

Maine Aquaculture Occupational Standards for Land-Based Shellfish Hatcheries

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Standards produced by:



In partnership with:



INTRODUCTION

The Maine Aquaculture Occupational Standards specify the current workforce skills and training needs of Maine's aquaculture industry. They are intended to: (1) give education and training providers a clear and comprehensive understanding of the specific technical skills and knowledge that are critical for the most common careers in each sector; (2) standardize workforce training in the state; and (3) establish an industry-led process to align training with workforce needs as the industry, and workforce needs, evolve. They are based on direct industry input through extensive one-on-one interviews with commercial businesses across Maine.

This document, produced by the Maine Aquaculture Association (MAA), is specific to the workforce needs of land-based shellfish hatcheries. Occupational standards for marine shellfish and sea vegetables farms, marine finfish farms, and land-based recirculating aquaculture systems (RAS) are available at <https://maineaqua.org/education/>.

The project team will update the occupational standards (OS) regularly to remain current with the ever-changing workforce needs of Maine's rapidly evolving aquaculture sector.

BACKGROUND

In 2020, The Gulf of Maine Research Institute (GMRI) and the Maine Aquaculture Association (MAA), in partnership with Educate Maine, and sponsored by FocusMaine, published the Maine Aquaculture Workforce Development Strategy – an in-depth analysis informed by direct input from Maine's aquaculture sector that documents the current and future labor needs of Maine's growing and developing aquaculture industry, and charts a course for Maine to establish a comprehensive workforce training system.

Occupational Standards to inform and standardize aquaculture workforce training are a pillar of the recommendations from the Maine Aquaculture Workforce Development Strategy.

To implement this recommendation, the Maine Aquaculture Association (MAA), which has over a 25-year track record of developing operating standards and best management practices (BMPs) for the Maine aquaculture sector, has worked with GMRI and Educate Maine to develop occupational standards that represent the needs of the sector, and are consistent with state educational standards.

MAA and GMRI built on top of the findings of the Maine Aquaculture Workforce Development Strategy by conducting a new series of interviews with a variety of commercial aquaculture producers and educational institutions to form the standards. The draft standards were then shared with the Maine aquaculture sector and educational community for final review and edits.

The occupational standards are segmented into several sections based on the sector, type of work, and job title, as outlined in the table of contents.

For questions, please contact Christian Brayden, Project Manager at the Maine Aquaculture Association, at christian@maineaqua.org.

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Land-based Standards

SHELLFISH HATCHERY – AQUACULTURE TECHNICIAN

This standard is intended to capture the core duties and skills involved in the operation of a land-based shellfish hatchery at the entry-level position, aquaculture technician. The aquaculture technician will be responsible for the daily monitoring and maintenance of the shellfish and the hatchery system. A hatchery technician will be responsible for taking care of millions of juvenile shellfish, with duties including cleaning and maintaining tanks and equipment, following daily routines, data collection and input, and aiding in spawning and routine husbandry and the culture of microalgae.

DUTIES

SYSTEMS OPERATION

Required:

1. Operate and maintain water and air pumps, filters, valves, graders, and other shellfish handling equipment
2. Follow all standard operating procedures (SOPs) and safety protocols on system operation for a variety of culture and feed systems, including specific cautions on water and electricity, chemicals, and noxious gasses in confined spaces
3. Monitor water heater and adjust as necessary
4. Perform daily, routine checks to ensure proper operation of hatchery and its components
5. Identify technical failures in equipment and systems and report them to team lead/manager
6. Identify safety issues and report them to team lead/manager
7. Identify repairs to be made and report them to team lead/manager
8. Record and report systems operation and performance, following defined operating procedures
9. Clean and maintain equipment, system, and facility
10. Perform small repairs on equipment and pumps e.g. put valve back on
11. Lift heavy objects
12. Follow protocol for hatchery water treatment processes: biofiltration, solid removal, oxygenation, pH control, temperature control and biosecurity
13. Maintain a healthy environment for shellfish in a variety of systems
14. Operate microalgae feed system
15. Aid in the culture of microalgae
16. Disinfect conical, set tanks, downwellers, upwellers, etc.
17. Scrub downweller/upweller screens

