

**PRACTICUM IN AQUACULTURE**

**THE CULTURE AND REPRODUCTION**  
**OF SALMONID FISHES**

**User's Manual for Graduate Course AQUA\*6200**  
**M.Sc. - Aquaculture Program**

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**PRACTICUM IN AQUACULTURE:  
CULTURE AND REPRODUCTION OF SALMONID FISHES**

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<ul style="list-style-type: none"><li>• A Farmers guide to understanding Water Quality: LaDon Swann.</li><li>• Principles of site selection for land-based salmonid culture</li><li>• Evaluating the Feasibility of Business Opportunities: Bill Baxter.</li><li>• Developing a Marketing Plan: Brian Cardy.</li><li>• Preparing Business Plans: B. Cardy, R. Gamble, E. Helps &amp; E. Schneider.</li></ul>	

## PREFACE

This practicum in aquaculture is designed to familiarize students with several of the unique aspects of maintaining fish in captivity and provide them with practical experience associated with 'hands on' training. Of particular importance is the opportunity to observe and handle fish under culture conditions, and experience some of the daily routines in a fish culture facility.

This manual covers a wide range of activities, most of which can be experienced at the Alma Aquaculture Research Station (AARS). As some routines are seasonal (eg. gamete collection), not all operations may be carried out during the session. Subsequent visits to the AARS or other facilities are expected to fill in these gaps. While the manual provides the core material necessary to carry out all discussed tasks, additional sources of information are identified at the end of each chapter.

To provide a framework from which to evaluate the experience gained on this practicum, you are to follow and complete the "Table of Assignments to Complete". The purpose of this table is to help you ensure that your training is complete. It provides you with an opportunity to evaluate your experience during the course and review what you have accomplished upon completion. Furthermore, areas which have not been covered can then be followed-up on a later date. It is suggested that you write a diary of your activities during the Practicum to assist you.

The concept and contents of this manual are the collective efforts of the staff at the AARS and the Aquaculture Extension Centre of the University of Guelph.

## COURSE OUTLINE

**DEPARTMENT:** MSc-Aquaculture, Interdepartmental Program

**COURSE NO:** AQUA\*6200

**FULL TITLE:** Practicum in Aquaculture: The Culture and Reproduction of Salmonids

**SHORT TITLE:** Practicum in Aquaculture

**SEMESTER:** Normally S,F,W, but check with course co-ordinator one semester in advance of semester you wish to register in this course.

**FACULTY CO-ORDINATOR:** Prof. Richard D. Moccia

**ALMA SESSION LEADER:** Mr. David J. Bevan

**LECTURE HRS/WK:** 1                      **LAB HRS/WK:** 8  
**TOTAL CONTACT HRS:** 108              **CREDITS:** 0.5

**PREREQUISITE:** Principles of Aquaculture, ANSC\*2200  
Science and Technology in Aquaculture, AQUA\*6100

**COREQUISITES:** None

**LECTURE SLOTS:** Time/day TBA: Room 002 ANNU  
TBA: one day at the Alma Aquaculture Research Station

### GENERAL DESCRIPTION:

This practicum provides students with the opportunity to gain intensive, hands-on experience in various aspects of finfish aquaculture, as well as challenging them with theoretical problems which are designed to compliment the practical sessions.. Using a learner-based approach, students will complete a series of problem solving modules covering topics in water management, hatchery operations, propagation techniques, feeding and nutrition, health and disease, economics, marketing and regulatory issues. Each module will require independent background reading, in addition to experiential training at the Alma Aquaculture Research Station. This approach will allow students to understand, and solve, discipline-oriented problems from both a theoretical and applied perspective.

