WHAT IS AQUATIC FARMING?

- Growing, farming, or cultivating aquatic farm products in captivity or under positive control by means of
  - managed cultivation for limited or no mobility species (bivalve or aquatic plants) or
  - enclosed within a natural or artificial escape-proof barrier for motile species
- Shellfish and aquatic plants only
- Commercial use only
- Finfish farming is prohibited
The department permits and regulates aquatic farming in the state in a manner that ensures:

a. the protection of the state's fish and game resources [and uses of those resources] and

b. improves the economy, and well being of the citizens of the state.
ADF&G PERMITS

• **Aquatic Farming Operation Permit - 10 yrs.**
  • To operate an aquatic farm or hatchery

• **Stock Transport Permit - 1 yr.**
  • To transfer stock to, from, or between an aquatic farm, hatchery, or stock acquisition site (waters of the state)

• **Stock Acquisition Permit - 1 yr.**
  • To collect wild stock from outside of an aquatic farm site, for the purposes of providing broodstock or seedstock to a farm or hatchery

• **Seedstock Supplier:**
  • **Shellfish Import Certification (Hatchery) – 1 yr.**
  • **Instate Seed Distributor Approval (Hatchery / Nursery) – 1 to 3 yrs.**
WHERE ARE PERMITTED AQUATIC FARMS IN ALASKA?

OPERATION LOCATIONS

- 57 Aquatic Farms
- 5 Hatcheries
- 7 Nurseries
AQUATIC FARM PRODUCTION REGIONAL DISTRIBUTION

* Based on 2017 Annual Reports from Permitted Operators
AQUATIC FARMING INDUSTRY
SALES PRODUCTION (1990 TO 2017)

In 2017:
41 operations with sales*
Aquatic Farms = $1.34 Million
Hatchery = $91,519
Nursery = $104,448
Total Sales = $1.53 Million

* Farm gate value
AQUATIC FARM SHELLFISH PRODUCTS
CULTURED AND SOLD

PACIFIC OYSTER
(Magallana gigas)
2-4 years to market size
Seedstock from hatchery and/or nursery

BLUE MUSSEL
(Mytilus trossulus)
3-4 years to market size
Natural set collection onsite or opportunistic on gear

PACIFIC GEODUCK
(Panopea generosa)
9-10+ years
Seedstock from hatchery and/or nursery
AQUATIC FARM SHELLFISH PRODUCTS CULTURED AND SOLD

PACIFIC OYSTER
*(Magallana gigas)*
2-4 years to market size
Seedstock from hatchery and/or nursery
~1.8 million produced (2017)

BLUE MUSSEL
*(Mytilus trossulus)*
3-4 years to market size
Natural set collection onsite or opportunist on gear
1,678 lbs. produced (2017)

PACIFIC GEODUCK
*(Panopea generosa)*
9-10 + years
Seedstock from hatchery and/or nursery
11,456 lbs. produced (2017)
AQUATIC FARM AQUATIC PLANT PRODUCTS
CULTURED AND SOLD

**SUGAR KELP** (*Saccharina latissima*)

- 4 – 6 months to market size - plant in winter and harvest in spring
- Seedstock (seeded lines) from hatchery

**RIBBON KELP** (*Alaria marginata*)

- 4 – 6 months to market size - plant in winter and harvest in spring
- Seedstock (seeded lines) from hatchery

In 2016, 1st farm operations permitted in Alaska for kelp.
AQUATIC FARM AQUATIC PLANT PRODUCTS CULTURED AND SOLD

**SUGAR KELP** (*Saccharina latissima*)
4 – 6 months to market size - plant in winter and harvest in spring
Seedstock (seeded lines) from hatchery

**RIBBON KELP** (*Alaria marginata*)
4 – 6 months to market size - plant in winter and harvest in spring
Seedstock (seeded lines) from hatchery

*In 2016, 1st farm operations permitted in Alaska for kelp.*

**By 2017, farms produced 16,180 lbs. of kelp.**
FARMING PHASES FROM CRADLE TO MARKET GATE

1st PHASE
SEED / SPAT
or
SEEDSTARTS
Hatchery and / or Nursey Operation

2nd PHASE
JUVENILE to ADULT
Nursey Operation

3rd PHASE
ADULT TO MARKETABLE SIZE
Aquatic Farm Operation
SEED DEVELOPMENT
HATCHERY PRODUCTION