Potential:

1. Assist in transfer from hatchery to nursery operation
2. Prepare transfer equipment and transfer shellfish from tank to tank
3. Prepare shellfish for delivery to customer e.g. in styrofoam boxes
4. Respond to alarms and notify team lead/manager, both during and potentially after standard operating hours

SHELLFISH CULTURE

Required:

1. Monitor and record oxygen levels
2. Complete and record water quality tests
3. Identify, record, and remove mortalities from tanks
4. Daily farm routine – follow schedule of tasks that must be completed and in the specified order
5. Provide appropriate levels of feed according to predetermined feeding density (cells/mL), and at the correct time
6. Follow biosecurity and disease protocols
7. Grade seed
8. Drain larvae
9. Clean shellfish broodstock and larvae
10. Move feed
11. Maintain proper water temperature and adjust as necessary
12. Create cultch for settlement events

Potential:

1. Aid in production of microalgae
2. Use the proper handling techniques to treat and transfer shellfish
3. Spawn adults
4. Spat settlement
5. Fill seed orders

KNOWLEDGE AND UNDERSTANDING

SYSTEMS OPERATION

Required:

1. Knowledge of protocol for working with electricity and water, chemicals, and basic lab equipment
2. Follow a manual and/or SOP
3. Read a pressure gauge, oxygen sensor, and other basic instrumentation readouts
4. Identify system failures (leaks, broken pumps/motors, etc.)
5. Clearly and consistently record information on system parameters
6. Use proper safety equipment and precautions

Suggested:

1. Basic understanding of hatchery systems, especially for shellfish
2. Proper use and maintenance of tools and equipment
3. Electrical knowledge
4. Ability to use or learn to use power tools
5. Basic plumbing
6. Understanding of basic hatchery design (layout, equipment/pipe sizing, etc.)
7. Lab techniques – pipetting and microscope viewing

SHELLFISH CULTURE

Required:

1. The importance of following specified schedules for maintaining equipment and the health of the shellfish, including a basic understanding of system operation and performance principles
2. The characteristics and behavior of healthy shellfish, and the warning signs of disease and illness
3. Level of care to be taken with shellfish in different life stages and sizes i.e. 1 mm vs 10 mm seed, as specified in SOP
4. How care and handling of shellfish affects their mortality rate, appearance, and quality in relation to customer preferences

Suggested:

1. Basic understanding of shellfish physiology and behavior
2. Rearing shellfish including producing microalgae, spawning adults, and rearing spat
3. Differences between different species of shellfish spat/juveniles and commercial strains e.g. diploid vs triploid
4. Microbiology

ESSENTIAL EMPLOYMENT SKILLS

Required:

1. Heavy lifting
2. Ability to stand, climb ladders, bend into small spaces, and be physically active for long periods of time
3. Ability to withstand hot, cold, and humid temperatures and work in loud and wet environments
4. Timeliness and consistency – understanding the importance of showing up for work when scheduled, and on time, and how that can affect the time-sensitive processes of farming
5. How to actively listen to, or read, and follow instructions and carry out tasks as directed, including speaking up if instructions are not understood
6. How to effectively communicate issues and concerns to team lead or manager, including the admission of mistakes
7. How to professionally engage with others at the workplace and in the community – be a good co-worker and a good neighbor
8. How to work independently, without constantly being told what to do
9. Be open to feedback
10. Attention to detail
11. How to work well as part of a team, previous crew-based work is helpful
12. Ability to identify, and potentially solve, problems in a team process

Suggested:

1. How to maintain records via hand-written diagrams, notepads, charts, or computer spreadsheets, and keep a time log
2. Basic math and writing skills, applied in a farming context e.g. animals per tank

SHELLFISH HATCHERY – TEAM LEAD

This standard is intended to capture the core duties and skills involved in the operation of land-based shellfish hatchery production at the mid-management level – team lead. It builds on top of the duties, knowledge, and understanding associated with the occupational standard for a shellfish hatchery technician. It is expected that a team lead will possess mastery of all expectations of a technician, including the ability to explain, train, and monitor those duties, the knowledge, and the understanding. The team lead will be responsible for the daily operation, monitoring, and maintenance of the hatchery systems, including microalgal culture, along with performing health and food checks on and the shellfish throughout all applicable life stages. Other duties may include overseeing spawning and grading, providing small repairs to the system, demonstrating the cleaning of equipment, and assistance in preparing for seed transfer to nursery or sales.

