FISHERIES AS A SUBJECT FOR UNIVERSITY TEACHING.

In the settlement of new countries we find that such as possess easily utilizable natural resources are the first to be develpped. This is due to the fact that nature has already performed the preliminary tasks; the cultivation, growth and development of plant and animal life up to the stage when they are most fitted for the needs of mankind. Men naturally prefer taking the partly finished product instead of labourously duplicating nature's work, and therefore rather than settle in ill favoured sections they pick out those localities where useful natural resources are most easily obtained.

Not every one is fitted to be a pioneer. Scientists, men of letters, the great classes that fill our offices and workshops do not find such life congenial. They follow later to take advantage of his discoveries, and generally secure more of the financial benefits of his work than does the pioneer himself. The man who first settles in a new country must be inured to hardships, know how to be happy without the many refinements which civilization brings in its train, and must be contented to work in the circumscribed limits to which his situation confines him.

To such people, surrounded as they are by natural resources far surpassing their ability to utilize, it must seem that the wealth of our forests and mines, and the animal life of our land and waters, cannot be impaired by such destruction as they are capable of. They are prodigal in their employment of these resources, and those who subsequently join in their labours follow their methods and habits in dealing with such products of nature as they can use to advantage. In the hurry and bustle of their lives, and in the presence of the ample abundance with which they are surrounded, none gives a thought of the morrow, or if a prophet does arise, his is as "a voice crying in the wilderness." It is only when the damage is done, when our mineral wealth is exhausted, our forests destroyed, our fisheries depleted, our game life nearly extirminated, and our soils robbed of their plant foods that we realize our wrong proceedure and call in the doctors of nature to repair the damage and restore the patients to their natural robustness, vigor and strength.

But not all doctors are good doctors. The old fashioned country practitioner, aided by plain living and country air, successfully treated many of his patients, but our present day knowledge of the human system, the ills it suffers from, and the means of curing such ills, was secured from the specialists our universities have produced. University trained chemists have revolutinized our manufacturies and even our system of warfare. Engineers from our universities have built great bridges, improved transportation systems, harnessed waterfalls, and provided light, heat and power for the services of mankind. It is true the preliminary work in these sciences was often undertaken, and largely forwarded, by self instructed workers in their special fields, but the greatest advancement has come, and will more and more continue to come, from those whose university training especially fits for the work.

It is a lamentable fact that in spite of our every day dependence on the natural resources of the country we have made less progress in the study of conditions surrounding them than we have in relation to medicine, chemistry or engineering. In fact in many respects astronomers have progressed farther in the study of heavenly bodies than our specialists in agriculture, forestry or biological studies have advanced in knowledge concerning the productions of the earth. The country is full of so called experts on agriculture, horticulture and live stock. The government has strewn the land from end to end with experimental farms. We have forestry overseers, and numerous others to advise us on special lumbering conditions. And so on with other natural products. But of real scientific knowledge of what ills these industries suffer from, and how to overcome them, our natural resource doctors are woefully ignorant.

It is true that re-forestration has been recommended, but what practical steps towards this end have been taken ? Our cattle and other live stock have been improved by breeding, but much of the credit for this is due the farmer, uninstructed save by his own experience. Practical orchardists have taught so called horticultural experts how to overcome adverse conditions in fruit production. Recently a convention of agricultural experts was held on the prairies and their deliberations were reported in a pamphlet of over 100 pages. Results were given of experiments under government supervision of the rotation of crops and the conservation of soil fibre. These experiments were carried on in many localities and covered a period of years, but in hardly one instance did any two experts agree as to the results obtained, while nothing in the whole report showed definite results had been accomplished. Except in theory these experts remain where they were ten or fifteen years ago.

It is not to be understood from this that no progress has been made in the scientific study of certain phases of our natural resources. There are some ten thousand different species of fishes in our waters to-day, and the habits, structure and classification of these are known and have been described. Similar knowledge has been secured concerning land animals, while the forms, methods of fertilization, germination, and subsequent growth of all species of plant life has been carefully studied and proclaimed.

But with all due credit to the earnest, painstaking scientists who have observed and classified these various wonders of nature, they are somewhat akin to our friend the old fashioned medical practitioner. They have found the patients, diagnosed their ills, and in some cases effected cures. In the main however our knowledge is woefully scant. What we need are specialists who will produce disease resisting plants and animals; will make two blades of grass grow where but one grew before; and who, instead of advocating restrictions on our use of a species to prevent extirmination, will show us how to increase and multiply the production of such specie to an extent that will provide for our utmost demands. As regards plant life there is such a specialist in California, in the person of Mr. Luther Burbank. We need Luther Burbanks for our other natural resources, and the place to produce Luther Burbanks is in our universities.

In no one field of research work is the need of real scientific training more apparent than in relation to our fisheries. Of British Columbia's natural productions fisheries rank next to timber and minerals in value, while if we take the entire production since Confederation it will probably be found that fisheries heads the list.

But despite the importance of our fishery resources, and of the utter lack of scientific training of those regulating and administering them, or who are commercially engaged in the industry, there are but two universities in the world that give special training to students in this branch of biology. The first and oldest of these universities is in Japan; the other is the University of Washington, in Seattle. There are many universities teaching forestry; hundred teaching scientific agriculture; while even states and provinces that are not known to possess mineral resources maintain schools of mines: but only two - one in each hemisphere - are training men to be specialists in fishery research.