Shellfish
- Broodstock conditioned and spawned
- Production of Algae for feed
- Eyed-larvae to seed reared to 3–4 mm

Seaweed - Kelp
- Fertile Mature Blades with Sorus
- Spore Release / Inoculate Solution
- Light and Nutrient Solutions
- Sporophyte on string wrapped PVC
SEED DEVELOPMENT
NURSERY PRODUCTION

REMOTE SETTING NURSERY
Eyed-larvae settles out and becomes spat
Feed Phytoplankton and Diatoms
Downwellers (200 μ) / Upwellers (240 – 400 μ)
Seedstock reared up to 3-4 mm

INWATER NURSERY
Seedstock cultured in marine waters
Fluid Upwelling System (FLUPSY) with paddle wheel
Brings in plenty of food phytoplankton
Seedstock reared from 3 – 15+ mm
WILD STOCK NATURAL SET - ONSITE

- Kelp on oyster longline
- Mussels on oyster gear
- Blue mussel fouling on stacked culture trays
- Blue Mussel culture socks
- By catch in oyster tray culture gear (scallops)
- Scallops on oyster gear - small scale
- Blue Mussel natural set lines
### Shellfish and Aquatic Plants Approved to Culture

#### Shellfish

<table>
<thead>
<tr>
<th>Shellfish</th>
<th>Total Permits</th>
<th>Seed Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bivalves</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacific Oyster*</td>
<td>34</td>
<td>Hatchery-produced</td>
</tr>
<tr>
<td>Geoduck</td>
<td>18</td>
<td>&quot;</td>
</tr>
<tr>
<td>Blue Mussel</td>
<td>10</td>
<td>Natural set</td>
</tr>
<tr>
<td>Littleneck Clam</td>
<td>5</td>
<td>Natural set and Hatchery-produced</td>
</tr>
<tr>
<td>Cockle</td>
<td>2</td>
<td>&quot;</td>
</tr>
<tr>
<td>Scallop – Purple-hinged</td>
<td>1 - 3</td>
<td>Natural set</td>
</tr>
<tr>
<td>rock, pink, &amp; spiny</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other Invertebrates</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea Urchin – green, red, and purple</td>
<td>1 - 4</td>
<td>&quot;</td>
</tr>
<tr>
<td>Sea Cucumber</td>
<td>1</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

#### Aquatic Plants (Macroalgae)

<table>
<thead>
<tr>
<th>Aquatic Plants (Macroalgae)</th>
<th>Total Permits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown – Sugar Kelp</td>
<td>15</td>
</tr>
<tr>
<td>– Bull Kelp</td>
<td>8</td>
</tr>
<tr>
<td>– Ribbon Kelp</td>
<td>6</td>
</tr>
<tr>
<td>– Three Ribbed Kelp</td>
<td>6</td>
</tr>
<tr>
<td>– Ribbon Kelp</td>
<td>3</td>
</tr>
<tr>
<td>– Giant Kelp</td>
<td>3</td>
</tr>
<tr>
<td>– Dragon Kelp</td>
<td>1</td>
</tr>
<tr>
<td>Red – Pyropia sp. and Palmaria sp.</td>
<td>3</td>
</tr>
</tbody>
</table>

* Pacific oysters are a non-native species – allowed to be imported into the state from the Pacific Northwest broodstock.
KEY STEPS FOR AQUATIC FARMING OPERATIONS -
CULTURE METHODS / MANAGED CULTIVATION

- Acquire Quality Seedstock
- Cleaning/Sorting
- Predator Removal / Defouling
- Dividing / Density Manipulation
- Monitor / Maintenance
- Predator Exclusion
- Recordkeeping
KEY STEPS FOR AQUATIC FARMING OPERATIONS - STANDARD CULTURE GEAR AND EQUIPMENT

**Raft & Trays**

- Longlines & Lantern Nets
- PVC Tubes / predator netting
- Floating cages

**Longlines & Trays**

- Flip-flop Bags

**Floating Bags**

- Submerged longlines

Longlines – large, more exposed areas or less current; Rafts for small sites with sufficient current
KEY STEPS FOR AQUATIC FARMING OPERATIONS
HARVEST METHOD, PROCESSING, & SALES

• Cleaning, hardening, processing, packaging, logistics, marketing, transport, etc.

