Green Energy in Alaska Mariculture Farm & Producers Survey Analysis

Prepared for

The Green Energy in Mariculture Project

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Prepared by
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Table of Contents

Cover photo courtesy of Alaska Mariculture Cluster / Bjorn Olson

Green Energy in Mariculture Survey Summary

The Green Energy in Mariculture (GEM) project conducted a comprehensive survey, led by Rain Coast Data, to assess baseline energy use and identify opportunities for increased energy efficiency and renewable energy adoption across Alaska's mariculture farmers and processors. Conducted between October 2024 and June 2025, the survey gathered detailed input from 22 mariculture operations across ten coastal communities, encompassing oyster and kelp farms, mussel harvesters, and standalone processing facilities.

Key findings include:

- **Average years in operation:**
  - Mariculture farms: 8 years; Mariculture processing facilities: 4.5 years
- **Average number of workers per site:** 5
- **Average annual harvest per site:** 45,000 pounds
- **Average number of farm visits per year by operator:** 113 (204 for oyster farms; 65 for kelp farms)
- **Average length of vessel used to visit farm/site:** 25 feet
- **Average vessel speed:** 21 knots
- **Average travel distance to farm site (by boat):** 6 nautical miles
- **Average annual fuel use:**
  - Gasoline: 848 gallons (used by 75% of respondents)
  - Diesel: 1,043 gallons (used by 25% of respondents)
- **Average vessel maintenance cost:** $1,611
- **Average road travel to launch point:** 6 miles
- **Average seedline used by kelp farms:** 14,500 feet
- **Average processing facility size:** 1,560 square feet
- **Average number of communities where products are sold:** 15

Producers identified strategies for improving energy efficiency, including reducing fuel use through fewer farm visits, switching to hybrid or electric vehicles and vessels, and installing solar and battery systems. Energy-efficient drying technologies, shared infrastructure, and electric-powered equipment were also cited as potential options.

The Green Energy in Mariculture (GEM) project aims to establish how energy is used in shellfish and seaweed farming and processing in Alaska, develop a plan for the industry to expand while minimizing energy use and emissions, and distribute best practices guidance for farmers that want to minimize energy costs.

Survey Methodology

The Green Energy in Mariculture (GEM) Project contracted Rain Coast Data to conduct a survey of Alaska mariculture farmers and producers to develop a baseline energy use profile by measuring energy use and trends in energy use.

The survey included 36 questions covering a range of mariculture focused activities, such as travel modes, scale of operations, inventory, energy use, and access to markets. Respondents were also given the opportunities to provide open-ended comments. The results will inform farmers and processors in the mariculture industry on how to maximize energy efficiency while minimizing dependence on fossil fuels.

Rain Coast Data designed and administered the survey in collaboration with the GEM team. The survey was open from October of 2024 through June 2025. The survey was distributed via text, email, social media, and on a variety of websites including the Alaska Mariculture Cluster page. In person requests were also made by team members visiting farm locations.

A total of 22 mariculture farm and processing operators participated in the survey, including 11 who only do harvesting, an additional 8 that are involved in harvesting and processing, and 3 who only do mariculture processing. The survey represents 95 mariculture harvesting workers, and 55 mariculture processing workers.

Survey Respondents by Type

Respondents	Farm Only	Farming and Processing	Processor Only
Oyster Farm	3	4	
Kelp Harvester	7	2	
Oysters, Kelp		1	
Oysters, Kelp, Mussels	1		
Oysters, Kelp, Mussels, FLUPSY		1	
Kelp Processor Only			3

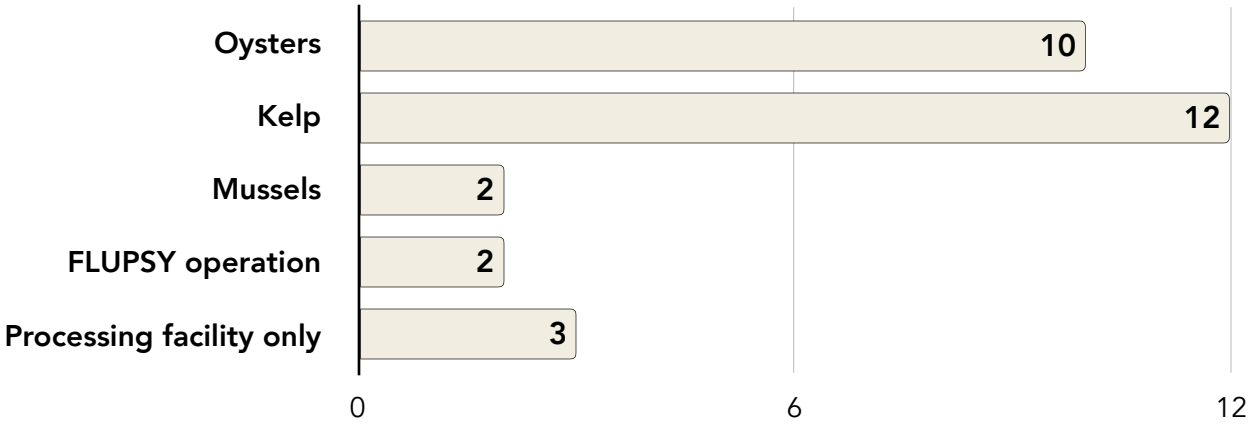
Note: Flupsy refers to a Floating Upwelling System (FLUPSY), used to accelerate the growth of oyster seed.

Mariculture Farms

Farm Type

Most survey participants ran a kelp or oyster farm.

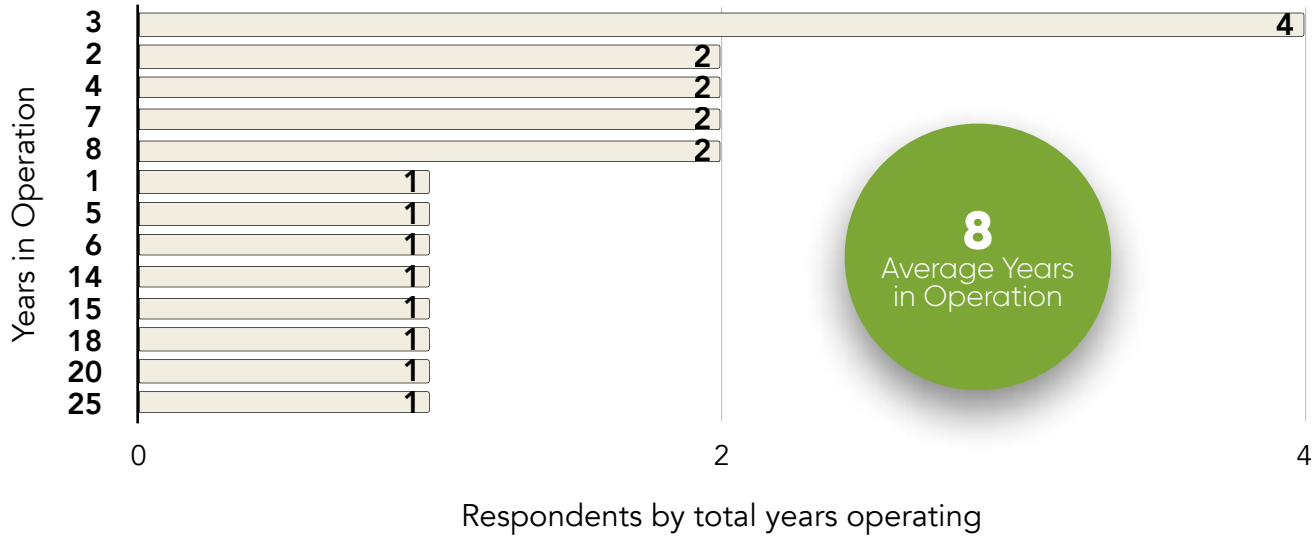
What type of mariculture farm do you operate? (check all that apply)