DUTIES

SYSTEMS OPERATION

Required:

1. Oversight and operation of:
 - a. Biofilters
 - b. Drum filters
 - c. Foam fractionators
 - d. Ozone and UV disinfection systems
 - e. Pumps and aerators
 - f. Tanks and system
2. Follow systems operation plan laid out by manager; lead and train technicians to follow it as well
3. Perform and lead routine maintenance and cleaning on systems and equipment in addition to the daily chore list
4. Perform small repairs (plumbing, electrical, etc.)
5. Organize and maintain hatchery tools, equipment, and facilities
6. Maintain appropriate housekeeping and sanitation procedures in the hatchery, ensuring proper protocol and required biosecurity measures are followed
7. Record and report systems operation and performance
8. Identify technical failures in equipment and systems and report them to the manager
9. Prepare systems and equipment for shellfish transfer
10. Respond to alarms and resolve the issue, potentially at all hours
11. Identify safety hazards and recommend remedies and/or take appropriate action
12. Administer water quality testing
13. Draft and submit husbandry and production report to manager
14. Report any broken items that need replacing to manager

Potential:

1. Use wire cutters, table saw, drill press, plumbing, pvc, Dremel, Sawzall, and other power tools
2. Move equipment throughout the hatchery

SHELLFISH CULTURE

Required:

1. Lead and perform:
 - a. Grading/shell length measurement
 - b. Sampling for health and disease screening
 - c. Transferring
 - d. Water quality testing
 - e. Analysis of water quality data to optimize animal growth and health
2. Perform daily duties or chores and husbandry activities including
 - a. Feeding (determine feeding density (cells/mL), mortality removal, etc.
 - b. Thoroughly record these events
3. Monitor shellfish behavior, condition, and health, and bring any abnormalities to manager's attention
4. Work with phycologist to determine appropriate formula and quantity of microalgae feed
5. Aid phycologist in culture of microalgae, including training technicians to help as well
6. Follow feed charts according to plan by manager and phycologist - monitor and report feed inventory
7. Record and remove mortalities
8. Work with manager to produce seed for sale and for nursery at appropriate times, in the correct quantity
9. Work with manager to coordinate when seed will be leaving the hatchery, and in what quantity
10. Fill in hatchery labor needs
11. Closely monitor and control environmental conditions to maximize production efficiency
12. Follow protocol for prevention and response to disease outbreaks
13. Increase biosecurity and ease in treating disease outbreaks
14. Determine and maintain proper stocking densities
15. Use a microscope to examine microalgae feed and shellfish larvae growth
16. Be able to predict spat settlement and prepare for it, including proper amount and size of cultch
17. Fulfill seed orders and potentially manage packaging supply inventory

TEAM MANAGEMENT

Required:

1. Manage teams of hatchery technicians of up to 4 to 6 people
2. Effectively divide flow of labor and tasks based on order of operations
3. Organize efficient use of hatchery technicians with other team leads (e.g. algae department), and communicate decisions and protocols up and down the chain of command, and across departments
4. Effectively manage worker schedules within team and with other team leaders to distribute labor throughout months of annual farm production cycles
5. Work with manager to create and understand work plans; distribute work plans to technicians to ensure timely, safe, efficient completion of a series of tasks
6. Task delegation, including identifying efficiencies
7. Lend technicians in your team to other part of the hatchery when help is needed
8. Resolve conflicts between workers, and effectively communicate up and down the chain of command
9. Oversee technician compliance with all company protocols, and SOP
10. Monitor and ensure the safety of all site workers at all times
11. Encourage farm hands to report any mistakes or issues with product or gear, and then report these issues to the manager

