go down the irrigation canals, but are not present below the anicut in the river.

22. The Dowlaishweram fishermen work in gangs of from nine to twenty in each under one head man. The fish are disposed of by sale, and the proceeds divided into shares. The usual plan appears to be for each gang to possess two boats, with one long net, which is fastened at either end of the stern of each boat; these boats are then paddled round a large circuit of water, and thus taken down stream, and gradually bringing the outer end of the net round they tow it on shore. About four hauls are made daily by each gang. I saw forty-five Sable fish captured at the first haul by three gangs of eight men each; this was considered only a moderate take. Ten of the fish were out of season from having deposited their ova; they looked dull about the eyes and head, and had a flabby unwholesome feel, these had no doubt dropped their ova below the anicut; for it is very improbable that, having once passed over it to spawn, they could return the same season, unless down the irrigation channels. Not a single one of the fry was taken below the anicut on this or on any subsequent occasion. Each adult fish is worth about six Pie. The Sable is said to be taken in the greatest number in the freshes of July, August, and September, whilst about the middle of October it commences to disappear from the river, which is getting clear. Owing to the comparative sluggishness of the Godavery it can be netted through much of the freshes. Some of the fry leave as late as March, and go down the irrigation canals to the sea. Besides being captured by long seine nets the Sable are taken by means of cast nets, and when the sluices are open even by baskets which are hung over the river close to the anicut wall, so that as they jump they fall into them in the same manner as previously described at the Bezwada and Coleroon anicuts. The best paying market for these fish appears to be at Samulcottah, where a Native Regiment is stationed. It is forty-five miles distant down the canal, and I am informed that by the time the fish arrive there they must be almost unfit for human food. Certainly the stench arising from the boats carrying fish is almost insufferable. If taken of an evening the fish are, as a rule, fifteen hours before they reach Samulcottah. They are not cleaned, and no salt is employed, the fishermen not having sufficient energy, apparently, to cure them; much of it is thus spoilt from arriving in a semi-putrid state. Individual fishermen, such as those from Dowlaishweram, cannot personally undertake this with much prospect of success, unless on a large scale, and the sub-divided manner of fishing renders it unlikely that, if the present mode is continued, any improvement can be expected. Here it may fairly be asked whether fish in this state has any

effect upon the health of the Native population of this station, or whether the Police seize it as unfit for human food, which I am assured they do not do.

Means of disposal of captured fish. Decrease of value of fisheries. The Dowlaishweram fishermen go to Bezwada yearly.

23. The fishermen state that there is no waste of fish taken from this locality; that all captured are sold without any trouble, and none of them ever remember fish left to the dogs and wild animals to devour. One year they mention, when cholera was very prevalent at Dowlaishweram, the Chief Engineer had their fish taken from them and buried, as he believed it to be either productive of that disease, or to assist in its dissemination. Sometimes they are losers by the fish becoming putrid en-route to distant markets, but they maintain that they could sell three times the amount now taken without the least difficulty. They universally agree that the number captured is much less than it used to be, and that the fisheries have been decreasing since the erection of the anicut, whilst above that structure large fish have almost entirely disappeared for the last few years. In the month of October many of the Dowlaishweram fishermen go to Bezwada with their nets, because it is only when the rapidity with which the Kistna flows during the freshes begins to subside that the Sable can be captured in that river. This appears to be the reason why the fishermen assert that these fish only arrive at Bezwada when the water in the Kistna becomes clear.

Fish obtained in the Kistna and Godavery rivers.

24. I will now detail the various species of fish which I personally obtained in the Kistna and Godavery. Possibly the communication formed by the canal between these two rivers may account for the similarity of the fishes, as lochs of sufficient size, although they impede, do not entirely prevent the ascent and descent of fresh-water fish.

List of sea Fishes personally obtained in the Kistna and Godavery rivers.

Scientific and Telugu Names.	Kistna river.			Godavery river.			Size attains.	Remarks.
	Above anicut.	Below. anicut.	In Irrigation canals.	Above anicut.	Below anicut.	In Irrigation canals.		
Sciæna coitor, *C. V.* Goraka, *Tel.* ...	No.	Yes.	No.	Yes.	Yes.	?	7 in.	Breeding.
Clupea palasah, *C. V.* Pulasu, *Tel.* ...	No.	Yes.	No.	Yes.	Yes.	Yes.	18 ,,	Do.
Pristis semisagittatus, *Shas* ...	No.	?	No.	No.	Yes.	No.	Large.	.....

There are other species of sea fish which also ascend, but these I have omitted, as they come up more for the purpose of preying upon the smaller kinds than anything else; and the anicut does not interfere with their breeding, but only assists them in procuring food. The fresh-water fishes I obtained were as follow:—

Acanthopterygu.

1. Ambassis, *Akkurati* and *Balimkaku*, Tel.
2. Goby, Gobius giurus, (H. B.,) *Tsikidundu*, Tel.
3. Nandus marmoratus, (C. and V.,) *Septi* and *Isoppitay*, Tel.
4. Common walking fish, Ophiocephalus striatus, (Bloch,) *Sowarah* and *Muttageddasa*, Tel.
5. Fresh-water sand eel, Rhynchobdella aculeata, (Bloch,) *Bommiday*, Tel.
6. Spined eel, Mastacemblus armatus, (Lacep,) *Mudibommiday*, Tel.
7. Small spined eel, Mastacemblus pancalus, (H. B.,) *Pahparaal*, Tel.

Siluridæ.