Years in Operation

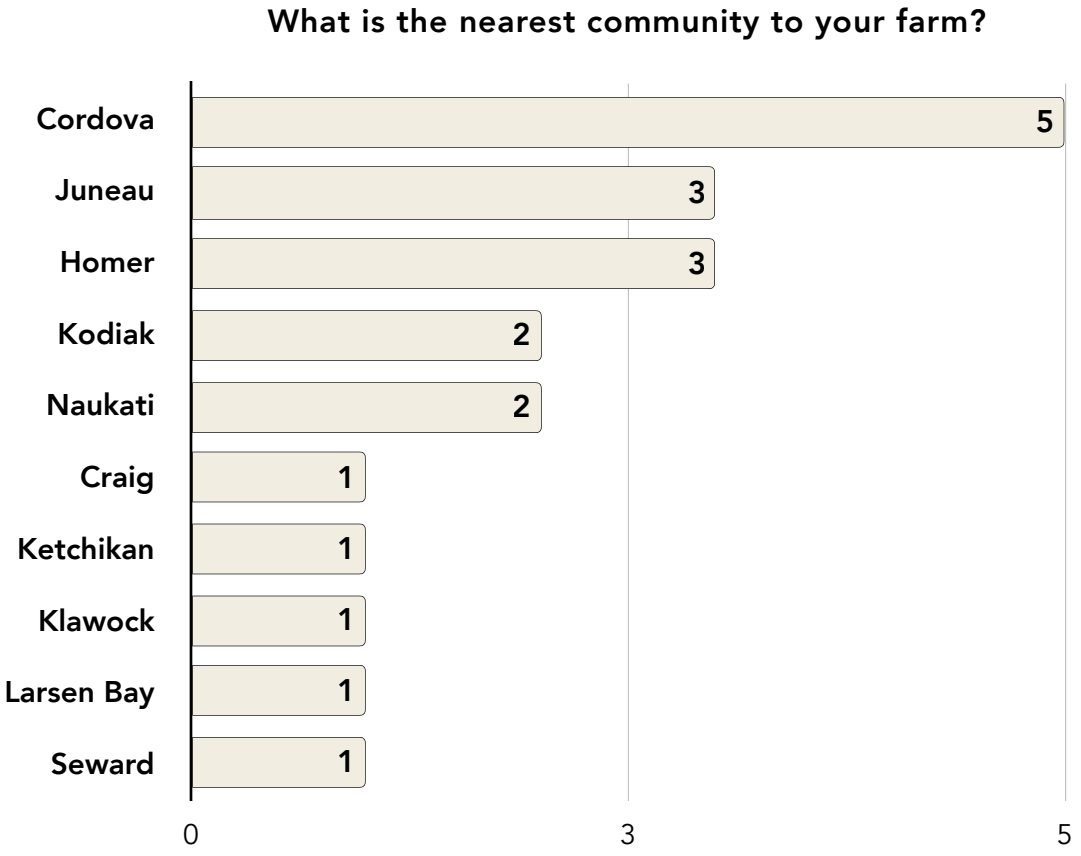
Responding mariculture operations have been in business an average of 8 years. Kelp operations had an average of five years, while oyster farms averaged 12 years in operation.

How many years have you been in operation?



Mariculture Farm Location

The mariculture farmers that participated in the survey work in ten communities across Alaska.

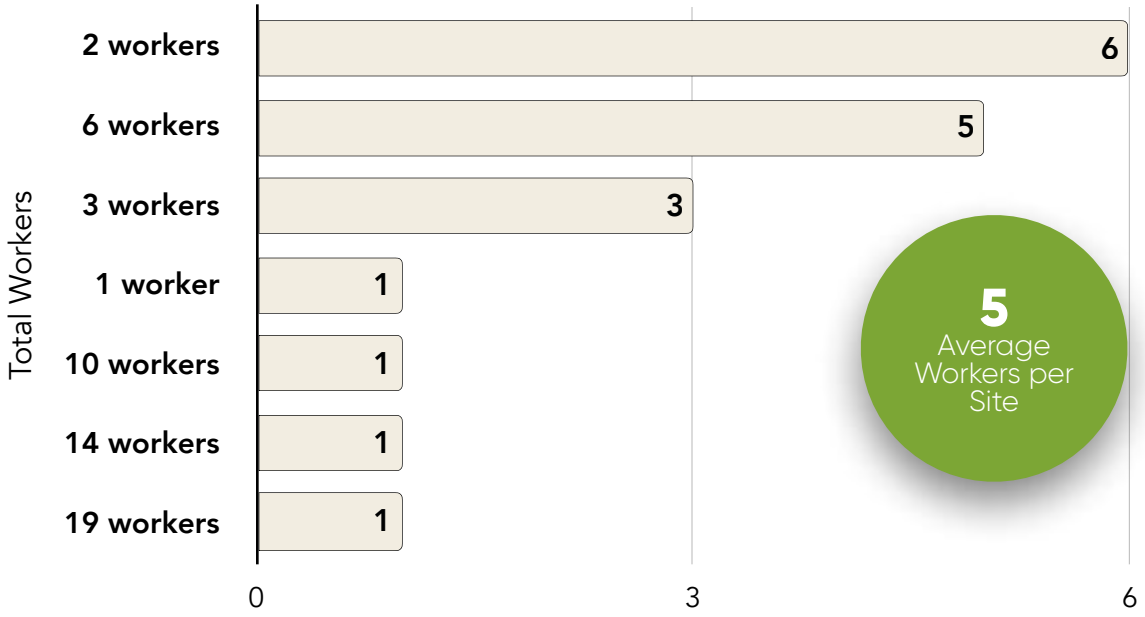


Mariculture Farm Size

Workers

Mariculture sites had an average of five workers, throughout the year, although the most common answer by respondent was two workers. Kelp operations had an average of five annual workers, while oyster farms averaged six people.

How many total people worked on your mariculture site in 2024?



Pounds

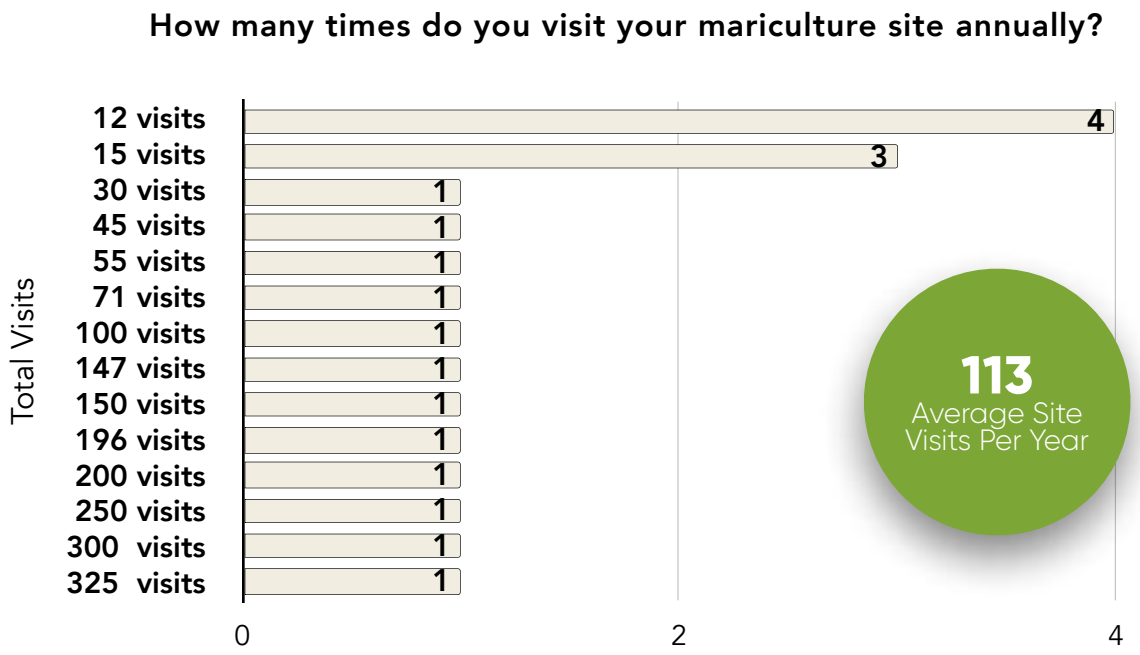
Across all mariculture operations the average harvest was 45,000 pounds. For oysters only, the average harvest was 47,600 pounds, but ranged from 100 pounds of product to 304,000 pounds annually. For kelp the average was 40,000 pounds, but operations ranged from 60 pounds to 209,000 pounds of product annually.