## **COURSE DESCRIPTION**

### **COURSE CONTENT:**

1. The practicum in aquaculture will provide the student with practical experience in several aquacultural discipline areas, and give a framework in which to place previous and subsequent experience. In particular, the participant will have the opportunity to perform specific tasks that they may have only read about such as feeding and health management of fish. This will allow an opportunity for them to become familiar with a farming-type of operation. The practicum will focus on independent tasks that are primarily "hands-on" in nature and not easily performed at the main university campus. Of particular importance, is the opportunity to observe and handle fish under culture conditions and experience some of the daily routine of a fish culture facility.
2. The course covers a wide range of undertakings, most of which will take place at the Alma Aquaculture Research Station (AARS). However, because of the seasonal nature of some operations, e.g. gamete collections, some operations may not be carried out during a given semester. Subsequent visits to the AARS or other facilities are expected to fill these gaps.
3. A detailed user's manual provides the core material necessary to carry out the tasks, and references are provided for additional material. The course material is organized in a series of independent-study modules covering the broad range of topics involving the culture and reproduction of salmonids. It is envisioned that students will complete all modules, subject to the seasonal availability of gametes and other specific activities. Problems are assigned to the students - either independently or in groups - and solutions to the problems require that the students first survey relevant literature and then complete a hands-on task assignment designed to demonstrate the principle under investigation.
4. This practicum course provides a unique learning experience for students that are being trained for senior management positions in aquaculture, rather than a research-focused career. To this end, it is important that all students obtain an exposure to a wide range of hands-on situations that cannot be experienced in the classroom. However, this introductory exposure is seen as important in providing a framework from which to build a career in the developing aquaculture industry.
5. Aquaculture is a multidisciplinary subject area. Faculty associated with the AARS are from a several departments including: engineering, food science, genetics, microbiology, nutritional science, veterinary medicine and zoology. While not directly involved in the formal instruction of this course, their involvement at the AARS and expertise can be exploited by the students.

## **LECTURE SCHEDULE:**

There will normally be one formal lecture session every second week in order to orient students to upcoming task assignments, as well as to review prior work completed. Typically, the lecture slot will be Wednesday morning, but will be subject to final scheduling depending on everyone's timetables.

## **APPLIED SESSIONS AT ALMA:**

Regular sessions at Alma will be scheduled during the first class lecture. Students are expected to attend these sessions, and will only be permitted to miss 'Alma Days' in exceptional circumstances. **These sessions are to be treated as regular class times**, and attendance may be taken.

## **REQUIRED TEXTS:**

Students are required to purchase the 'User's Manual for Course AQUA\*6200' which will be made available during the first class session. Cost of the manual will be \$20.00. There are no other texts required for this course.

## **TRANSPORTATION:**

Normally, students will be expected to provide their own transportation to and from the Alma Aquaculture Research Station. Mileage will be paid if students can arrange to car pool.

## **CLOTHING REQUIREMENTS:**

Certain tasks to be completed, will of necessity, be undertaken in sometimes inclement weather conditions. Students will be required to bring their own cold-weather clothing, as well as a sturdy set of rainproof outerwear, and red-soled (or other non-streaking) rubber boots. **Rain gear WILL NOT be provided by the program, or by loan from the Alma Research Station.** Since some of the tasks also require that individuals be reasonably physically fit, students are required to advise the course instructor if they have any physical or other disabilities that may impair their ability to complete specific tasks.

## **METHOD OF EVALUATION:**

### 1. Problem Solving Modules - 60 %

Students will be expected to complete the assigned problem-based tasks and submit written reports where required. The length and detail required for these reports will vary depending on the particular assignment, and this will be reviewed with the instructor prior to undertaking the module.

2. Skill Competency - 20 %

A variety of skills will be gained throughout this course. Students will be required to demonstrate their competency in particular tasks as the course proceeds.

3. Final Oral Exam - 20 %

Students will complete a 2 hr. final oral exam covering the entire practicum course content.

**PROBLEMS ?**

If you encounter any problems during this session, please contact the course instructor immediately.

Telephone Contacts:

Richard Moccia	(519) 824-4120 ext. 56216
David Bevan	(519) 824-4120 ext. 52689
AARS	(519) 669-5411

## **ALMA AQUACULTURE RESEARCH STATION**

Much of this 'practicum' will be completed at the Alma Aquaculture Research Station (AARS). The AARS is a new research and quarantine facility that has been designed to address two basic objectives. First and foremost, the station is an upscale, preproduction research and development facility for University of Guelph researchers. Scientists are able to perform large scale studies with results that are directly relevant to the commercial sector. The second basic objective of the station is to provide quarantine facilities for the controlled importation of exotic new species or strains of fish. The station has access to 7,000 litres per minute (Lpm) of well water and has over 350 holding units from vertical incubators to 11 m diameter circular concrete tanks. Currently, over 75,000 rainbow trout, Arctic charr are being held at the station.