8. Scorpion fish, Saccobranchus singio, (H. B.,) *Marpu*, Tel.
9. Wallago attu, (Bloch,) *Valaga*, Tel.
11. Eutropius taakree, (Sykes,) *Salava jella*, Tel.
12. Pseudeutropius atherinoides, (Bloch,) *Ahku jella*, Tel.
13. Pangasius buchanani, (C. and V.,) *Banka jella*, Tel.
14. Silondia gangetica, (C. and V.,) *Wanjou*, Tel.
15. Macrones cavasius, (H. B.,) *Nahra jella*, Tel.
16. Macrones aor, (H. B.,) *Muti jella*, Tel.
17. Macrones tengara, (H. B.,) *Saku jella*, Tel.
18. Rita crucigera, (Owen,) *Gudla jella*, Tel.
19. Bagarius Yarrellü, (Sykes,) *Rahti jella*, Tel.

Cyprinidæ.

20. Catla buchanani, (C. and V.,) *Botchee*, Tel.
21. Cirrhina Leschenaultü, (C. and V.,) *Aruzu*, Tel.
22. Labeo fimbriatus, (Bloch,) *Ruchu* and *gandumenu*, Tel.
23. Labeo gonius, (H. B.,) *Mosul*, Tel.
24. Labeo calbasu, (H. B.,) *Nullagandumenu*, Tel.
25. Barbus? *Vugamma*, Tel.
26. Barbus guentheri, (Day,) *Nilusu*, Tel.
27. Barbus sophore, (H. B.,) *Chadu perigi*, Tel., or "Bitter carp."
28. Barbus ambassis, (Day,) *Kalay*, Tel.
29. Crossochilus reba, (H. B.,) *Pullarazu*, Tel.
30. Thynnichthys? *Kala tala* and *Ahku chappah*, Tel.
31. Nuria danrica, (H. B.,) *Konissi*, Tel.
32. Amblypharyngodon mola, (H. B.,) *Tallamaya*, Tel.
33. Aspidoparia morar, (H. B.,) *Ulsa*, Tel.
34. Rohtee vigorsü, (Sykes,) *Kunninga*, Tel.
35. Rohtee microlepsis, (Blyth,) *Kilay*, Tel.
36. Rohtee ogilbü, (Sykes,) *Kunninga*, Tel.
37. Chela bacaila, (H. B.,) *Badishaya*, Tel.
38. Perilampus atpar, (H. B.,) *Arku konissi*, Tel.

Irrigation Canal to Cocanada. Presence of Sable fish. Suggest that destruction of fry should be prevented, but a fish pass at Dowlaishweram of no immediate necessity.

25. From Dowlaishweram I proceeded to Cocanada down the canal, and took the opportunity of examining whether the Sable fish make use of that communication with the sea as a means of ascent and descent. At its mouth I was able to obtain several specimens of the mature fish, which is exceedingly common at that spot, but above the lochs they were absent; still it is my belief that these may have been the mature of young fry, which had come down this means of exit from the Godavery to the sea. Above the first loch from the sea there were a considerable number of the young, of the same size as those taken in the Godavery at Rajahmundry, thus conclusively showing that the fry are able to make use of

this communication with the sea to descend from the river; for, as already observed, the young fish cannot pass over the anicut after the freshes are over, the water being too low. The only exit they find at Dowlaishweram is by the canal. The locks are opened several times a day for the purpose of admitting boats passing to and fro; young fry have a natural tendency to go down stream, and thus wait close to the obstruction until it is opened, when they will have little difficulty in descending, provided their capture at these spots is prohibited. I do not think, therefore, that at present it is necessary to incur any expense in building a fish pass at Dowlaishweram, as I found sea fish above that structure, and also traced the young down the canal towards the sea. The destruction of the fry in these canals is, however, on all hands admitted to be most disastrous. They are captured close to the locks, and wherever any impediment exists; whilst when the water is cut off in the canals, and they are closed for repairs, the lower end becomes dry, and the fish must either die there or pass into the paddy-fields and be destroyed. As these fish pass down from October to January or February, this destruction should be entirely prevented, and this alone would probably be one means of restoring the Sable to the river.

How fish are salted at Cocanada. Decrease of fresh-water fisheries. Great amount in a preserved tank.

26. At Cocanada there are about forty fishermen who formerly resided within the limits of the municipality, but as their absence was considered desirable they were presented with a suitable piece of land on which to erect their village; this having the additional recommendation of being beyond the municipal taxing limits appears to suit them exactly. They consider the best season for sea fishing commences about December, and although they salt fish it is not of a good quality. They collect the saline effervescence from the marshes, whatever it may consist of, and into this they put small fish, which are allowed to remain in it for twenty-four hours, and subsequently one day's drying in the sun is deemed quite sufficient. The smell of this preserved fish is abominable. It is their impression that good salt is too expensive for it to be profitable to them to use it in curing fish. They have a yearly ceremony about December when they boil milk and rice together on the banks of the Godavery, which they then worship, and subsequently have a feast off some goats which are killed for the occasion. In the fresh-waters, and tanks fed by the irrigation canals, it is asserted there has of late years been a considerable falling off in the quantity of fish taken, and consequently the price has risen. This falling off of fish, however, can hardly be due to anything but the destruction of the fry, as I was fortunate enough to be able to ascertain. The Collector, Mr. Fraser, kindly allowed me to have one haul of a seine net in a tank at Cocanada, fed by the irrigation channel; for the last two years the water has been used for drinking purposes, and all netting consequently prohibited. In this haul twenty-seven large *Botchees* were taken, weighing from 5 lbs. to 9 lbs. each, besides an enormous number of small fish, consisting of the young of this species, and other inhabitants of fresh-water. This was most interesting, showing the effects of preservation; such fine Botchees it would be simply impossible to obtain from any irrigation channels or tanks which are constantly netted.

Fish castes at Gopaulpore, and salting fish.