45,000
Average Harvest in Pounds

Travel Modes, Distances and Frequency

Frequency

On average, survey participants visited their mariculture farm 113 times per year, with some farms making only a dozen visits per year, to others visiting the site nearly every day. Kelp farmers make an average of 65 visits annually, while oyster farmers visit 204 times, on average.



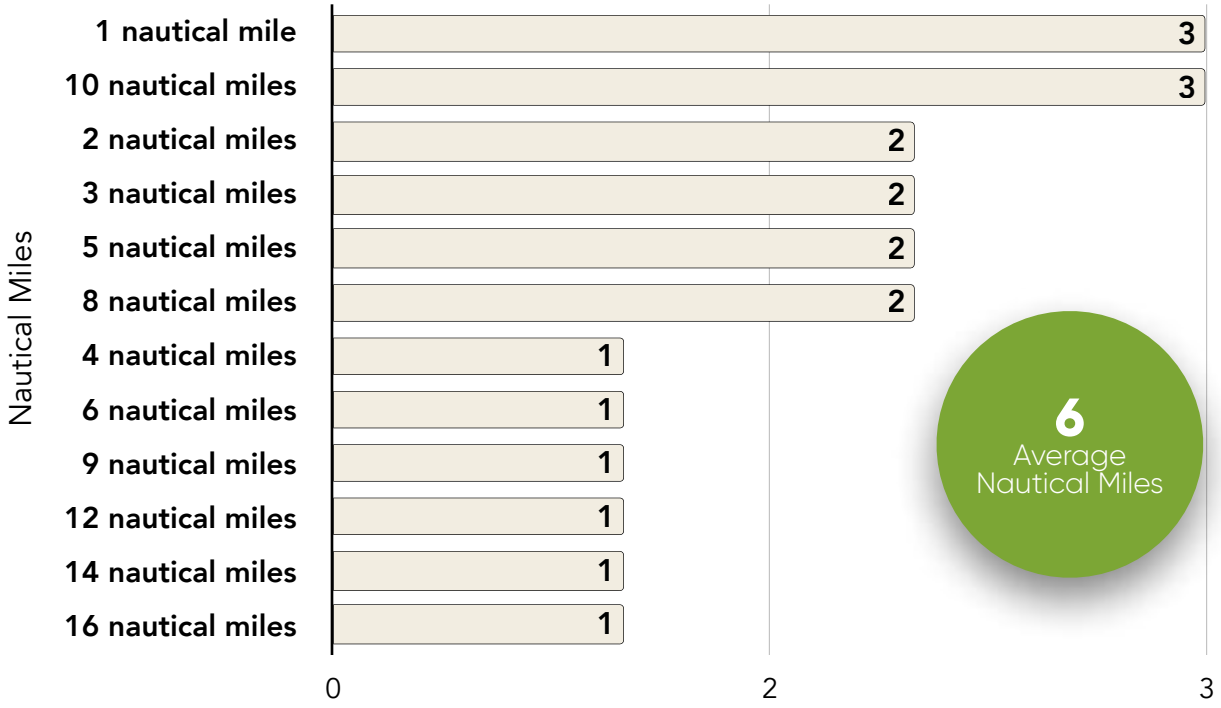
Boat Travel

All farm operators use a boat to reach their mariculture farm site. A separate question asked users about small plane travel to access their site. No respondents access their site regularly via float plane.

Site Distance by Boat

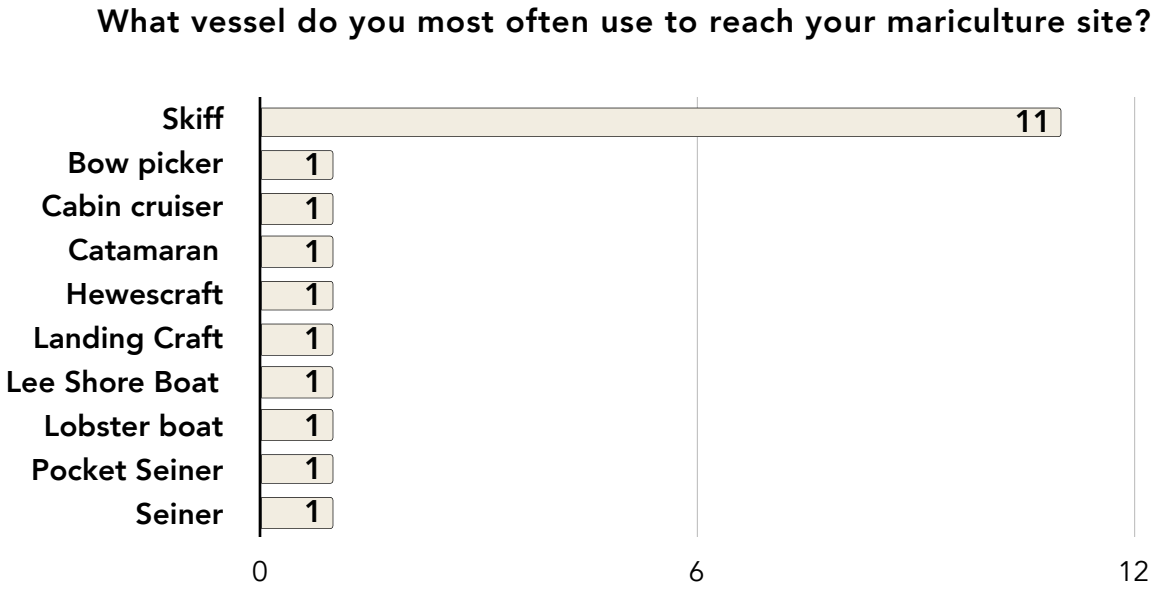
On average, survey participants traveled six nautical miles by boat to their mariculture farm. Kelp farmers travel nearly double the distance on average, 8 nautical miles, while oyster farmers travel 5 nautical miles.

If you take a vessel to your mariculture site, how many nautical miles does it typically take you by boat?