The AARS is managed by staff of the University of Guelph. During normal operations, there are four employees based at the station. Because of the complexity of the stations operation, and the reliance on electrical and mechanical equipment to supply high quality water to the fish rearing units, the station is manned every day of the year.

On normal working days (Monday to Friday), operations begin at 8:30 am by carrying out a routine check of the station. This includes observing pump and generator status, well depths, water temperatures and a general inspection of the facility. The routine continues with feeding and observation of experimental and station fish stocks, and is normally completed by 11:00 am. Subsequent procedures, not necessarily performed on a daily basis, include fish sampling, tank cleaning, water quality monitoring and the maintenance and repair of equipment. Station staff also provide technical support to ongoing and future research experiments involving the reorganization of fish tanks, selection of experimental fish and the development of a working experimental protocol. As a research station working with live animals, the AARS is required to adhere to the "Animal Utilization Protocols" of the Animal Care Services of the University of Guelph.

Other activities include maintaining the "Waste Water Treatment Centre", artificial propagation of trout and charr for subsequent research purposes and brood stock development, writing reports for University and Government purposes and providing tours of the facility. Generally, these activities can be planned in advance.

Normal station operation is complete by approximately 4:30 pm. All critical systems are continuously monitored, including electrical power, pump activity, water flow, air supply and station security (see sheet "AARS Security System Zone Coding"). Backup systems include standby power, back-up pumps and compressed oxygen. Three of the staff carry pagers and one staff member lives on-site so that after-hour alarms can be responded to with minimal delay. Weekend operation is reduced to one person who carries out the daily routine for all experimental fish stocks and selected station stocks.

## **INTRODUCTION TO AQUACULTURE**



By the year 2008, the world's population exceeded 6.6 billion, representing a 10% increase in less than a decade. During this period, the harvest of fish protein from the oceans and freshwater has decreased to approximately 90-95 million metric tonnes, while aquaculture production increased to 67 million tonnes with a value of \$86 billion (FAO FishStat).

Twenty years ago, the aquaculture industry in Canada was perceived as being one with little future for large-scale development. Since then, the private sector has built an industry that is now worth 400 million dollars to the Canadian economy, and has produced approximately 5,000 new jobs. Canadians farm Atlantic and Pacific salmon, rainbow trout, mussels, oysters and several species of marine algae. At present, the industry is concentrated on both coasts of Canada, primarily British Columbia and New Brunswick, as well as Ontario. This industry is expected to almost double production and value over the next decade, be worth over 500 million dollars, and provide eight to ten thousand jobs for Canadians.

The Ontario aquaculture industry has shown equally spectacular growth since its initial start over thirty years ago. In 2006, the industry produced nearly 4,000 metric tonnes of trout, with a farm-gate value of 16 million dollars. Furthermore, the industry provided 180 jobs at the farm level, with an addition 200 jobs in the supporting industries. There is the potential for continued growth of the Ontario industry, with many suggesting the industry could produce 10,000 metric tonnes annually<sup>1</sup>.

The University of Guelph is well positioned to be a part of the developing aquaculture industry. As a university with strong roots in the agricultural sector, it has well developed expertise in biology, engineering, animal health, reproduction, genetics, economics, food science, toxicology and others, which are matched by few others in the world. In addition, the University of Guelph is renowned for its role in the expansion and development of the poultry, swine, beef, dairy and field crop industries, and has begun to play a similar role in the aquaculture industry, both in Ontario and throughout Canada. Central to this role is the Alma Aquaculture Research Station (AARS)<sup>2</sup>.

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<sup>1</sup> "AQUASTATS - 2006", Moccia and Bevan (Factsheet) and "Aquaculture's Growing in Ontario and Worldwide", Moccia (Article).

<sup>2</sup> "Alma Aquaculture Research Station", Moccia (Factsheet) and "Brief Overview of Aquaculture Research at the Alma Aquaculture Research Station", Moccia (Alma Information).