

Reviewing Recent Methods and History for Farming Sea Scallops (*Placopecten magellanicus*) and Issues Important to the Development of Scallop Aquaculture in Maine



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Goals of this talk

Review methods for scallop production, and other issues like the market, public health issues, permitting and regulation, etc

To bring people together to address the many issues that need to be solved in order to develop scallop aquaculture in Maine

Acknowledgements:

To the many farmers, fishermen and scientists who have shared freely of their information and considerable knowledge, and to the Univ. of Maine and Maine Sea Grant, for time on sabbatical to make several of these visits

Biological and Market Rationale for Scallop Aquaculture

Case studies

Tom Pottle, Maine

Mutsu Bay, Japan

Bay Tender Shellfish, Nova Scotia

Sea Perfect Cultivated Products, Cape Breton

Magellan Aqua Farms, New Brunswick

Culti-Mer, Magdalene Islands, Quebec

Hillsburn Basin Scallop Group, LTD, Nova Scotia

Darling Marine Center, and Mid-coast Lobster Pounds

Bottom Seeding

Spat Collection

Permitting

Biotoxins

Diseases and Pests

Market Considerations

Suggestions for the Development of a Maine Scallop Aquaculture Industry

Biological and Market Rationale for Developing Scallop Aquaculture in Maine:

Seafood trade deficit (\$10 Billion as of 2010)

Good quality scallops from Maine, reputation is established on the global market

Well developed infrastructure

Management becoming more active to improve and stabilize wild production

Diversification for the fishing industry

Locally produced, fresh products are popular

Strong 'foodie' culture in Maine, great creativity in restaurant sector

Rationale, cont.

Seafood consumption in the US is on the rise, emphasis on prepared foods

Scallops are an endemic, coast-wide species, occurring in upper bays to fully oceanic conditions.

Excellent outlook for seed supply, minimal impacts to wild larval supply, and scallop farms would likely add to local recruitment (high fertilization success)

Large size of scallops in collectors means that scallops could reach market size (50+mm) in 1 to 2 growing seasons; shorter than other areas and quicker to start of cash flow



BUT! On The Other Hand.....

- Culture of *Placopecten magellanicus* has a lot more failures than successes. Improvements are still needed in equipment, husbandry, handling, processing, product development and marketing.

- Niche market means that production can't outgrow the market, and the market must be grown

- Risks from toxic algae are real and must be given the very highest priority to ensure public health.

- New ventures often take a while to work out

- Aquaculture is farming, and farming is risky.

Time Period	Milestone
1950's-1960's	Japanese developing bottom and suspended scallop culture following natural stock declines.
Late 1960's	First sea scallop spat collection trials by Memorial University (Scaplen, Evans) around the island of Newfoundland.
Mid 1970's	Larval rearing trials at Memorial University to pediveliger stage (Idler et al.).
Late 1970's	Biological feasibility of cultivating scallops from wild spat collection to market size animals (>100mm) demonstrated in Placentia Bay (Naidu et al.).
1980	First commercial sea scallop farm established in Little Mortier Bay, NL.
1980's	Wild spat collection in Port-au-Port area suggests excellent seed supply
1981-1989	Memorial University "perfects" pilot hatchery production of sea scallops to 5mm shell height (Dabinett et al.).
Late 1980's	Two commercial scallop farms established on south and north coasts.
1992	Patented sea scallop hatchery methodology (Dabinett).
Early 1990's	Spat collection no longer economical in Port-au-Port. Low spat numbers thought to be due to over-exploitation of wild broodstock.
1995-2000	Trials on developing farm best practices and lowering costs of production for grow-out (Parsons, Couturier).
1995	Technical constraints to commercialization outlined and industry R and D project established to address them. Commercial scallop hatchery built in Belleoram.
2000	Belleoram seed hatchery closes doors after 5 years due to variable production and uncertain industry interest.
2000-2001	Sudden, unexplained mass mortalities at two commercial farms (Pools Cove and Charles Arm) in age classes 1-4 years results in 80% or more dead scallops. Industry lacks confidence, and stops production.
2004	4 commercial sea scallop farming licences, but no production.

Scallops: Domestic Production and Imported Product

(includes several species and product forms)

Maine Landings

2010-2011: 190,000 lbs., worth \$1,490,000 (\$7.80/lb)

US landings

2009: 58,000,000+ lbs, worth \$382,000,000 (~ \$6.58/lb)

Imports of Scallop Products to the US

- 2010: 50,318,400 lbs. imported, worth about \$232 million (\$4.60/lb).