Some years ago Prof. Stephen A. Forbes, of the University of Illinois, speaking on the subject of fisheries, said;-

"If we wish to maintain or to improve the conditions of life for the fishes of our rivers, we must first know what the present conditions are, and which of these are the most important for our purposes. We might, it is true, hatch young fish by the million, and throw them out by the hundred thousand, into all sorts of waters which their species inhabit, without any precise knowledge on our part of the conditions in which they will find themselves when set free, or any rational judgement of the chance that they can survive to adult size. This sort of thing, I surmise, has sometimes been done, but I hope that it is, at any rate, done no longer, and certainly it can no longer be defended as either scientific or practical; it is simply ignorant. Intelligent plans for their improvement require that we should know the conditions under which our fishes live, and thatnwe should be able to distinguish beneficial conditions from injurious, and important conditions from unimportant. We need to know what our fishes require in respect to,the main essentials of their well being, that is, to a suitable water supply, to oxegen for respiration, to temperature in the different parts of the year, to their food at all their ages, to breeding places, to freedom of migration and other necessary movements to and fro, and to freedom from injurious physical conditions, from poisonous gases and solutions, from parasites, from diseases, from excessive competition, especially for food, and from decimation by their enemies."

"It is commonly conceded, I think, both by scientific students and by practical fishermen, that the most general and rigorous natural limitations upon the number of fishes are those set by their breeding grounds and their food supply, and that of these the latter is the most important. We especially need to know,therefore, what the most valuable fishes feed upon as fry, as young, and when fully grown, under various conditions, and at different times of the year: where their food supply is most abundant; whether their most important food resources are at all times

sufficiently accessible to them, and under sufficiently favourable conditions; what their food species feed upon in turn; and so on down through the series of forms dependent one upon another until we reach the primary sources of their food, and the conditions of its greatest abundance and availability."

"Next we need to know, for each important fish, its spawning times and places; where such places are to be found; whether the fry can escape from them in due season, and if not, why not, and what can be done about it; whether such most desirable spawning grounds are present in the necessary abundance and of convenient access, and if not, what can be done about that. All this involves, as it seems to me, a systematic survey and description, from the fisheries standpoint, of the whole congeries of waters - main river, tributary streams, and connected lakes - so made as to lead to a clear discrimination of their individual features as homes for fishes or places of occasional resort, and leading also to a classification of them in definite groups and kinds, each kind containing similar waters with similar surroundings. As soon, however, as we attempt to analyze, in this sense, the envioronment and the needs of the more important fishes, we find the essential elements of their welfare so interwoven, in one direction or another, with those of virtually all the other organisms in their neighborhood, and detirmined at so many points and in so many ways by the whole local system of things - biological, chemical, and physical, aquatic and terrestial, climatical and seasonal - that there is evidently no fit way to our end except by a general survey and analysis of that system as a whole."

It is twelve years since Prof. Forbes made these comments. He laid down 23 essential points as requiring elucidation before we could speak authoritively on what is needed to preserve our fishery resources. His audience embraced many of the most prominent fish culturists on the continent, who congratulated him upon his masterly presentation of the case and pronounced his arguments unanswerable. It might be expected that action along the lines he recommended would have followed, but, despite 12 years lapse of time, not one of these 23 essential points has as yet been detirmined; in fact it can almost be maintained that no intelligent attempt has been made to investigate any single one of them. Our fishery doctors are following the old fashioned obsolete practises of our forefathers. We still release hatchery fish in the manner which Prof. Forbes condemned as indefensible on either scientific or practical grounds, and we know no more of the conditions under which our fishes live, and what they have to contend with, than was known at the time he spoke.

This state of affairs cannot be wondered at when we consider the class of men to whose keeping our fishery resources are entrusted. Practically all of our administrators are political appointees whose chief qualification has been their loyalty or assistance to the reigning political party. We insist on lawyers to administer our laws; medical practitioners for health problemns; architects for public building construction; qualified engineers for road making and other engineering works; but our

fishery resources, although producing over $100,000,000. annually, are left to the tender mercies of politicians, here to-day and gone to-morrow, who have neither knowledge nor experience to qualify them for the task.

Instead of showing progress in the study of the problemns mentioned by Prof. Forbes, the U. S. Bureau of Fisheries, in a report just issued, simply reiterate his opinion in the following words;-

"The decline of valuable fisheries has been witnessed too often to admit of continued faith in the inexhaustibility of fish or shellfish of any kind. Yet the intelligent detirmination of what restrictive measures are necessary, what means of exploitation are unreasonable, or what plans of propagation or development are profitable can be made only upon the foundation of full and correct knowledge of the life histories, habits, and conditions of life of the fish that are to be considered."

And the report further on says;-

"The scientific knowledge which is the basis of the future welfare of the fisheries requires not only time and application, but also skill and special training. Of greatest importance are the services of men who have not only natural qualifications and the preliminary training which institutions of learning can give, but also such special experience, interest, and devotion as can be gained only as the result of prolonged application to fisheries studies. Something may be done with inexperienced and changing agents, but the most successful and economical work will be done with a trained and continuing force."

It is time then that our universities responded to the needs of the fishing industry and trained students for the special work outlined. That there is a future for such specialists is self evident, not only for governmental appointments, but in commefcial life as well. It is necessity, not inclination, that forces business men to intrust the management of their companies to the class of men they employ to-day. They will quickly and willingly engage the specialist who can keep the plants in operation and also knows how to insure future supplies. A few years ago the university educated agricultural student was looked upon as a "kid gloved" farmer, and was derisively compared to the so called "practical" farmer. To-day the positions are reversed. It is the university man who is considered "practical" and draws the big salary, while the old fashioned farmer is content to serve under him and learn from experience the knowledge of what crops are most profitable, and what are most adaptable to his particular soil. The same opportunities await the fishery specialists as the agriculture specialists now enjoy, and when the industry is confided to the keeping of duly qualified experts we can confidently expect not only will the supply of raw material be maintained, but our operations will be extended to the utilization of species now wasted; our by-products will be turned to profitable account; and healthful employment will be provided for a far greater number than can obtain work in the industry as it is conducted to-day.