27. From Cocanada I proceeded by Steamer to Gopaulpore. Here the very heavy surf which prevails during the south-west monsoon, and even at other times of the year, renders the risk of fishing in the sea somewhat greater than in most other seaport places. There are two castes of fishermen, the *Wahdas*, who ply their occupation in the ocean and deep waters, and also act as boatmen, but never salt the fish they capture; and the *Cundras*, who fish in the rivers, back-waters, and along the shore; they also purchase sea fish from the Wahdas, which they carry to Berhampore and elsewhere for sale, and even salt what remain, but this is not much, as the supply rarely equals the demand. From June to September, inclusive, are considered the best months for river fishing, when Mullet, Whiting, and several other species of fish ascend for the purpose of depositing their ova. I observed that women are sent down to the sea to collect the water from which they obtain the salt for preserving those small species of fish which are useless for sending away fresh for sale.

Weir at Gopaulpore.

28. There is a small estuary or brackish river of about three miles in extent at this place, which extends from the Munsoorcotta Fort to the sea. This is farmed out, and I closely examined the whole of it with reference to the fry of sea fishes. On it there are two weirs erected for the purpose of capturing fish and crustacea. They are about four feet in height, and consists of labyrinths open on the land side or upstream; the walls of these labyrinths are formed of cages, about four feet long and two feet wide at the base; they are flat below, joining above where there is a hole at one end to remove the captures; along the face, upstream, each of these cages has three openings low down in the rattan, like the entrance into a wire rat-trap, so that whatever enters cannot escape. These cages are taken up at low tide, and replaced before the next high tide. A keeper lives alongside and sends off whatever is taken to Berhampore, immediately it is removed from the weir. On the sea face of this weir are also nets which are hauled up at every low tide. Mostly crustacea are captured, but also Mullet, Eels, and Whiting. On crossing this river above the weirs a number of Mullet commenced jumping out of the water, and making off in every direction. My bearers then became very excited, bumped the tonjon on shore and rushed as fast as they could go into the water, where they forthwith set to work vigorously, clawing up the mud from the bed of the river with both hands. In this manner they secured a number of Mullets; in fact, each man on an average caught ten a minute, whilst the fish were of moderate size. The only fish which appear to breed above the weirs is a small species of Mullet.

Sea fish at Gopaulpore, and possible existence of the oil Sardine.

29. The sea on my first arrival was too rough to allow the fishermen to use their nets, so I remained a few days until the surf subsided. Here I found the young of the Makerel, *Scomber kanagurta*, C. and V., in abundance, but I was unfortunately unable to obtain any information as to whether they arrive in droves as in Malabar, where they are extensively salted for the Ceylon and other markets. I was also informed that, during the last few years, shoals of small fish, about the size of Sardines, have appeared about November. I could not ascertain whether they previously arrived about the same time, or at all. They are not made any use of, as oil is not manufactured in this place. Captain Waters has promised to be good enough to send me some specimens to Cuttack that I may ascertain whether it is the true oil Sardine, which for several years have been so unaccountably absent from the Western Coast.

Berhampore. Tank fishing. Tank of putrid water contained fish.

30. From Gopaulpore I went to Berhampore and inspected a large tank, a few miles from that station. It was covered with the lotus plant, and its deep waters were so full of weeds that it could scarcely be imagined that it was of much utility for fishing purposes. The fishermen I took with me could not use a net, and after two hours' work we were obliged to give it up, having only taken two Walking fishes and a Loach by means of tickling. But just as we were leaving, the fishermen who farm it came down and showed us the means by which they contrive to make a good livelihood. They use shallow boats, which they pole about amongst the weeds, and every here and there they hauled up baskets like the traps described in paragraph 27, which had been placed in the best positions the previous night. In these traps not only Eels and Crabs are caught, but also the Walking fish, and Climbing perch, which, when on their travels, walk or crawl through the entrances into the rattan cages. They also spear fish, and thus obtain very large ones. The spear differs from that in use at Cuddalore, being flat, with four prongs on a single line, the two outer being the longest. Large quantities of fish are also taken by rods and lines from the boats, a large bivalve mollusk, which is very common here, being used as a bait. The fish when captured are taken into Berhampore for sale, where they meet with a ready market. There is said to be no apparent decrease in the number of fish, but the amount taken depends greatly upon the rain-fall, and consequent filling of the tanks. I may here mention that in one small tank we came to the water was perfectly putrid, and the Natives informed me that it had been so for months, and was consequently unfit for anything but fish. I was curious to ascertain whether fish really could exist in water so foul, so after much persuasion prevailed upon the fishermen to use their nets, and it was found as full of fish as any of the other tanks, the only difference being that they were of a darker colour. The water I should mention was nearly black, and the bottom of the tank deep in black slimy mud; yet Natives not only eat these fish themselves, but sell them as good for food in the market.

Chetterpore.—The returns for fisheries in the Ganjam Collectorate.

31. I next proceeded to Chetterpore, where I did not obtain much, as the tanks were nearly dry, and the curious long fresh-water lake running ten feet above the high-water level, parallel with the sea, from which it is merely divided by a bank of sand, was full of weeds. The Brinjarees, who yearly come down the ghauts with pack bullocks and donkeys, exchange turmeric and other articles with the people in this Collectorate for salt-fish. After the abolition of the moturpha tax in this Collectorate the fisheries were farmed out, and have been annually let since that period. The Munsicotta river, however, where the farmer has had the expense of making weirs, is let on a lease of five years. The following is a synopsis of the return furnished me by the Collector of the rents of the fisheries:—

Return of Rents for the Fisheries in the Ganjam Collectorate.