KEY TO SUCCESSFUL SALES

• a consistent aquatic farm product available in quality and quantity and when the buyers want it in the form that they want
## AQUATIC FARM SITE SUITABILITY / SITE SELECTION

**MUST BE SUITABLE FOR THE FARMING OR THE SHELLFISH OR AQUATIC PLANT**

### Physical and Biological Characteristics

- **Protected**
- ✔ **Exchange rates, water temps, currents, salinity, food availability, light, and suspended sediments**
- ✔ **Suspended - Water depth (40-60 ft or greater)**
- ✔ **On bottom - Substrate composition, Intertidal exposure**

### Other considerations

- ✔ **Fouling organisms**
- ✔ **Predation**
- ✔ **Pollution**
- ✔ **Paralytic Shellfish Poisoning (PSP)**
- ✔ **Distance from labor pool and market**
- ✔ **Vicinity to other farms**
AQUATIC FARM SITE SUITABILITY / SITE SELECTION
MAY NOT SIGNIFICANTLY AFFECT FISH, WILDLIFE, OR THEIR HABITATS
IN AN ADVERSE MANNER

PROXIMITY TO SENSITIVE AREAS:

- Anadromous Fish Streams
- Herring Areas
- Kelp and Eelgrass beds
- Shorebirds, water fowl, harbor seals, seal lion, walrus concentrations
AQUATIC FARM SITE SUITABILITY / SITE SELECTION
MAY NOT REQUIRE SIGNIFICANT ALTERATIONS IN TRADITIONAL FISHERIES OR OTHER EXISTING USES OF FISH AND WILDLIFE RESOURCES

PROXIMITY TO EXISTING USE AREAS

• Existing commercial, subsistence, sport, or personal use areas for fish, shellfish, or aquatic plants
• Salmon Hatchery - special harvest areas or terminal harvest areas
• Major anchorages and floatplane access
PROXIMITY TO RESTRICTED AREAS

Designated Areas:

- State refuge and sanctuaries
- State parks and marine parks
- State critical habitat areas (CHA) except Fox River / Kachemak Bay
AQUATIC FARMING OPERATION PERMIT

OPERATION, DEVELOPMENT, AND STAFFING PLANS MUST DEMONSTRATE TECHNICAL AND OPERATIONAL FEASIBILITY

1. One operation and development plan for each species intended to be cultured
2. Demonstrates technical and operational feasibility – improving productivity of the organism above what would occur in natural conditions
3. Summarizes installation and maintenance of support facilities / culture gear / anchoring systems
4. Schedule is consistent with life history of species intended to be cultured
WHY DO AQUATIC FARMING?

**BENEFITS**

1. Sustainable
2. Economic opportunity
3. Opportunity to innovate
4. Opportunity to transfer technology
5. Opportunity to educate
6. Quality of life
7. Heritage
8. Food Security
9. Habitat for other species

**State and Industry Commitment**

1. Committed Coordinators
2. Mariculture Loan Program
3. Alaska Shellfish Growers Association
4. Alaska Fisheries Development Foundation
5. MTF goal of $100 M /20 yrs.
6. College of Fisheries and Ocean Sciences - University (UAF) - Mariculture Professor & Specialist
7. NOAA Sea Grant Services & NOAA Aquaculture Coordinator

**Limitations**

1. Seed supply
2. Workforce
3. Cost of doing business
4. No single point of contact
5. Limited state resources
6. Public perception
7. Public submerged and intertidal lands vs private lands
QUESTIONS

For additional assistance, please contact:
Aquaculture Section/Commercial Fisheries Division
Alaska Department of Fish and Game
P.O. Box 115526, Juneau, AK 99811-5526
(907) 465-6150 - cynthia.piring-ham@alaska.gov
(907) 465-4325 - sam.rabung@alaska.gov
Fax: (907) 465-4168

General Aquatic Farming email: dfg.dcf.aquaticfarming@alaska.gov