XV.—*On the Introduction of Salmon into Tasmania.*

REPORT of a Sub-Committee appointed at the February Monthly Meeting of the Royal Society, to consider the questions submitted in the note of the Hon. the Colonial Secretary of the 9th of February, 1858, relative to the Introduction of Salmon into Tasmania, and the payment of the Parliamentary Reward of £500.

Members:—Hon. E. S. P. Bedford, Esq., M.L.C.
J. W. Agnew, Esq., M.D.
Morton Allport, Esq.
Joseph Milligan, Esq., F.L.S., Sec., R.S.T.

£500.—"Conditions on which the money would be paid:—viz. If Spawn be introduced, whether that should be the sole condition?"

1. Upon this the opinion of the Sub-Committee is,—that the mere introduction of *Spawn*, even though properly fecundated, and in a state of vitality, ought not of itself to entitle the person introducing it to any portion of the reward.

2. The Sub-Committee consider that the £500 ought only to be paid upon delivery in the Colony, to persons duly authorized, of not less than five hundred living Salmon fry three months at least after their escape from the ova, or of not less than two hundred and fifty of Salmon smolt, alive and healthy, or of five pairs of full-grown male and female Salmon,—that is, of fish which have visited the salt-water, whether grilse or older.

3. The Sub-Committee think that the introduction of a smaller number of healthy living fry of Salmon, or of healthy smolt, should entitle the importer to a proportionate amount of the reward; always providing that no claim exceeding half the amount specified in each case in the following scale should be recognized on any delivery of fry less than three months old, whatever their number or condition may be.

4. The Sub-Committee accordingly recommend that partial payments be made on the following scale :—

For the introduction of—		£
100	Healthy living Salmon fry and no less number	300
200	Ditto ditto	350
300	Ditto ditto	400
400	Ditto ditto	450
500	Ditto ditto	500
Or for the introduction of—		
50	Salmon smolts in good condition	300
100	Ditto ditto	350
150	Ditto ditto	400
200	Ditto ditto	450
250	Ditto ditto	500
Or for the introduction of—		
2	Pairs of full-grown Salmon, that is, of the age of grilse or older, being male and female	200
3	Ditto ditto	300
4	Ditto ditto	400
5	Ditto ditto	500

"If it should be required that the fish be kept *alive* until of an age to be placed in the rivers,—who is to be at the expense of keeping the fish in the meanwhile?"

5. Upon this point the Sub-Committee are distinctly of opinion that, as the successful introduction of Salmon into the Colony would benefit the whole community, all the expenses necessarily incurred in conducting the experiment to its termination ought to be defrayed by the Government, whether such charges be incident upon the safe custody and care (after arrival here) of Salmon spawn alive, but not hatched, or of Salmon fry of tender age, or of *smolts*, &c. of a size and age fitting them for a journey to the sea, or of adult Salmon.

6. About the year 1850 the French Government thought it of sufficient national importance to nominate a *Commission de Pisciculture*, with the celebrated naturalist, M. Coste, at its head, to inquire into and report upon a project for stocking various rivers of France with Salmon and Trout, &c., and to superintend an establishment formed for that purpose. In 1852 the system was adopted at Outerard in Ireland, and

in 1853 taken up and acted upon extensively and most successfully by the Municipality of Perth in Scotland, in which body certain rights pertaining to the fisheries in the Tay River there are vested.

7. The ample experience obtained by the persons employed at these large establishments, by Mr. Shaw of Drumlanrig, and by Mr. Young of Invershin, and at other establishments of minor importance at home, renders it unnecessary for the Sub-Committee to hazard any remarks upon the mode of procuring and shipping Salmon spawn, fry, or smolt, or of their management on board ship, otherwise than as they may be affected by the conditions of the voyage itself, through varying temperature, &c., to this Colony.

8. The Sub-Committee think that, were the Colonial Government to enter into a correspondence on the subject with the Burgh Magistrates of Perth, a thoroughly experienced and trustworthy person might by their means be engaged to take charge of and conduct any piscicultural station and operations which it may be necessary to maintain in this Colony for a year or two. It is accordingly suggested that it be a recommendation from the Royal Society to the Colonial Government to open communication with the Town Council of Perth, and to solicit such aid as they may be able to afford, as well in the selection of one or two active, intelligent, and well-behaved men of experience from the number of their *employés*, as in all the details of procuring and preparing spawn duly fecundated, or young fish, with suitable boxes, &c., to meet the exigencies of the long voyage and its changing climatic conditions.