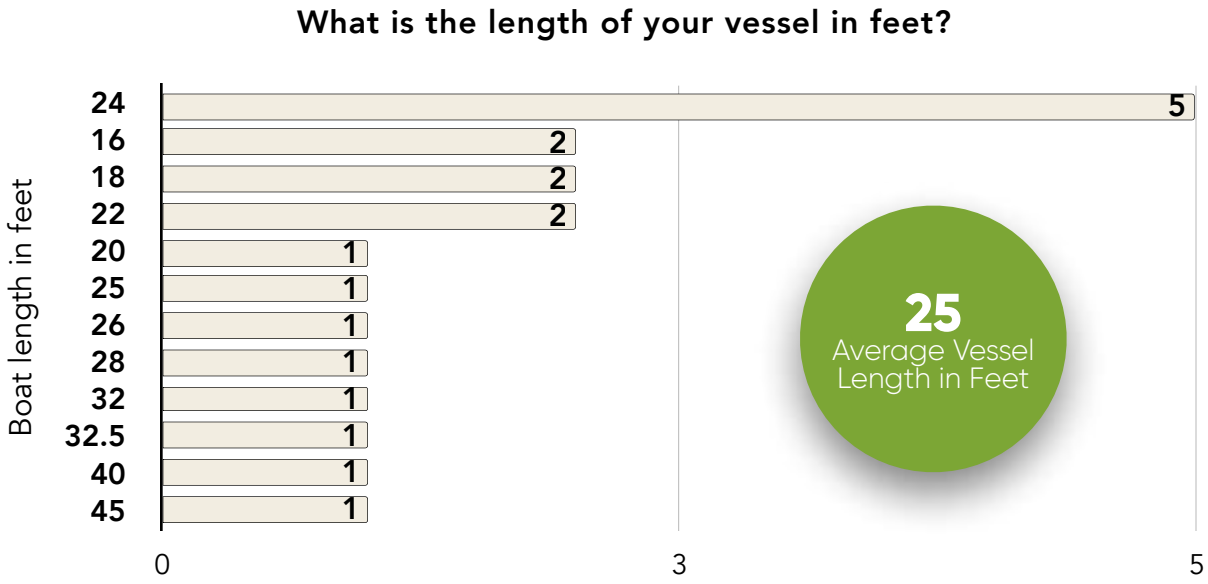
Vessel Type

The most common boat used to reach mariculture sites in Alaska are skiffs.



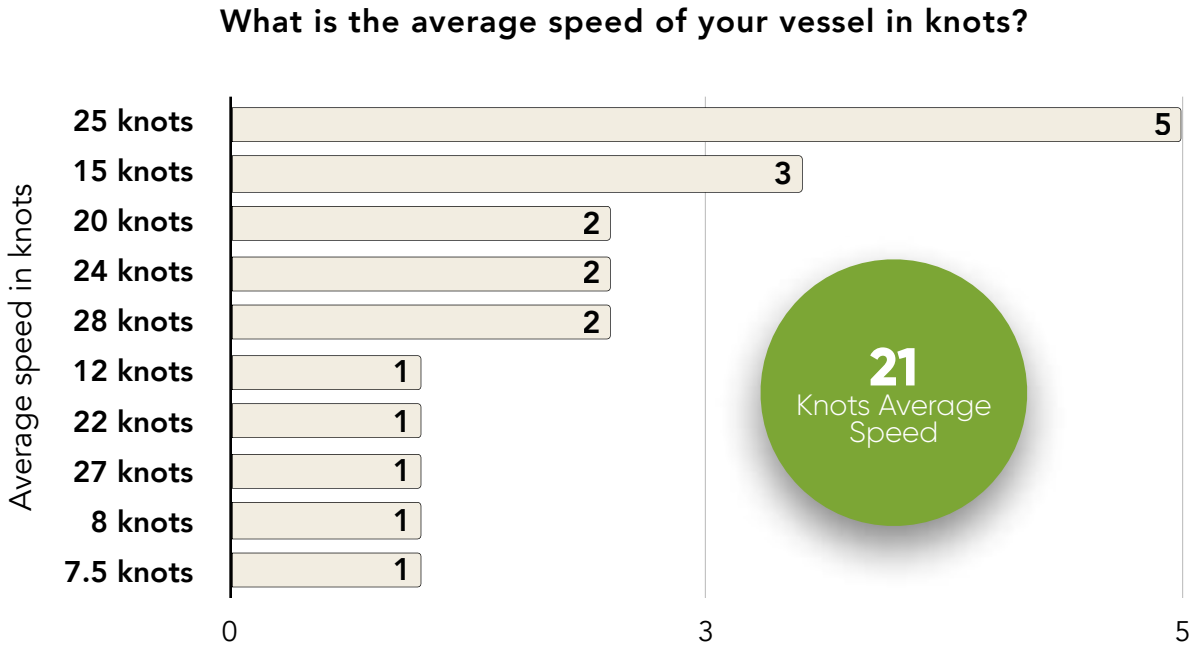
Vessel Length

The average length of vessels used to access mariculture sites is 25 feet. For vessels harvesting kelp the length is slightly longer at 29 feet, and slightly shorter for vessels heading to oyster farms, at 23 feet.



Vessel Speed

Those visiting their mariculture farms travel at a speed of between 7.5 and 25 knots. The average speed of the vessels used to visit mariculture sites is 21 knots. Those headed to kelp sites are slightly slower at 20 knots on average, while those visiting oyster farms have an average vessel speed of 21 knots. The skiffs have an average speed of 21 knots.



Vessel Fuel Usage

Fuel usage varied considerably between farms.

Diesel: On average, a quarter of the farms use diesel boats, using 1,043 gallons of fuel annually. Diesel usage ranged from 120 gallons per year to 3,000.

1,043 Average gallons of diesel used annually

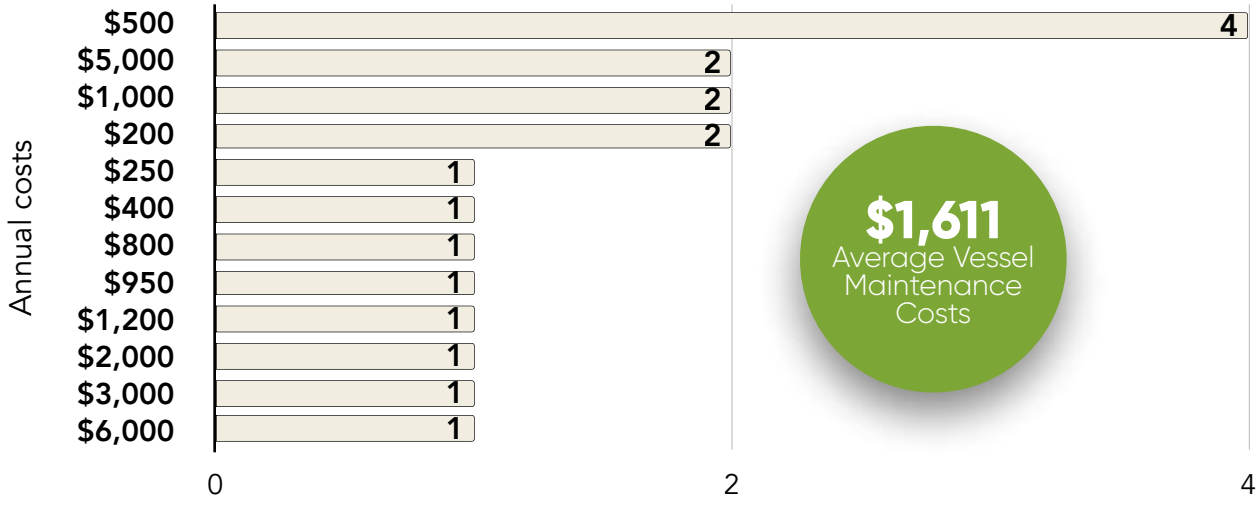
848 Average gallons of gasoline used annually

Gasoline: Three-quarters of the farms surveyed use gasoline fueled vessels to reach their farms, averaging 848 gallons of fuel annually. Gasoline usage ranged from 25 gallons per year to 4,200 gallons.

Vessel Maintenance Costs

The average cost of maintaining a vessel used to access mariculture sites is $1,611 annually. For vessels used to harvest kelp the cost is less at $1,500 annually (although that number decreases to $611 when you exclude those who only work with kelp). Vessels used to access oyster farms cost $2,611 annually for maintenance.

What are your estimated annual vessel maintenance costs?