Fusly.	Berhampore Talook.				Gumsur Talook.			Chicacole Talook.				Total.		
	Fresh-water swamps and rivers.			Salt-water swamps and rivers.				Fresh-water swamps, tanks, nullahs, and rivers.		Rivers.		Fresh-water swamps and rivers.			Salt-water swamps and rivers.					
	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.	Rs.	A.	P.
1275 ...	1,161	2	8	550	0	0	.....			.....			393	4	0	327	12	0	2,432	2	8
1276 ...	1,595	8	0	766	0	0	199	0	0	36	14	0	1,074	0	0	625	0	0	4,296	6	0
1277 ...	1,600	8	0	921	0	0	238	8	0	39	8	0	955	12	0	626	0	0	4,381	4	0

From the foregoing it will be seen that there is a steady but rapidly increasing revenue derived from the fisheries of this Collectorate, whilst the fishermen do not complain of a decrease of fish to any extent. Doubtless the character of the tanks, and the great prevalence of the screw pine, the *Pandanus odoratissimus*, the roots of which have spread into most of the tanks, combined with the large quantities of the lotus and other weeds, renders constant netting almost impracticable, thus giving the fish a chance of breeding; for it is not worthwhile to take much trouble in catching the fry when large fish are obtainable. Indiscriminate fishing is also prevented, the farmers in the places I visited having watchers to protect their property.

Ganjam.—Salt-fish. Value of fish. One mode of fishing.

32. The largest fisheries at Ganjam are marine and back-water. The fishermen are the same castes as at Gopaulpore. Salt appears to be more easily obtained from the salt pans being within a mile of the town, and it is surmised that much of the rejected salt is used in curing fish. Salt-fish is exchanged with the Brinjarees as at Gopaulpore. A Mullet of about 3 lbs. in weight, in full roe, is valued at 1 Anna when plentiful, and 1 Anna 3 Pies when scarce, whilst other sea fish are sold at proportionate rates. The Sable ascends the river for some distance, but the people are so poor that the pecuniary value of the fishing cannot be very great. If some impetus were given to the capture of fish, the contiguity of the salt pans should make salt-fish cheap and abundant, but the inhabitants are wanting in energy, and apathetic in the extreme.

An official informed me that he went out one night to see how the Murrul or Walking fish, *Ophiocephalus striatus*, (Bloch,) was captured. The fisherman had provided himself with a long flexible bamboo as a fishing rod; a line was attached to the end, having a hook baited with a bull frog. Hardly had the frog been splashed into the water when a moderate sized Walking fish made a dart at and swallowed it. Desirous of ascertaining what would next ensue, the Murrul was left as a bait with the swallowed frog; before long a large water-snake was seen swimming towards it, and soon had the fish in its capacious jaws, and was thus pulled out of the water and despatched.

Rumbah and the Chilka lake. Value of fish.

33. The next station, or rather deserted house, I went to was Rumbah, on the banks of the Chilka lake, a portion of which is in the Madras territory and the remainder in Bengal. It is a large collection of salt-water, about thirty-five miles in length from north-east to south-west, and eighteen from east by north to west by south. It is divided from the ocean by a narrow strip of sand, seldom upwards of 300 yards in breadth, and discharges its waters by an opening into the sea. The general depth is about five feet, and rarely above six. Several rivers empty themselves into it, bringing down a large amount of alluvial deposit. The bed consists of thick blue mud. As it is navigable for large cargo boats the fishing is unlet, but a considerable amount of marine fish appear to be taken in it, some of which are dried and others salted. Numerous labyrinthiform weirs, much like those described at Gopaulpore, are employed along the shores of this lake for taking crustacea, which are most abundant. A Begti, *Lates calcarifer*, weighing about 30 lbs., was brought me, and the fishermen were very well pleased to accept six Annas, which shows either how very cheap fish is there or the poverty of the population.

Expenses incurred, amounting to Rs. 647-9-2, and requested to be sanctioned.

34. I beg to append a list of the expenses incurred in this Northern inspection, which amounts to Rs. 647-9-2, and trust that this sum, as well as that included in my last report, will be sanctioned. I hope to send in my conclusive report by the end of the current month, and regret that, up to the present time, the returns I requested from the various Collectors have not been received, consequently I shall be unable to make it so full as I had proposed doing.

I have the honor to be,
Sir,
Your most obedient servant,

FRANCIS DAY,
On Special Duty.

CUTTACK,
November 17th, 1868.

APPENDIX No. I.

From Surgeon FRANCIS DAY, to the Superintending Engineer of Bezwada, dated Bezwada, 25th September 1868.

1. I have the honor to request you will be so good as to favor me, at your convenience, with your opinion on the following subjects to append to my report to Government on the state of the fisheries of this Presidency, suggesting such remedies as may appear to be expedient.

2. Assuming the necessity of erecting a fish pass to enable the passage of fish over the anicut during this period of the year, or from October to January inclusive, the question arises whether you would advocate a permanent or temporary structure as regards its effects on the anicut? Could you suggest any inexpensive temporary pass which would not act injuriously on any portion of the anicut?

3. The pass I allude to would have to be eighteen feet wide, with a series of steps, each one foot high, with basons thirteen feet long between each, except the last three feet of perpendicular height furthest from the anicut, which might be merged into a slope nine feet long, and having a one foot step at the top of it. The whole of the floor of the fish pass should be made as smooth as practicable, and have side walls to maintain it as full of water as possible. The walls for each step should be one foot lower than the one above it, but one-third of the length of each of these walls must be two feet high so as to bring that part on a level with the summit of the one above it. This portion should be on alternate sides of the pass at each step. The basons should hold three feet of water in depth below the walls forming the steps above each.

4. The best place for a permanent fish pass would, doubtless, be up the apron opposite the deepest water, or if such would be dangerous there is a place about eighteen feet wide between the under-sluices and the lateral walls of the apron.