9. The Sub-Committee do not suppose that any difficulty would be experienced in finding, by this mode of procedure, men practically acquainted with the artificial propagation of fish, who would be perfectly willing to make an agreement to enter and continue in the service of the Government or of an association organized here for the purpose of carrying out the project, during a period of three years,—a term which would afford ample time to test its practicability, and, probably, to diffuse the breed of Salmon over many of the rivers of Tasmania.

10. It is concluded that persons undertaking such an enterprise would correspond with the Colonial Agent in London. The Sub-Committee therefore suggest the propriety of this officer being instructed to place such persons in communication with the Town Council of Perth, in order that the latter may be thereby enabled nicely to time the engagement and departure, &c. of the men they may be empowered to hire, and that the experiment may have the full advantage of the experience and aid of men so hired during their voyage to the Colony.

11. In order more completely to ensure the success of the experiment, the Sub-Committee, without entering into minutiæ of arrangements previous to shipment, which would be better left to those more immediately interested and of greater experience in such matters, beg to recommend that young Salmon fry (pars) should be shipped in tanks, at the same time and together with the boxes of spawn, as the men who attend to the latter could with perfect ease manage the former; and similar contrivances for maintaining a constant flow of fresh water would be requisite in either case.

12. In the event of young fish being selected for the experiment, your Committee would suggest that the trial might, with very little additional expense or trouble, be made still more complete and decisive by shipping, in a separate tank or tanks, Salmon smolts, about twenty-four months of age, when they would naturally be prepared to migrate to salt water, and to sojourn there for two or three months, and might be expected, therefore, to thrive if kept in it during the voyage, in which case it is scarcely necessary to remark, that any quantity might, with facility, be procured for them alongside the vessel.

13. It is not to be expected that the enormous growth, peculiar to the Salmon during its migration to the Sea, could manifest itself under such circumstances; and it would probably be discovered that smolts, so confined in tanks of sea water, would require a regular supply of food, besides that yielded in the shape of animalculæ by the salt water itself.

14. The grand obstacle to the introduction of Salmon spawn hitherto having been the difficulty, or rather impracticability, of retarding the process of maturation in the ova, so as to prevent hatching out the young fry during the voyage, the Sub-Committee consider that the experiment made with spawn would still be almost certainly frustrated, unless means were devised for preserving the ova comparatively cool during the whole, or nearly the whole, of the passage out. Ice, as suggested at page 221 of Vol. ii. of Papers and Proceedings of the Royal Society, presents itself as a most convenient and manageable agent for the purpose. The ova of Salmon have, under favourable circumstances, been hatched in fifty days, while cases have, on the other hand, occurred in which the young fry did not emerge till 140 days had elapsed from the date of fecundation. In the course of experiments at Barnhill, near Perth, spring-water directed so as to flow over boxes of Salmon spawn was found to answer perfectly the purpose of the continuous stream known to be essential for preserving vitality in the ova, and so treated, the fecundated spawn yielded young fry in sixty days. In France the Salmon ova are said to be hatched in the artificial breeding ponds in sixty days. At Stormontfield, the site of the piscicultural operations of the proprietors of the Tay fisheries, the time for maturation of the ova and hatching out of the Salmon fry is 120 to 140 days. The temperature of the spring-water referred to would, probably, be a few degrees under the mean annual temperature of the place, which is about 47·5, say 42°, while the temperature of the water employed by the Perth authorities, which was taken from Stormontfield mill-race, would probably range about 4° or 5° lower, the atmospheric temperature for the winter quarter there being 38·8°. Organic development in the ova is, therefore, hastened or retarded just in proportion as the temperature may be high or low. M. Coste hatched Salmon ova arranged with layers of gravel, &c. in the usual way in canals or drawer-like compartments placed successively one over another from bottom to top of a tub, into the uppermost of which, a run of fresh water being intro-

duced from a tube with a regulating stop-cock, was made to percolate unintermittingly through the whole series. M. Coste's contrivance seems particularly well adapted for the narrow space and the limited amount of fresh water which can be afforded on board ship. Were one such tub containing the ova enclosed within another, so much larger as to admit of an interspace filled with water, the temperature of which could, by means of ice surrounding the cistern whence it issued, be preserved at a point near to that of the water employed in Stormontfield breeding troughs, say about 38°, and the ova continuously supplied with water from the same source, an equable temperature might be maintained within and around the spawn tub, so low as to give every reasonable assurance that the ova would not be hatched within the time occupied on an ordinary passage from Europe to the Colony. The tubes employed, it need scarcely be observed, ought to be of flexible material, and the boxes or tubs containing spawn or young fish should be so placed and secured as to obviate violent shocks, and to have a command of good air. In the case of young fry it would still be essential to keep up a run of fresh water through the tanks holding them, but the low temperature might be dispensed with. Smolts of two years of age, as already observed, would, probably, live out the voyage in tanks of sea water, if aided by subsidies of food thrown in to them.