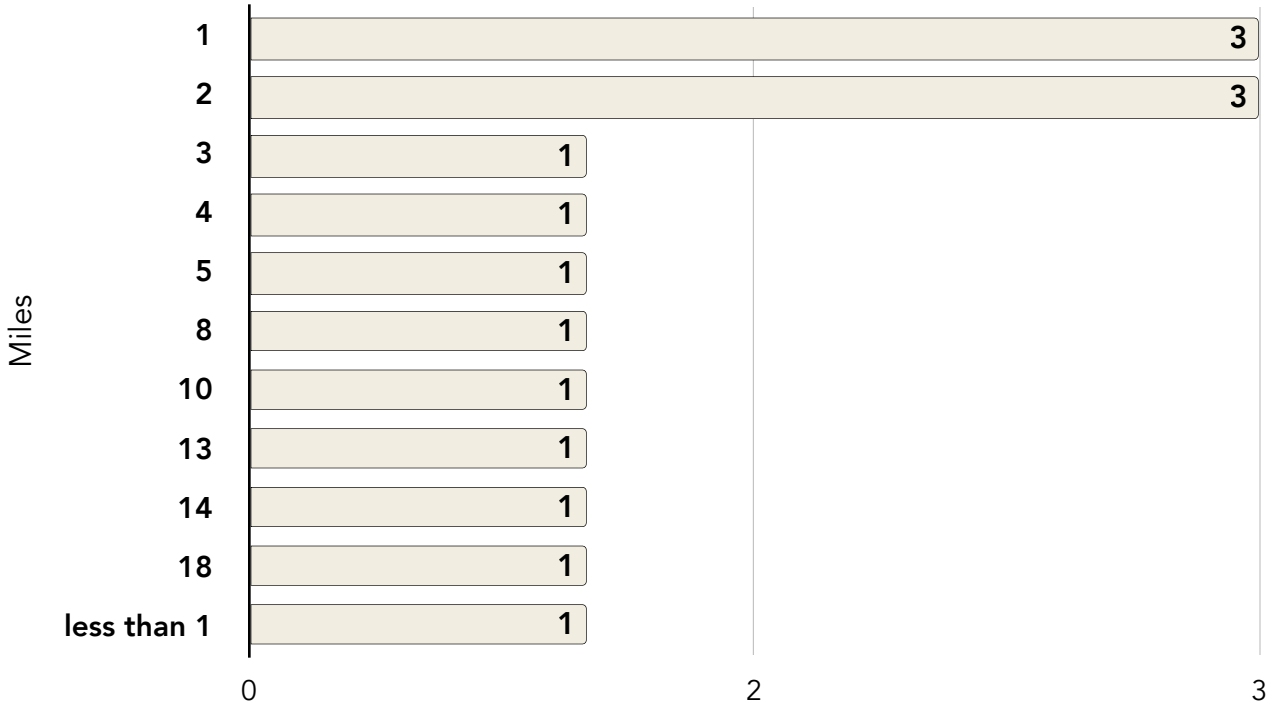


$1,611 Average Vessel Maintenance Costs

Car or Truck Travel

Three-quarters of respondents also use a vehicle to drive to their boat to access their mariculture site. On average respondents drive six miles in a car or truck. Those with oyster farms drive eight miles, on average, while those with kelp businesses drive just four.

If you use your car/truck to reach your mariculture site, how many miles do you typically drive? (Respondents take boat to ultimately reach farm).

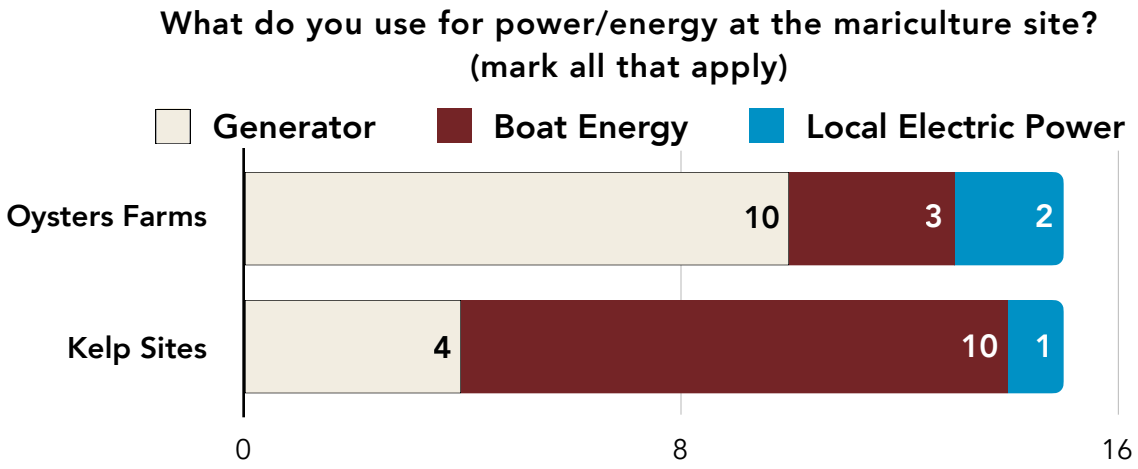


6
Average Road Miles

Equipment Usage

Energy Source

Overall 60% of respondents use generators when at their remote site, 55% use energy from their vessel, and 10% plug into local electric power. When comparing site types, two-thirds of oyster farmers are using generators, while two-thirds of kelp farmers are using energy from their boats.



Seedline

Respondents were asked how many feet of new seedline they used or purchased in 2024. This question pertains to kelp harvesters only. On average respondents used or purchased 14,500 feet of seedline annually. The use ranged from 6,400 feet to 26,000 feet. One respondent noted that 1,200 feet of line is added annually to their operation for more growing space. (A seedline in is a rope or line that has been inoculated with juvenile kelp sporophytes (tiny kelp plants) for growing kelp in ocean farms.

14,500
Average feet of seedline used annually

Hydraulic Equipment

Approximately half of respondents use hydraulic equipment in their operations, including the following:

- Yes 5hp unit

- A hydraulic lift
- Deck winch, washdown pump, boom
- Hydraulic capstan winch to move moorings and haul lines.
- Hydraulic cranes.
- Crane, winch, tumblers
- Big hydraulic power pack to drive sorter
- Honda power pack to run hydraulics to turn a seine block with belt to tumbler
- Hydraulic washdown pump, uses gillnet reel for pulling lines, uses pot hauler to pull lines
- Power pack and vessel hydraulics
- Some, at the installation of the mariculture farm
- We use a hydraulic gill net reel for harvesting

Inventory

We asked mariculture operations owners to describe the inventory of what they use on their mariculture farm, with space to answer in the following categories:

Vessel 1:

1 skiff, made ourselves, skiff motor is about 10 years old. It's a Yamaha 40 horse
130 hp outboard
18' skiff with outboard
1983 Cummins 6BT 210hp Turbo Diesel
2001 Peragrin marine landing craft
2023 115 hp
24' Fishing ski barge with 90 hp outboard
24' Lee Shore Boats Clamshell Skiff
24ft welded aluminum skiff, Yamaha 150, daily driver for farm checks
25' Defender, (2) 225hp Hondas,
38 X 12 Bowpicker aluminum
40' Osmond Beal 550 hp diesel transportation, harvesting
Bottom Time, tour boat: Twin Cummins 210s Engines
Bow picker for hauling commute site, harvest
Lee Shore Boat w/150hp Honda Outboard
Mercury, 40 HP, outboard, skiff
Seiner: Winter checks on farm (once/month), anchor setting (lost one anchor, adding two more), engine year: 1977, rebuilt in 2014, 230 hp
Skiff 24 feet, 115 HP Yamaha outboard, 2019
Twin 250 hp Yamahas 2010

Vessel 2:
18' Crestliner, 25hp gas outboard (2000)
2016 Hewescraft
23' Pacific Skiff
26 x 8 catamaran oyster boat
32' landing craft 90hp outboard 2024 farm work
34ft landing craft, 2 Yamaha 250, harvest/heavy operations vessel
90 hp outboard
Bow picker, gillnetter: Cat C7, boat built in ~1994, original engine, 210-360 hp
Harvesting barge 30 feet, 150 hp Yamaha outboard, 2023
Kachemak Welding - Pocket Seiner - F/V Lindy
Light aluminum work Skiff, Cage flipping: 40 HP Yamaha
Twin, Man diesel engines, ~1989, on Area-M gillnetter contracted to install anchors at farmsite
Zodiak-8' for seeding