12. Check-in with technicians to ensure their understanding of tasks to be completed before they begin
13. Problem solving, troubleshooting, and finding solutions, and communicating them while out on the farm
14. Set a good example by behaving professionally, leading and inspiring the team

Potential:

1. Assist the manager in employee performance reviews, as requested
2. Provide a continuous improvement mindset
3. Lead special projects, such as construction of specialized farm equipment and systems

KNOWLEDGE AND UNDERSTANDING

SYSTEMS OPERATION

Required:

1. Basic understanding of land-based hatchery systems
2. Knowledge of protocol for working with electricity and water, chemicals, and lab equipment
3. Follow a manual and/or SOP
4. Read a pressure gauge, oxygen sensor, and other monitoring equipment readouts
5. Identify system failures (leaks, broken pumps/motors, etc.)
6. Clearly and consistently record information on system parameters
7. Operate basic safety equipment and precautions
8. Follow SOPs for confined spaces
9. Follow safety standards and relay them to team

Suggested:

1. Proper use and maintenance of tools and equipment
2. Basic plumbing and electrical knowledge
3. Ability to use power tools
4. Experience with mechanical, pipeline, plumbing, or electrical work
5. Lab techniques – pipetting and microscope viewing

SHELLFISH CULTURE

Required:

1. Basic understanding of shellfish biology, physiology, and health
2. Basic understanding of the principles of biosecurity
3. The importance of following specified schedules for maintaining gear and the health of the shellfish, including a basic understanding of site operation and performance principles
4. The characteristics and behavior of healthy shellfish and the common signs of disease or illness
5. Level of care to be taken with shellfish in different life stages
6. How care and handling of shellfish affects their mortality rate and quality in relation to customer preferences
7. Understanding how stocking densities affect shellfish growth rates
8. Microalgae culture for shellfish feed
9. Differences between different species of shellfish spat/juveniles and commercial strains e.g. diploid vs. triploid

Suggested:

1. Basic understanding of shellfish physiology and behavior, including microalgae
2. How to detect issues with shellfish behavior and relating it to issues or improvements of process installations
3. Knowledge of production methods and effects of feed, system parameters, and handling on final quality product
4. Experience working in aquaculture
5. Microbiology

TEAM MANAGEMENT

Required:

1. How to manage a team of up to 5 people
2. Basic human resources course
3. Team building, including creating an environment in which technicians are comfortable to admit mistakes and report issues
4. Conflict resolution and problem solving
5. Company culture, including how to train team members to be good co-workers and representatives at the workplace and in the community
6. How to effectively explain tasks to be accomplished and ensure that others understand
7. How to lead by example, and provide leadership/inspiration

REGULATORY COMPLIANCE

Required:

1. Manage DEP discharge permits

ESSENTIAL EMPLOYMENT SKILLS

Required:

1. Ability to lift 50 lbs.
2. Ability to stand and be physically active for long periods of time.
3. Ability to withstand hot, cold, and humid temperatures and work in loud environments
4. Timeliness and consistency – understanding the importance of showing up for work when scheduled, and on time, and how that can affect the time-sensitive processes of farming
5. How to listen to instructions and carry out tasks as directed, including speaking up if instructions are not understood
6. How to effectively communicate issues and concerns to manager, including the admission of mistakes
7. How to work well as part of a team, previous crew-based work is helpful
8. Attention to detail
9. Problem solving
10. How to maintain records via hand-written diagrams/charts or computer spreadsheets, and keep a time log – ability to produce essential documents in Excel and Word
11. Basic math and writing skills, applied in a farming context e.g. shellfish per tank (stocking densities)

Suggested:

1. Basic chemistry knowledge e.g. buffer solutions

SHELLFISH HATCHERY - MANAGER

This occupational standard builds on top of the duties, knowledge, and understanding associated with the occupational standard for a shellfish hatchery team lead. It is expected that a manager will possess mastery of all expectations of a team lead, including the ability to explain, train, and monitor those duties, the knowledge, and the understanding. The manager must be able to manage multiple teams and ensure the proper organization teams and work in the operations of the business, including planning and organizing the hatchery operations and production.