15. In anticipation of young Salmon fry being delivered here alive, it would be expedient and most desirable to have pens and ponds prepared for their reception near the margin of a perennial stream or rill of pure water, to be diverted at will into or away from them, as might be required.

16. Similar ponds, connected with an ever-flowing rill of good water, would be absolutely essential for the reception of ova, should such be delivered here unhatched, though still in a living and healthy condition. The character of the streamlet and of the brook or river into which it falls should correspond as nearly as possible with the affluents of the Salmon rivers at home, up the tributaries of which the pregnant fish are known to force themselves, in order to deposit their spawn in the beds of shingle and gravel prevailing there.

17. It appears to your Sub-Committee to be indispensable that the site selected for the first of such ponds should not only be connected with a suitable main river channel, but that it should be within a moderate distance of Hobart Town, so as to admit of frequent and close supervision from Head-quarters.

18. The stream which most perfectly fulfils these intentions is probably the North West Bay River. The Derwent is the only river besides, which, within an accessible distance, is at all adapted to the purpose, and there can be no doubt that one or other of its many smaller affluents a few miles above New Norfolk would be found to suit admirably in every respect, except in the matter of distance from Hobart Town, which is no immaterial consideration, however, where constant supervision is so essential.

19. Mr. Morton Allport, who is familiar with the North West Bay River, gives the following reasons for preferring it to any other :—

> "*First.*—The moderate distance from town, and consequent ease of supervision.
>
> "*Second.*—The great purity of the water and quantity of feed.
>
> "*Third.*—The comparative absence of natural enemies.
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> "*Fourth.*—The river presents a series of shallow, gravelly rapids, and deep, still holes, from its source to its mouth, and is fully as large as many of the streams in which I have caught Salmon fry in Wales.
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> "*Fifth.*—The short course of the river (about twelve miles), which will enable the fish to reach the sea in a short time. This is of the greatest importance, as it has been incontestably proved that the destruction of fish from natural causes is infinitely greater in the fresh than in the sea water.
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> "*Sixth.*—The slight variation in the temperature of the water which at the source is not perceptibly different summer and winter. The rapidity of the fall prevents any great change of temperature below."

20. In the event of spawn or young Salmon fry being brought in safety to Hobart Town, it would be essentially necessary to have them immediately removed, with all care and tenderness, and with every precaution against accidental

injury, to nursing ponds prepared beforehand. Ground ought therefore to be enclosed and ponds excavated, in anticipation of such arrival. The ponds should be connected by shallow channels on one hand with the river, and on the other with some slender tributary. Clean wooden troughs, provided with sluices to guard against floods and sediment from back water, if near the river's level, would probably answer best. The egress of young fish and the ingress of voracious aquatic enemies would have to be prevented by the use of wire gratings, and the ponds would probably need to be netted over to avoid the depredations of rapacious birds. An area of two to four acres would probably afford space enough for all the contrivances and appliances needful, and also admit of the construction of a cottage and garden for a resident overseer.

21. The cost of forming ponds and channels depends much upon the nature of the ground to be excavated, and upon surface levels, &c. No precise site having yet been determined upon, your Sub-Committee are unable to form any close estimate of the probable amount of outlay which these works would entail; but they are of opinion that all the preliminary operations taken together may be executed upon contract for a sum not exceeding £200.

22. In conclusion, the Sub-Committee venture to suggest, that even after the safe arrival and delivery of fecundated spawn or of young fry, the success of the experiment may be rendered still more certain by the offer of an additional premium, to be paid upon the production of the first proof of Salmon having actually spawned and bred in any Tasmanian river, to the person who first placed Salmon spawn or young Salmon in such river.

(Signed) JOSEPH MILLIGAN,

Secretary.

The Report which was brought up, read, agreed to, and ordered to be communicated to the Government, at a meeting of the Royal Society held on the 16th March, 1858, was transmitted accordingly to the Hon. the Colonial Secretary, on the 25th March, 1858. J. M.