Vessel 3:
21’ Specmar
22' Bayweld 150hp Yamaha commuter skiff
49 ft pilot house trawler(converter troller) living quarters
60 hp outboard
Bomber, Employee and Farmer Transportations: 21' Landing Craft, 300 HP Yamaha
Planning to rent a duck boat for planting (john boat/low aluminum skiff with a square bow, 25 hp outboard)
Triple 300 HP Yamaha outboards, on 50-foot landing craft used to harvest kelp

Generator 1:
1.5 HP Yamaha
13 hp Honda powerpack
5kw diesel
Diesel Generator, Kabota
Honda 2000
Honda 2200
Honda 2200w
Honda eu 3000
Honda water pump
Northern lights 16kw backup processor power
TBD

Generator 2:
2 HP Cummins
2kw gas
8000 kw Westinghouse
Firman 3650w
Honda 1000w (for submersible pump)
Honda powerpack 5 hp tumbler

Vehicle 1:
2000 GMC Sierra 1500 5.3L v8
2003 Chevy truck
2021 Ford Transit T350 AWD 3.5 Ecoboost
6 cyl truck
Ford F150
Ford f250
Ford F350 diesel 2018 transportation of product
Suzuki 4 wheeler
Toyota tacoma

Vehicle 2:
2021 Ram 2500 6.4 HEMI
Ford f 350
GMC 1500 truck
Nissan Titan
Toyota 4 Runner 2015 product delivery and transportation

Other 1:
5 hp FLUPSY 24 hour
Honda power pack for hydraulics

Other 2:
18 hp power pack periodic

Other 3
5 hp pressure washer periodic

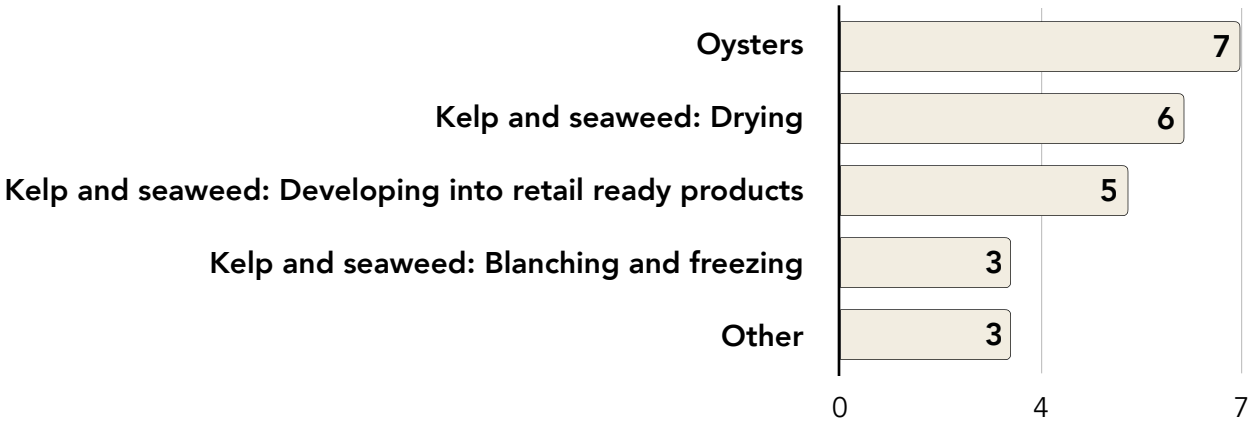
Mariculture Processing Facilities

A total of 11 mariculture processing facilities responded to the survey, including 8 that also ran farms or harvesting operations.

Facility Type

Five respondents processed oysters only, one processed oysters, kelp, seaweed and mussels, and an additional five processed kelp and seaweed only.

What type of mariculture products do you process at your facility? (check all that apply)



Other includes: Biostimulant (research grade) and salted kelp; blue mussels; and smoked kelp.

Processing Facility

Respondents were asked to describe the scope of their processing facilities. Below are the open ended responses to these questions.

Oysters

- Small room built into my garage
- Shore based holding and processing facility with SED sorting line, cooler and capacity to ship 5,000 dozen per week
- Refrigeration, storage, washing, packing, tagging, logging
- We package and keep oysters in refrigeration until we ship them out intra and interstate through Alaska Airlines.

- Boxing
- Utility trailer with LED lights, LG air conditioner with CoolBot system
- Shipping, receiving, processing

Kelp

- A small 8ft x 20ft permitted space with a hood, crab pot boilers, robo coupe processor, freeze dried
- We are a hybrid harvesting and processing and packaging platform
- Smoking, drying and some freezing...selling product in 4 ounce mason jars (cottage scale)
- Receives freshly harvested farmed kelp, produces retail ready products, food grade salted kelp, bulk food-grade dried kelp, research grade biostimulant
- We're in the process of purchasing a dryer and a heat pump for a heat source.

Processing Facility Size

Respondents were asked to describe the size of their main production processing facility. Facilities range from 120 square feet to 5,000 square feet. The average facility size is 1,560 square feet. Oyster and kelp facilities are similar sized, on average.

Product Processed

Respondents were asked how much they harvested in 2024.

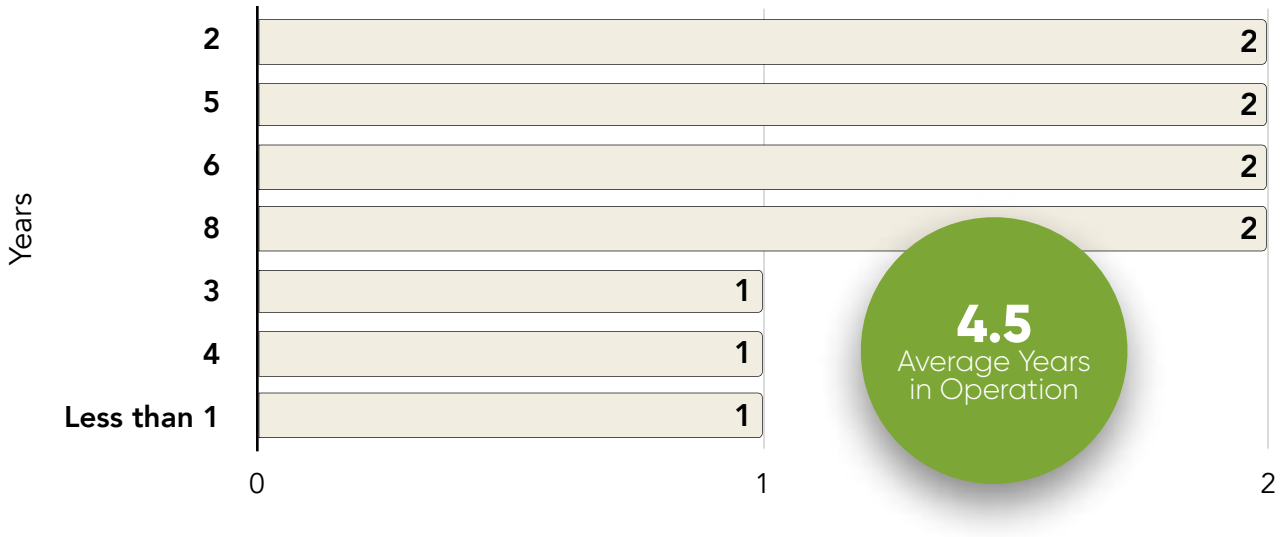
Oysters: On average, the facilities processing oysters processed 78,000 oysters. Since the numbers were most often expressed in dozens, this is approximately 6,500 dozen oysters. The range was 15,000 to 204,000 oysters.