DUTIES

SYSTEMS OPERATION

Required:

1. Train team leads and oversee all aspects listed in Team Lead - Systems Operation, item 1
2. Oversee inspection, monitoring, and every aspect of proper system operation, including review of maintenance logs
3. Analyze systems operation and performance
4. Oversee maintenance and provide minor repairs
5. Contact facilities management when necessary
6. Respond to alarms and resolve the issue, at all hours of the day
7. Identify new areas for further improving hatchery system performance
8. Evaluate hatchery production techniques by researching scientific publications, attending workshops, and conducting experiments
9. Ensure safety protocols are visibly posted, discussed, understood, and followed
10. Review and refine system and safety protocols
11. Oversee water quality testing and analyze results
12. Organize movement of equipment throughout farm
13. Ensure all facilities are clean, organized, and well-maintained

Potential:

1. Help design systems as appropriate
2. Oversee systems/equipment installations, modification, or repair

SHELLFISH CULTURE

Required:

1. Train team leads; oversee all aspects listed in Team Lead – Shellfish Culture, items 1 & 2
2. Oversee the microalgal feeding of multiple lots and sizes of shellfish (feeding, monitoring feed intake and waste, and adjusting feeding rates)
3. Maintain the proper stocking density in each tank
4. Proper culling techniques
5. Evaluate shellfish culture techniques by researching scientific publications, attending workshops, and conducting experiments
6. Coordinate with nursery and/or sales team for transfer of shellfish within hatchery or for delivery to seed purchaser
7. Analyze and track shellfish inventory, growth, and mortalities and compare them to projections to ensure consistent product supply, meeting target goals

8. Oversee the spawning of oysters, including the successful fertilization of gametes and settlement of larvae
9. Ensure that protocols are followed for stocking, transfer, and harvest, including paperwork and records
10. Oversee grading, sorting, and counting of shellfish
11. Teach proper protocols on handling of shellfish at all life stages
12. Implement biosecurity and disease prevention and management protocols
13. Review and refine protocols
14. Oversee phycologist to maintain cultures of multiple species of microalgae – ensuring proper feed formulas, quantity, and schedule
15. Help phycologist, with addition of team leads and technicians, when necessary
16. Oversee fulfillment of seed order, including packaging supply inventory
17. Maintain records on husbandry, stock, and disease testing

Potential:

1. Collaboration with R&D department, partners, and laboratories

TEAM MANAGEMENT

Required:

1. Organize efficient use of several crews of teams, and communicate decisions and protocols up and down the chain of command, and across departments
2. Manage hatchery employees, including hiring, training, scheduling, supervising, and evaluating
3. Interact with the safety officer to implement a sound employee safety program
4. Manage one to three teams, potentially more
5. Distribute work plans to team leads to ensure timely, safe, efficient completion of a series of tasks
6. Discuss expectations and how to complete specific tasks with team leads to ensure that they have a clear understanding
7. Set a good example by behaving professionally and working hard – motivating and inspiring the team
8. Resolve conflicts between workers, and effectively communicate up and down the chain of command
9. Task delegation, including identifying efficiencies
10. Ensure compliance with all company protocols, and SOP
11. Monitor and ensure the safety of all site workers at all times
12. Encourage team leads to create a culture where technicians report any mistakes or issues with product or gear to the team lead, who then reports these issues to the manager
13. Problem solving, troubleshooting, and finding solutions, and communicating them while out on the farm

Potential:

1. Report notable performance, reliability, and leadership potential of employees
2. Provide a continuous improvement mindset
3. Managing worker schedules
4. Interface with public

OPERATIONS MANAGEMENT

Required:

1. Manage and plan the operations of the hatchery, including developing a plan for the month, and potentially the week and the day, regarding the spawning, setting, feeding, and transfer of shellfish, and production needs of and schedule of algae, including equipment maintenance and hitting production goals within expected timeline
2. Delegate plan(s) to team leads
3. Consolidate feedback from technicians and team leads to create appropriate work plans
4. Distribute work plans for team leads, and approve work plans for work crews
5. Lead distribution of shellfish to nursery operation or to customers
6. Coordinate transfer/sales schedule with nursery and/or sales department
7. Achieve production target and maintain accurate, timely reporting; track production
8. Maintain detailed records of all hatchery-related purchases and maintenance orders, potentially working with an accountant
9. Track seed sales and make sure bills are paid
10. Plan purchases and order supplies, maintaining relationships with vendors and allowing for sufficient lead time

REGULATORY COMPLIANCE

Required:

1. Ensure compliance and approval of DEP and discharge permits
2. Ensure compliance with biosecurity protocols

Potential:

1. Observe water quality conditions and product quality for disease and product quality management. This may include recording temperature, or providing other related lab and research work.

KNOWLEDGE AND UNDERSTANDING

SYSTEMS OPERATION

Required:

1. Strong understanding of hatchery dynamics and food production systems
2. Familiarity with design details and equipment of shellfish hatcheries and microalgae culture
3. Knowledge of testing protocols and analysis of results
4. Plumbing and electrical
5. Safety protocols for working with water and electricity, chemicals, lab equipment, and potential noxious gasses in confined spaces
6. Lab techniques – pipetting and microscope viewing

Suggested:

1. Strong skills in R&D processes
2. Forklift certification
3. Basic computer programming e.g. alarm systems, cameras

SHELLFISH CULTURE

Required:

1. How to raise shellfish through all stages of life
2. Differences between different species of shellfish spat/juveniles and commercial strains e.g. diploid vs. triploid
3. Detailed understanding of raising shellfish to specified sizes and composition according to processing capabilities and consumer preferences, within a set timeline
4. Knowledge of aquaculture and shellfish handling across life stages of shellfish
5. Understanding of best management practices for shellfish biosecurity
6. How to detect issues with shellfish both on paper and via visual observation
7. How to identify areas for improvement
8. Microalgae culture for shellfish feed
9. Knowledge of potential diseases and biosecurity risks and how to minimize these risks
10. How to explore new technologies and processes to expand and improve production
11. Microbiology

Suggested:

1. Understanding of hatcheries for multiple types of shellfish
2. Stay up to date on sector research, including opportunities for R&D

TEAM MANAGEMENT

Required:

1. How to manage one to three teams of up to five workers, appropriately dividing the labor and order of operations
2. Basic human resources course
3. Team building, including creating an environment in which crew members and chiefs are comfortable to admit mistakes and report issues
4. Talent recruitment and retention best practices
5. Conflict resolution and problem solving
6. Company culture, including how to train team members to be a good co-workers and representatives in the community
7. Basic knowledge of employment regulations

Potential:

1. Provide sexual harassment prevention training, or work with HR to ensure its proper implementation and follow-up

OPERATIONS MANAGEMENT

Required:

1. Project management, including developing project strategy and simultaneously managing several large projects across multiple realms of the business e.g. spawning, microalgae culture, grading, seed sales, etc.
2. Basic production planning, including growth projections
3. How to work in sync with other departments of the business e.g. aligning hatchery timelines and production levels with nursery and grow-out planning to ensure they fit in with projected sales numbers and timelines
4. Best management practices for production and operations management, including hatchery design protocols and understanding logistics

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5. Fluency in word documents, email, spreadsheets (e.g. Excel) and budgeting, potentially working with an accountant
6. Basic budgeting, including an ability to follow and stay within a given budget
7. Good recordkeeping practices

Suggested:

1. Detailed understanding of aquaculture, business, biology, and production
2. Ability to use financial management software e.g. QuickBooks

REGULATORY COMPLIANCE

Required:

1. First aid certified
2. Confined spaces training

SHELLFISH HATCHERY - PHYCOLOGIST

This standard is intended to capture the core duties and skills involved in the management of microalgae culture in a shellfish hatchery. The phycologist will work with multiple species of microalgae production to meet the needs of the shellfish hatchery. They will be responsible for working with other teams and individuals in the hatchery, and will need to align timelines and quantities accordingly.