5. A temporary fish pass of rough stones covered with mats, and yearly renewed, such as we conversed upon, might answer, and if you would assist the experiment this year, I shall be happy to advance as far as Rupees 50 for mats to keep the water in the temporary pass and flowing over the wall. The mats employed for covering the steps and sides will, I fully understand, be liable to be washed away, but without them I do not think the construction will answer.

6. As I find that breeding Sable fish are now coming up the river, I should very much wish this experiment to be tried this season, and if you will oblige me by giving me your opinion on the result obtained I shall esteem it an additional favour.

APPENDIX No. II.

Observations on the state of the Fisheries in the Godavery river since 1861.

Questions.	Answers.
1. Do you consider that the fish in the Godavery have increased or decreased since you came here in 1861?	1. I think that the fish have decidedly decreased since my arrival here in 1861. This decrease has been most apparent during the past three years. The causes of the decrease are—1st, the excessive destruction of the fish below the anicut; and, 2ndly, the universal and unrestricted capture of the fry in the river and irrigation channels.
2. Have larger fish been lately captured in the river, or has their comparative size remained unchanged or decreased?	2. I think that the average size of the fish now captured is less than in former years.
3. Are the fry captured to any great extent in the Godavery, the irrigation channels, and the paddy-fields?	3. Yes, the destruction is excessive, and some means for their preservation should be adopted. I would suggest that the Superintendents of the irrigation should be empowered to act as "Water bailiffs."
4. Are the fishermen better or worse off now than formerly?	4. The position of the fishermen is unchanged, because (though the amount of fish now captured is less than in former years) the price of the fish has more than doubled.
5. Where are the fish sold which are taken at the anicut?	5. The fish are sold in the local market, and the portion in excess of local demand is sent to Cocanada, Samulcottah, and Peddapoor.
6. Are any salted and sold?	6. A small portion is salted, but a considerable portion is preserved by drying in the sun.
7. In what months are there most fish?	7. The "Pullasa" is abundant in August, September, and October, and sometimes till the middle of November. Other kinds of fish abound in the river above the anicut, and are captured by drag and hand-nets, till the freshes come down in June.
8. What has been the effects of the anicut?	8. The anicut facilitates the capture of fish below it by causing them to collect in large numbers when awaiting a fresh, to enable them to pass over it on their way to the spawning grounds. Since it was raised two feet higher (that is, within the last four years) it prevents the return of the later fry to the sea, and causes them to pass down the irrigation channels where ninety-nine per cent. of them perish either by capture with nets, or by being carried out in the small channels which run into the paddy-fields.
9. Have you heard of the fish being left to decay on the banks of the rivers, if not sold?	9. I have heard that, before my arrival here in 1861, the fish were sometimes allowed to rot, namely, when the supply was in excess of local demand. This does not now occur, as there are great facilities for conveying it by transit boats to Cocanada and Samulcottah. Further, the enhanced value of the fish now causes it to be dried, if in excess of present requirements.

10. Can you tell me if any rent, subsidy, or bribe in any form, is paid by the fishermen to be allowed to capture fish in Rajahmundry ; if so, the amount, and to whom ?

10. I have heard that fees are paid, but it is very difficult to obtain reliable information.

11. In what months do the fry of the sea species try and go to the sea. Can they cross the anicut ; and if not, what becomes of them in your opinion ?

11. The early fry of the sea species begin to pass down to the sea in November and December. There is then some water passing over the anicut, and they can cross it. I believe that after December they cannot cross the anicut, and thus the later fry are compelled to pass down the irrigation channels where they are captured, or pass into the paddy-fields.

12. If the destruction of fish is excessive, what measures do you consider necessary to be taken to stop it, without interfering more than is absolutely necessary with the fishermen ?

12. The fishermen should be compelled to enlarge the meshes of their nets, and small fish should not be captured while the fry are passing down to the sea. Fish passes should be made in every anicut, and all fishing should be discontinued on one day in each week, this would give the fish one quiet day in seven to approach the foot of the pass.

13. Do you imagine any alteration is called for in the size of the mesh of the nets ?

13. Decidedly the meshes are too small.

RAJAHMUNDRY, (Signed) FRANCIS DAY,
7th October 1868.

To the Reverend Dr. Murphy.

RAJAHMUNDRY, (Signed) J. MURPHY.
8th October 1868.

Memorandum of expenses incurred from Madras to Cuttack, inclusive.

			RS.	A.	P.
September	2nd.... ...	Goods to Steamer ... ... Embarking at Madras... ... ... Disembarking at Masulipatam, and telegram	24	8	0
		Freight and charges	21	9	0
September	3rd.	2 First class tickets by Steamer	120	0	0
		4 Third class do. do.	40	0	0
,,	5th to 9th.	Fishermen and bearers	4	0	0
		Conveyance to fishing grounds	3	8	0
,,	10th.	Expenses to boat and on to Bezwada	17	5	0
,,	12th to 14th.	Fishermen, bearers, &c.	5	13	0
,,	15th to 28th.	Do. do.	10	3	0
,,	29th.	Boat and expense from Bezwada to Ellore ...	13	6	0
,,	30th.	Do. do. Ellore to Rajahmundry ...	21	12	0
October	2nd to 8th.	Fishermen and bearers	9	0	0
,,	8th.	Boat to Cocanada	21	0	0
,,	9th to 13th.	Fishermen and bearers	7	0	0
,,	13th to 17th.	2 First class tickets, 4 Third class, and freight by Steamer to Gopaulpore, and landing charges ...	226	8	6
,,	19th to 23rd.	Fishermen and bearers	8	9	0
,,	23rd.	Bearers and cart to Berhampore	3	12	8
,,	24th.	Fishermen and bearers	2	0	0
,,	26th.	Bearers, &c., to Chetterpore	19	15	0
,,	27th to 29th.	Fishermen, &c.	2	0	0
,,	29th.	Bearers, &c., to Ganjam and fishermen there ...	6	0	0
,,	31st.	Do. to Rumbah	5	10	0
November	2nd.	2 Boats to Tanghy	13	2	0
,,	4th.	Bandies to Cuttack	12	0	0
		Bearers and hire of palkees to Cuttack	29	0	0
		Total ...	647	9	2

(Signed) FRANCIS DAY.