Kelp: Kelp processing facilities processed an average of 4,500 pounds of kelp annually. However this ranged from 10 pounds to 17,000 pounds.

Years in Operation

Responding mariculture processing facilities have been in business an average of 4.5 years. Kelp and oyster average years of operation averages were nearly identical to each other.

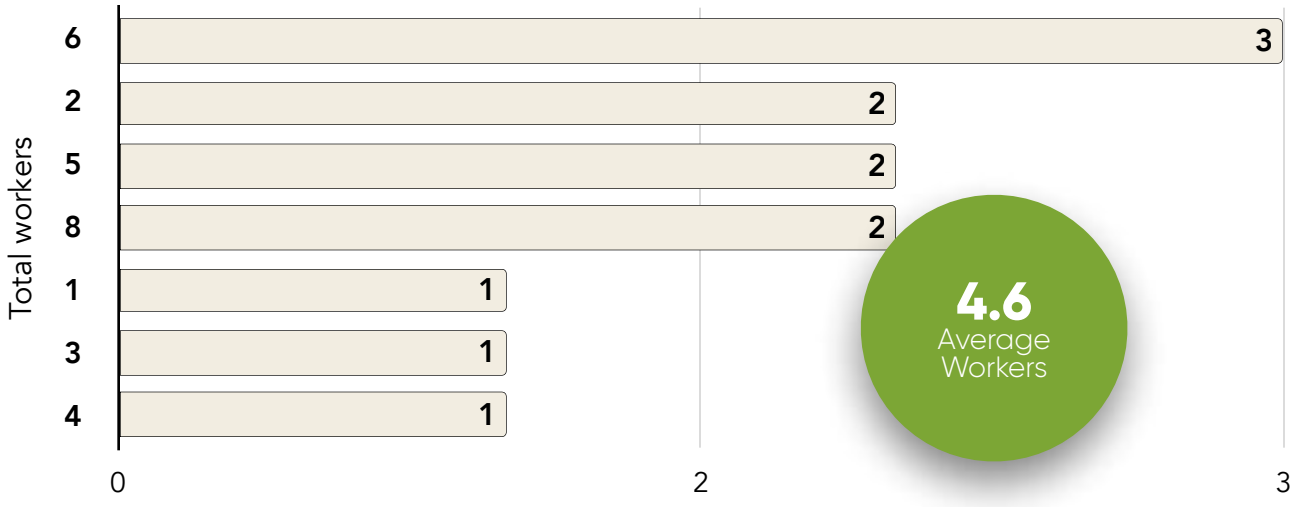
How many years have you been in operation?



Workers

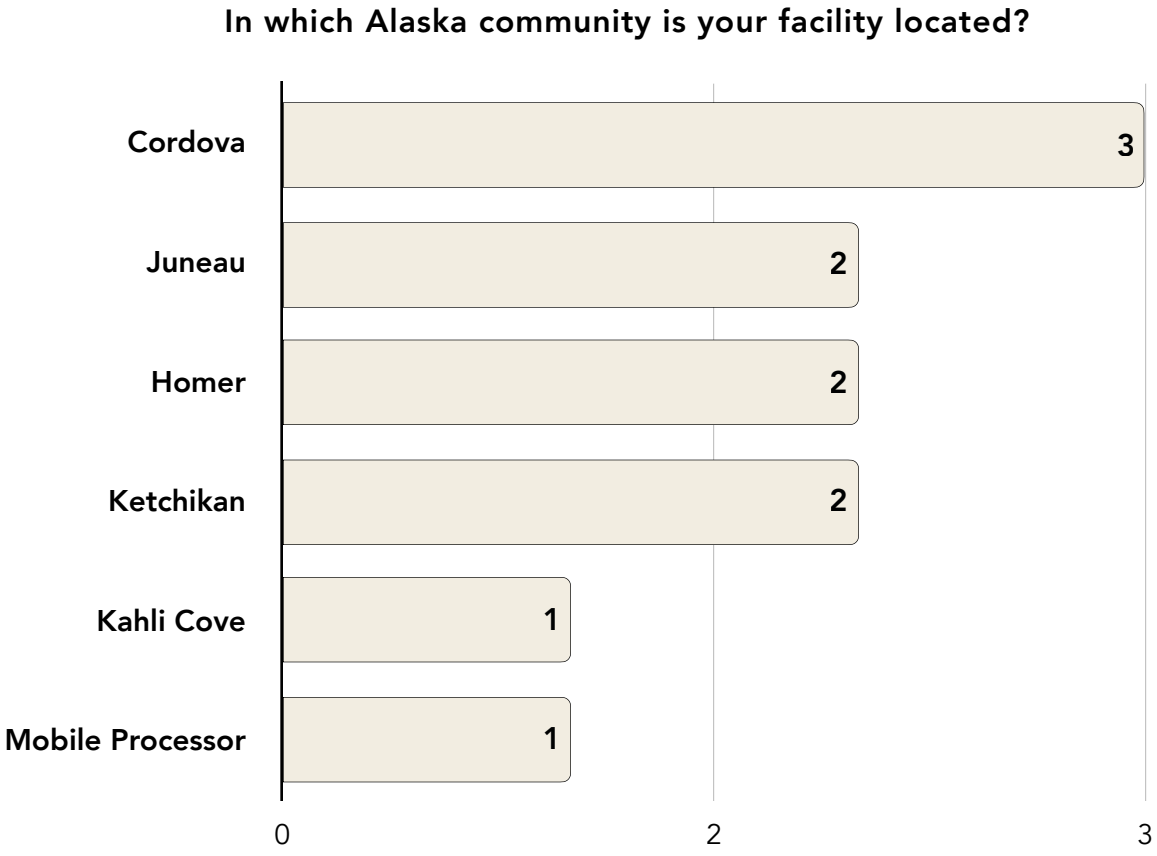
Responding mariculture processing facilities have an average of 4.6 workers. Kelp and oyster operations had a similar number of average workers.

How many total people worked at your processing facility in 2024?



Mariculture Processor Location

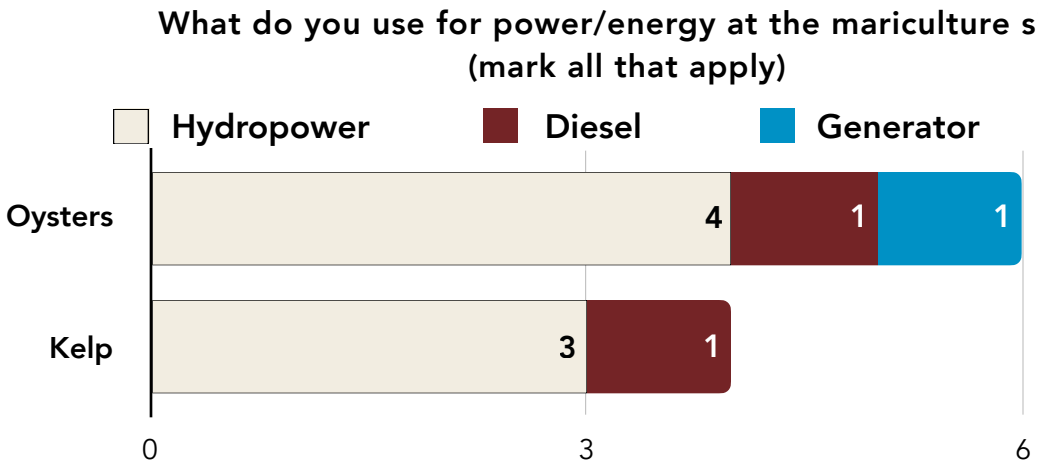
The mariculture processors that participated in the survey work in five communities across Alaska, and also include a mobile processing facility.



Equipment Usage

Energy Source

Respondents were asked if they used local hydropower to run their operations, local electricity fueled by diesel, or personal use generators. Most processors run their mariculture facilities using hydropower. The facility that processes both kelp and oysters is on local diesel electricity and is counted twice in the chart below.