DUTIES

SYSTEMS OPERATION

Required:

1. Draft new systems or provide improvements to current system based on capacities, space, budgets, timelines, and other specifications
2. Work with outside contractors to select appropriately sized equipment, install equipment, and meet timelines
3. Oversee the installation of new equipment, and modification of current equipment
4. Test and troubleshoot system
5. Ensure water quality remains at appropriate levels throughout entire system
6. Ensure appropriate HVAC, pumps, filters, screens, hoses, and tank materials to optimize algae health and minimize production costs
7. Maximize the production efficiency while minimizing the risk of catastrophic systems failure
8. Monitor discharge water
9. Daily follow-ups and monitoring of every aspect of the system, including overview of maintenance logs
10. Design and troubleshoot control systems
11. Analyze systems operation and performance
12. Oversee maintenance and often provide own repairs
13. Respond to alarms and calls, and resolve issues, at all hours of the day
14. Identify new areas for further improving micro-algal or hatchery performance.
15. Evaluates microalgae production techniques by researching scientific publications, attending workshops, and conducting experiments
16. Ensure safety protocols are visibly posted, understood, and followed
17. Organize movement of equipment throughout farm

MICROALGAE CULTURE

Required:

1. Sterile inoculation
2. Grow and maintain multiple species of algae at the same time
3. Cell counts under a microscope
4. Algal transfers for culture and for shellfish food
5. Scale up production based on timelines and production quantities
6. Maintain controlled environment of algal stock room
7. Mix nutrients and maintain inventories
8. Determine correct algae species mixtures for feed, depending on shellfish size
9. Catalog feed formulas used and their efficacy
10. Maintain quality control and sanitation

Potential:

1. Lead small teams of feed or hatchery workers in aiding micro-algal culture
2. Basic chemistry understanding

OPERATIONS MANAGEMENT

Required:

1. Manage several concurrent, large projects
2. Ensure projects stay within timelines and budget
3. Coordinate maintenance, repairs, and upgrades with schedules of hatchery, nursery, grow out, and sales
4. Coordinate algae production with shellfish seed inventories to ensure adequate feed supply

Potential:

1. Work with hatchery and production teams when help is needed in altering the system; lead hatchery and production teams when help is need in micro-algal culture or in altering the system

REGULATORY COMPLIANCE

Required:

1. Observe water quality conditions and product quality for disease and product quality management. This may include recording temperature, or providing other related lab and research work.
2. Hazardous material reporting

KNOWLEDGE AND UNDERSTANDING

SYSTEMS OPERATION

Required:

1. Strong understanding of microalgal culture systems
2. Familiarity with design details and equipment of microalgal culture
3. Knowledge of testing protocols and analysis of results
4. Advanced plumbing and electrical
5. Food production systems engineering
6. Knowledge of sterile culture techniques

Suggested:

1. Strong skills in R&D processes

MICROALGAE CULTURE

Required:

1. Detailed understanding of how microalgae equipment affects shellfish biology and water chemistry

2. Knowledge of aquaculture and shellfish across life stages
3. How to identify areas for improvement
4. Knowledge of potential diseases and biosecurity risks
5. Basic knowledge of microalgae biology and physiology
6. Microbiology

Suggested:

1. Understanding of feed culture for other species
2. Stay up to date on sector research, including opportunities for R&D

OPERATIONS MANAGEMENT

Required:

1. Project management, including developing project strategy and simultaneously managing several large projects across multiple realms of the business
2. How to work in sync with other departments of the business e.g. aligning hatchery timelines and production levels with nursery and grow-out planning to ensure they fit in with projected sales numbers and timelines
3. Best management practices for production and operations management, including farm design protocols and understanding logistics
4. Fluency in word documents, email, spreadsheets (e.g. Excel), and budgeting
5. Basic budgeting
6. Good recordkeeping practices

Suggested:

1. Detailed understanding of aquaculture, biology, chemistry, and production

REGULATORY COMPLIANCE

Required:

1. First aid certified
2. Confined spaces training