R. D.

Memo for orders on A^s 3028-3697 and 3925.—

In the latter part of 1867, the attention of Government was attracted to the injurious effect of irrigation works on River Fisheries, and the Collectors of Godavery, Kistna and Tanjore were called upon for certain information on the subject vide the Proc^s of Govt. under date 11 th Sept^r 1867 N^o 2140.

2. The reports of these officers were forwarded to Govt by the Board of Revenue with their Proceedings under date 28^th January 1868, N^o 156, and disposed of by

I would request that a special letter be addressed to me for transmission to Mr. Day's

by Govt. in their Order under date 27th May 1868, No. 1466. The Government expressed their opinion that from the information contained in the papers submitted, there could be no question that in all the great rivers which flowed out in the East Coast of the Presidency, there were certain kinds of valuable fish which came up from the sea to deposit their ova in the head waters of the rivers, but were intercepted by the anicuts and there easily captured and destroyed in large numbers with the roe in them.

The diminution of the food supplies of the people was an inevitable result of this method of fishing and the Govt. deemed the

No. 3028

From Surgeon T. Day
On Special Duty,
Dated 9th September 1868.

FOR ORDERS.

This report affords but small material for any observations, as Dr Day leaves to a future day a fuller report, his propositions for remedial measures. I suppose I shall be on the hope that the "comprehensive" report honoured by Dr Day will be more considered than the present one. primary

A.J.A. The people who reside on & on the banks of the Cauvery & Coleroon are of the fishing community. I should suppose there are very few Mahomedans about there who follow fishing or the use of nets in fishing nets: and therefore no complaint from any quarter has yet reached the Govt that a scarcity of fish for food has any where been experienced.

Dr Day's closing paras: about his expenses, domestic & otherwise, are quite out of place in a report of this character & should be excluded from it, with instructions to make them up into a separate letter. I do not however see why Dr Day's bill should be detained because he took his wife & children with him. If Mrs Day had been left at Madras, she must have been fed & lodged & would, in that position, have cost him more th

I would record the
communication with
reference to the
proposed subsequent
Report. I do
not however agree with
my colleagues in thinking
that we ought not to
legislate for the
prevention of the nuisance
the Slaughtering of
the animals are ready
to anticipate the future
& the present. I
think it is much
to be lamented the food
supplies of the
Country by regulation
or Legislation.
I think it may shield
him under the circumstances
circumscribed within
his advances. But I
would give him the very
small allowance for
travelling R.s 374.
and R.s 200 which
he has lost or forfeited
by his suspension. The
whole affair is only
£50. I would never
make a difficulty
with a servant who
charged with a duty
of this nature.

N.

REVENUE DEPARTMENT.

No. 3697.

From Surgeon F. Day. F.L.S. &c. &c. &c.
Dated 17th November 1868.

FOR ORDERS.

Referring to para 34 of his communication from Dr. Day, we are all without his "Conclusive" report— that, Super, will contain any memoranda Dr. Day may have made for preserving fish or preserving the different kinds enumerated & with the advantage of taking one or more specimens. Please communicate Dr. Day the terms of Report

Dr. Day

N.

WM

A.A.

the evil, one of sufficient magnitude to justify their interfering to avert it.

3. As, however the Board had requested Mr. Fraser, the Collector of Godavery, to enquire, while on leave in England, as to the best means of furnishing the fish with the means of surmounting the obstacles to their reaching their breeding waters, the Government deemed it advisable to await his return before undertaking any works for this purpose; but they resolved in the meantime to depute Mr. Day to enquire into and make a comprehensive report on the subject in all

all its bearings.

4. Subsequently a letter from the Govt of India was received requesting that Dr Day's attention might be called to the practical aspect of the question, as well as to its scientific bearings, and that information might be obtained (1) as to what fish constituted a practically important portion of the food of the people (2) which of those migrate for the purpose of depositing their spawn (3) among migrating fish, what are those which live entirely in fresh water, and what are those which pass from the sea or brackish water into the fish

river

river waters and (4) what are the precise habits of each of these classes of fish as to their migration, both in respect to their extent up the rivers, and the season at which they occur, and also the season at which the young brood of fish are developed, and at which they descend the rivers.

5. The Government of India also requested that Dr Day might be directed to extend his enquiries to the rivers of the Orissa Coast in the Bengal Residency, and they enquired whether any wanton destruction of fish took place in the Inland

Rivers

Rivers of the Madras Presidency.

5. In the order of Govt. under date 12th August 1868 No. 2151. Dr Day's Special attention was drawn to the points for enquiry specified by the Government of India and he was directed to visit the rivers of the Orissa Coast. The Board of Revenue were also requested to ascertain from Collectors of Districts whether any wanton destruction of fish took place in the Inland Rivers.

6. In conformity with these orders Dr Day has now submitted three interesting and valuable reports summarizing in his third, the information

contained

contained in his first and second. He examined the Coleroon and Cauvery rivers in the South, then returned northwards to Madras, enquiring into some of the tank fisheries on his way, and making a short detour to the Palar River in North Arcot. From Madras he proceeded by steamer to Masulipatam, from which place he investigated the fisheries in the Kistna and Godavery rivers. From thence he passed to the Ganjam District landing at Gopalpore where he enquired into the Sea and Fresh water fisheries, and

proceeded

proceeded to the Chilka lake
viâ Berhampore, Chudlepore,
Ganjam, and Rumbah.