Energy Use

Respondents were asked how much electricity their facility used in 2024. Responses varied, with six respondents:

- 3000 kwh
- 100 kwh
- 8,500 kwh
- $8,000
- 4 hours little chief per 5 pounds smoking, 12 hours in countertop dehydrator
- Unsure, this is on private property connected to owners shore power.

Freezer Capacity

Respondents were asked how freezer capacity they use. Responses varied, with seven respondents:

- 5sf
- 100 sf
- 4x4
- None
- Residential chest freezer--a couple cubic feet
- Tiny chest freezer
- Wet storage and cold storage

Travel Modes, Distances and Frequency

Raw Product to Processing Facility

Procuring Raw Product

While oyster processors used every type of transport to get their product, those who do kelp processing get their product through fishing boat and truck only. The average distance the raw product traveled to the processing facility was 110 miles, although kelp traveled just 14 miles on average.

How do you get your product? What modes of transportation are used to ship the raw harvest to you? (Mark all that apply)

Survey Respondents by Type		
Respondents	**Oyster Processing**	**Kelp Processing**
Barge	1	
Ferry	2	
Jet	2	
Small Plane	1	
Truck	3	1
Tender/Fishing Boat	1	3
Skiff/Smaller Boat	4	

Distance

Oysters

- 0 miles
- 1.7 miles
- 12 miles over water
- 15 miles (3 on skiff, 12 in van)
- 170 miles by water. 50 by ferry
- 950 mi

Kelp

- 5 miles
- 12 miles
- 12 miles
- 14 nautical miles
- 6 miles by skiff, 20 miles by fishing boat

Processed Product to Market

Shipping Processed Product to Market

All type of transport are used to get processed oysters and kelp to market. Oysters traveled less than a mile to 3,000 miles to reach their market. Kelp traveled less than a mile to more than 2,000 miles.

How do you get your product? After processing, what modes of transportation do you use to ship your product to market? (Mark all that apply)

Survey Respondents by Type		
Respondents	**Oyster Processing**	**Kelp Processing**
Barge	1	1
Ferry	2	1
Jet	5	3
Small Plane	3	1
Truck	4	3
Boats	2	3

What is the typical distance from your processing facility to the point of sales?

Oysters

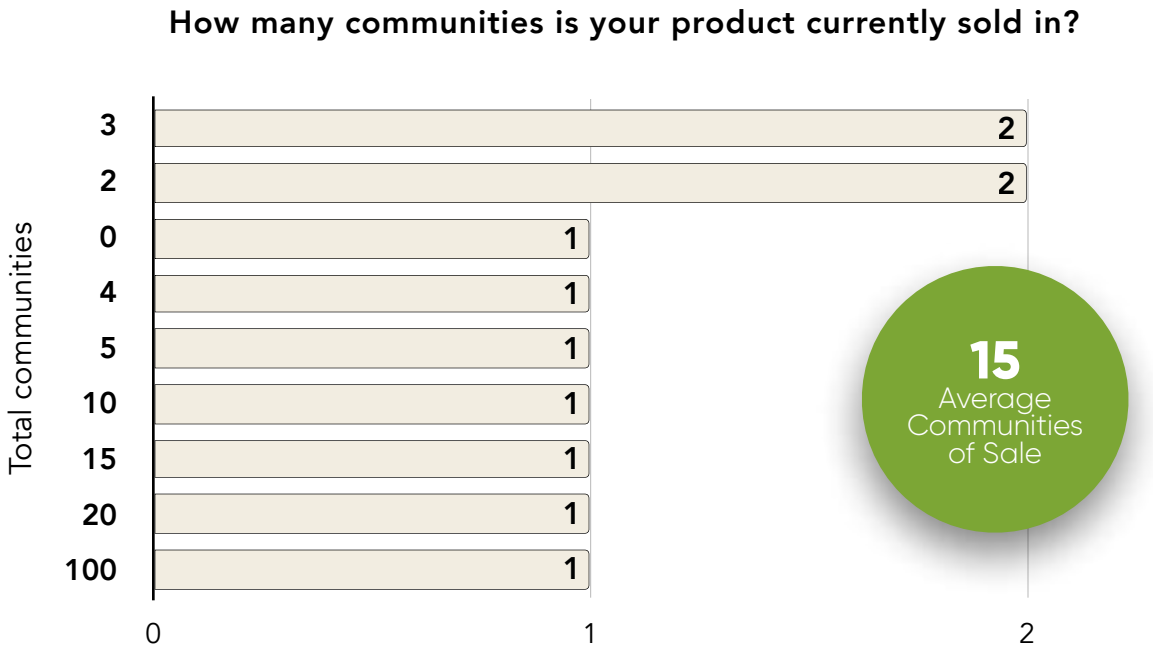
- 20 miles
- 0-3,000 miles
- 15-20 miles
- Varies, can be 5-1,000 miles depending on where the oysters are being shipped.
- 55 miles
- Within 1 mile
- 200 miles

Kelp

- 10 miles
- Some local (within 5 miles) and some by jet to Wyoming
- 10 ft to 200 miles

Communities

Processors were asked how many communities they currently sell their product in. Responses ranged from none to 100, with 15 communities being the average.



Improving Energy Efficiency: Open-Ended Responses

Respondents were also asked what changes they would make to improve the energy efficiency of their mariculture operation. Respondents identified several strategies for improving energy efficiency in mariculture operations, focusing heavily on reducing fuel consumption through fewer farm trips, hybrid or electric vehicles, and optimized vessel performance using monitors and specialized propellers. Solar power is being planned at farm sites and processing facilities, complemented by battery systems for on-site equipment. Other ideas included using heat pumps for kelp drying, solar kilns, electric powerpacks to operate hydraulics, electric outboards and jetskis, and shared or commercial spaces and vessels to enhance labor and transport efficiency. Some operators are still exploring options and seeking additional recommendations.

Improving energy efficiency in kelp operations

- We're focussed on labor efficiency, getting a shredder and a dehydrator, getting an auger to feed the shredder, making salted kelp (zero onsite energy), biostimulant (small energy demand compared to dehydrating), thinking about copacking facility.
- Not sure, hoping for recommendations!
- Planning on purchasing a heat pump as the heat source for our dryer. Using straight electricity to generate hot air for drying kelp will be far more expensive than using a heat pump.
- Installing an engine monitor on the Honda 150hp to find optimal rpm/speed for fuel consumption efficiency.
- Shared commercial space.
- We would love to have something to replace our powerpack to power hydraulics. Also electric outboards.
- Electric powerpack system for running hydraulics.
- Electric kicker for operating on the farm (currently working by hand). A vessel specific for harvesting--maybe shared by everybody--could be a little bit wider, could do two lines at a time partnering with nearby farms to reduce trips.
- Solar kiln for drying. Hydrofoil electric boats--just a boat that would carry a kayak out there, my boat takes 2 hours out and 2 hours back, a jetski could work for a lot of check ins. Boats have to be winter worthy (cabin heater).

Smoking for drying (tried it and it hasn't really worked). Electric jetski, maybe swap batteries at kelp farm with solar charger.

Improving energy efficiency in oyster operations

- Reduce trips to farm, so that farm activity is sorting, cleaning and harvesting, and the only trips back to port include a harvest of product for sale. We are not there yet.
- Add a solar/battery system at the farm site to power equipment and security. Purchase an AWD EV with the farm instead of using a personal vehicle to substantially lower fuel/maintenance cost.
- Add solar to farm site.
- We will be adding solar panels to our farm, to help with energy on our farm.
- Make testing closer to operation not in Anchorage.
- We are looking to figure that out more this year!
- Diesel outboard, additional solar, new propellor developments.

Improving energy efficiency in combined oyster/kelp operations

- Fewer trips. Hybrid tech would work.
- Solar panels on processing facility.