7. Though Dr. Day does
not give any precise
information as to the
particular fish which
form any material por-
tion of the food of the
people in each locality,
the result of his enquiries
shews that in all parts
of the country which
have been visited
by him, there is
usually a ready
market for fish,
and it frequently
happens that the
fishermen

fishermen are
unable to meet
the local demand.

8. In paragraphs
5, 6, 7 & 8 of his
third report, he
gives an interesting
account of several
kinds of fish
which fall into
the three classes.
Non-migratory
fresh-water fishes,
migratory fresh-
water

water fishes, and migratory sea-fishes which ascend the rivers, but precise and detailed particulars of the character desired by the Government of India in regard to the habits &c. of each class have not apparently been obtained, though much information of a general nature is submitted.

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9. It seems from Dr. Day's enquiries that there is a general decrease of the supply of fish both in rivers and tanks except in the Ganjam District. That the decrease in the Cauvery and Coleroon Rivers and in the Kistna and Godavery is to be ascribed in a great measure to the construction of the anicuts, which undoubtedly have the effect of preventing the fish generally from proceeding up the rivers to their breeding

breeding waters, and
also act as obstacles
to the young fish
when returning sea-
=wards. It appears
also that large numbers of fish
are caught close under
the sluices in their
endeavours to ascend.
Dr. Day, however, does
not ascribe the decrease
in the supply of fish
solely to this cause. The
principal reason he con-
=siders to be the want of

destruction

destruction of fry which
takes place owing to the
small mesh of the nets
used by the fishermen,
and the indiscriminate
fishing which usually
takes place.

10. The remedies sug-
=gested by Dr. Day
are (1) that all pieces
of water sufficiently
large for fishing, which
are not navigated as
a rule by sea going
vessels, should be
leased out, in order

to

to give a distinct interest to some person in preventing indiscriminate fishing.

(2). That provision should be made in the contracts for the protection of fish, in regard to the size of the mesh used, the periods and the penalties for fishing the

draining

draining off of water in tanks and the poisoning of rivers. He also recommends that fish passes of which he submits an improved pattern, should be constructed at the dams to enable the fish to pass over them; and that rewards should be given for the destruction of vermin which are known to destroy fish. He is not in favour of prescribing fence months for some fish are best suited for the table during the breeding season. He would, however, prohibit fishing during certain months in the irrigation channels through which the spawning fish pass, downwards towards the sea.

11. In conclusion, Dr. Day recommends that a complete enquiry into the whole of the fisheries of the Madras Presidency

Presidency both sea and inland should be undertaken, and he appends a list of questions which he proposes should be circulated to certain officers.

12. The adoption of Dr. Day's proposals, can do no harm, and will probably slightly augment the receipts of our local funds to which fish rents are now credited, as there are numerous pieces of water the fishing of which is not now rented. Indeed, as shewn by Dr. Day, in some Districts, the fishing is altogether free. It is submitted that the Board of Revenue might be directed to find Dr. Day's suggestions in force in the ensuing Rev. year which commences on the 1st of July. The Board might also be directed to combine the three sets of questions proposed, in such a manner as to obtain from Collectors all the information which Dr. Day seeks.

13. The fish passes which Dr. Day proposes to erect for the present at the Bezwada and Lower Anicuts only, on the Kistna & Coleroon rivers might be referred to the P.W. Dept. for their opinion as to whether Dr. Day's pass is an improvement, & and after this point is settled, that Dept. might be directed to construct a fish pass at each of those places.

14. It would perhaps be well also to refer to the Board of Rev. for enquiry

enquiry and report, &c
Dairs remarks in his second
report (March 8, 1821) about
the renting of fisheries by
the D. C. C. and the
taxing of the fisheries
at Rajahmundry and
Dowlaishweram.

The suggestion made by
the Rev: Secretary Powell
be adopted W.O.L

Agreed N. D. A.

Ed. Thomason
Esq.

Revenue Department

G. 1185

Proceedings of the Madras Government

Under date the 30th April 1869.

Read again Reports from Surgeon F. Day F.L.S. &c. &c. &c. dated — September and 17th November 1868, and recorded in Pro: of Govt. 4th July 1869, No. 306.

Read also the following further Reports from F. Day Esq. dated 7th December 1868.

In the latter part of the year the attention of Government was attracted to the injurious effect of irrigation works on River Fisheries, and the Collectors of Godavery, Kistna and Tanjore were called upon for certain information on the subject in

in the Pro.t of Govt. under date
11th September 1867, N.o 2140.

2. The reports of these Officers were forwarded to Govt. by the Board of Revenue with their Proceedings under date 28th January 1868 N.o 656, and disposed of by Govt. in their Order under date 27th May 1868, N.o 1468. The Govt. expressed their opinion that from the information contained in the papers submitted, there could be no question that in all the great rivers which flowed out to the East Coast of the Presidency, there were certain kinds of valuable fish which came up from the sea to deposit their ova in the head waters of the rivers, but were intercepted by the anicuts, and then easily captured, and destroyed in large numbers, with the result in these the diminution of the food supplies of the people was an inevitable result of this method of fishing, and the

the Govt. deemed the evil, one of sufficient magnitude to justify their interfering to avert it.

3 As, however, the Board had requested Mr. Fraser, the Collector of Godavary, to enquire, while on leave in England, as to the best means of furnishing the fish with the means of surmounting the obstacles to their reaching their breeding waters, the Government deemed it advisable to await his return, before undertaking any works for this purpose, but they resolved, in the meantime, to depute Mr. Day to enquire into, and make a comprehensive report on the whole subject in all

all its bearings.

4. Subsequently, a letter from the Govt. of India was received, requesting that Dr. Day's attention might be called to the practical aspect of the question, as well as to its scientific bearings, and that information might be obtained

(1) as to what fish constituted a practically important portion of the food of the people.

(2) which of those migrate for the purpose of depositing their spawn.

(3) Among migrating fish, what are those which live entirely in fresh water, and what are those which pass from the sea or brackish waters into the fresh river

-river waters and (4) what are the precise habits of each of these classes of Fish as to their migrations both in respect to their extent up the rivers, and the season at which they occur, and also the season at which the young brood of fish are developed, and at which they descend the rivers. The Government of India also requested that Dr. Day might be directed to extend his enquiries to the rivers of the Orissa coast in the Bengal Residency and

April 1869

and they enquired whether any wanton destruction of fish took place in the Inland Rivers of the Madras Presidency.—

5. In the order of Government under date 12th August 1868, No. 2151, Dr Day's special attention was drawn to the points for ~~specified~~ individual enquiry by the Government of India and he was directed to visit the rivers of the Orissa Coast. The Board of Revenue were also requested to ascertain from Collectors of Districts whether any wanton destruction of fish took place in the Inland Rivers.

2.

6. In conformity with these orders Dr Day has now submitted three interesting and valuable reports, summarizing in his third, the information contained in his first and second. He examined the Coleroon and Cauvery rivers in the South, then returned northwards to Madras, enquiring into some of the tank fisheries on his way, and making a short detour to the Palar River in North Arcot. From Madras he proceeded by steamer to Masulipatam, from which place he investigated the fisheries in the Kistna and

and Godavery rivers. Thence he passed to the Ganjam District landing at Gopalpore where he enquired into the Sea and Fresh water fisheries and proceeded to the Chilka lake via Berhampore Chuttepore Ganjam & Purnbala

7 Though Lt Day does not give any precise information as to the particular fish which form any material portion of the food of the people in each locality, the result of his enquiries shews that in all parts of the country which have been visited by him, there is usually a

a ready market for fish and it frequently happens that the fishermen are unable to meet the local demand.

8. In paragraphs 5, 6, 7 and 8 of his third report he gives an interesting account of several kinds of fish which fall into the three classes, Non-migratory fresh-water fishes, Migratory fresh-water fishes, and Migratory Sea-fishes which ascend the rivers, but

precise

* of 7 Dec. 1868.

precise and detailed particulars of the character desired by the Government of India in regard to the habits, &c. of each class, have not apparently been obtained, though much information of a general nature is submitted.

9. It seems from Dr. Day's enquiries that there is a general decrease of the supply of fish both in rivers and tanks, except in the Ganjam District; that the decrease in the Cauvery and Coleroon Rivers and in the Kistna and Godavery is to be ascribed in a great measure to the construction of the anicuts, which undoubtedly have the effect of preventing the fish generally from proceeding up the rivers to their breeding

breeding waters, and also act as obstacles to the young fish when returning seawards. It appears also that large numbers of fish are caught close under the ancute in their endeavours to ascend. Dr Day however, does not ascribe the decrease in the supply of fish solely to this cause. The principal reason he

he considers to be the wanton destruction of fry, which takes place owing to the small mesh of the nets used by the fishermen, and the indiscriminate fishing which usually takes place.

10 The remedies suggested by Dr Day are (1) That all pieces of water sufficiently large for fishing, which are not navigated as a rule by sea going vessels shou

should be leased out, in order to give a distinct interest to some person in preventing indiscriminate fishing.

(2) That provision should be made in the contracts for the protection of fish, in regard to the size of the mesh used, the periods, and localities for fishing, the

draining off of water in tanks, and the poisoning of rivers. He also recommends that fish passes, of which he submits an improved pattern, should be constructed at the sluices to enable the fish to pass the anicuts, and that rewards should be given for the destruction of vermin which are known to destroy fish. He is not in favour of prescribing fence months for some fish, as it would be difficult to do so for the table during the breeding season. He would, however, prohibit fishing during certain months in the irrigation channels through which the young fish pass downwards towards the sea.

11. In conclusion, Dr. Day recommends that a complete enquiry into the whole of the fisheries of the Madras Presidency be

both sea and inland should be undertaken, and he appends a list of questions which he proposes should be circulated to elicit answers.

The adoption of Dr Day's proposals seems unobjectionable and will probably slightly augment the receipts of the local bodies, to which fisheries are now credited, for there are numerous cases of poles, the fishing of which is not now elicited. Indeed, as shewn by Dr Day, in some districts the fishing is altogether free. The Govt therefore resolve to direct the Board of Revenue to put Dr Day's suggestions in force in the ensuing Revenue Year, which commences on the 1st of July. The Board will also be instructed to combine the three sets of questions proposed

for in Council on the reception of Dr Day's report and resolved to send the Board of Revenue at once a Circular for putting into force as far as practicable from the 1st of July next.

Confirmed here in the most suitable way that can be found for the purpose intended

x 7/7 Rec'd 68.

proposed in such a manner as to obtain from Collectors all the information which Dr Day seeks.

13. The subject of the fish passes which Dr Day proposes to erect for the present at the Bhrawadah and Lower Cauvery only, on the Kistna and Collroon rivers will be referred to the P.W. Department for their opinion as to whether Dr Day's proposals in this respect, and if such is the case, orders will be issued for that Department for the construction of a fish pass at each of the places above mentioned - accordingly

14. The Govt resolve also to refer to the Board of Revenue for enquiry and report, Dr Day's remarks in his second report (paras 8-18-21) also the

the visiting of fisheries by the Department Public Works, and the taxing of the fishermen at Bequimmy and Dorchester.

Cases Surgeon Day Mr Durkee 80 Rec. 169 Mr 306 Despatch
" Prof Rice "
" Dr Dept "