Most imports are for frozen product, either meats or value-added.

Who were the major scallop importers to the US in 2010-2011?

China = 9.4 million kg.

Mexico = 1.8 million kg.

Canada = 846,000 kg.

Case Studies

JAPAN – Aomori Prefecture, Mutsu Bay

Spat collection experimentation in the 60's

Transition of fishermen from wild capture to farming

Cooperative structure

Government research and development

Scallop production in Hokkaido and Honshu ~ 400,000 mt traditionally

Diversified products: meats, mantles, whole, roe on, boiled, smoked, dried, etc..

Impact of 2011 tsunami will have a profound impact on all Japanese seafood production, including scallops.

Production cycle:

Wild spat collection, nursery culture, growout: pearl nets, lantern nets, ear hanging, bottom seeding

Principal lessons:

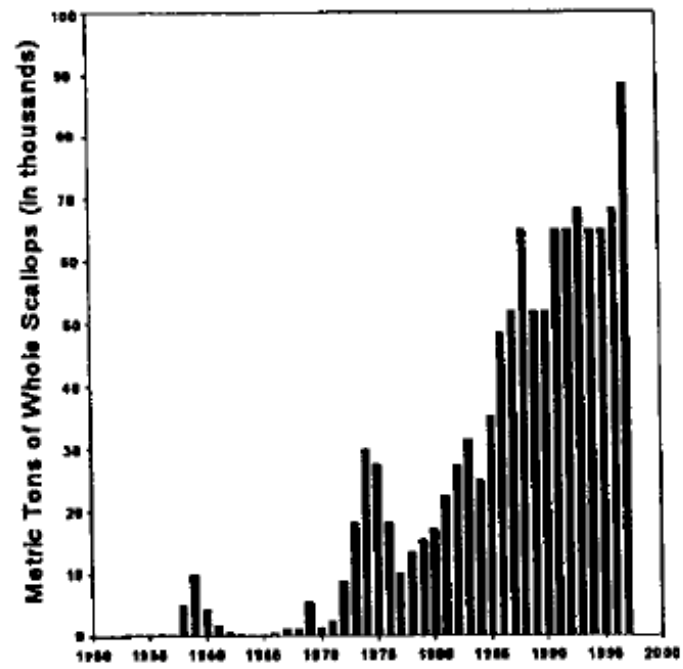
Spat collection procedure

We will not have same focus in Maine on single species production

Equipment and processing knowledge can be obtained

Diversification in products is good for business

Figure 2. Annual Japanese scallop landings from Aomori





Huge landings, labor-intensive culture equipment, and specialized vessels in Japan, all targeting scallop culture.



Japanese processing and product development is highly advanced, production cycle is well known, and the entire region is focused almost solely on scallop production.



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08-Jun-2011
Norito Matsui

[Market Trend](#) | [Scallops](#) |

Mutsu Bay Scallop Production Devastating, Prices Soar

[Aomori] Scallop production in the Mutsu Bay in Aomori Prefecture has been devastating. According to the Aomori Prefecture Federation of Fisheries Cooperatives, fiscal 2011 harvest through May amounted to 8,890 tons, down 72% over the same period in the previous year. Output of semi-grown shells, of which shipment is at its peak, totaled 6,968 tons, down 76%. Annual production plan is set a...



[Read more](#)

Read also

- [Aomori Semi-Grown Scallop Port Price Soars Amid Poor Harvest](#)
- [Okhotsk Frozen Scallop Industry Looks To U.S. Demands](#)
- [NMFS Closes Scallop Fishery Area in Nantucket Lightship Starting Mid-June](#)
- [Aomori's Mutsu Bay Scallop 3rd Auction Hits Even Higher Prices](#)
- [Frozen Scallop Price May Hit Peak in Osaka](#)

Market Headlines

- [Canadian 2011 Bluefin Tuna Fishing Quota Down by 3%](#)
- [Sales of Top 100 Seafood Processors' in Hokkaido Down 5.6% in Fiscal 2010](#)
- [Fishermen Not Welcoming Competitors From Different Sectors: Survey](#)
- [Seafood Import Volume in May Up 8.9%, Value Up 6.5%](#)
- [Export Volume of Seafood in May Halved, Unit Price Up 60%](#)
- [Import Volume of Frozen Shrimp and Prawn Down 9.4% in May](#)
- [Kabayaki Eel Import Seen To Fall Below 15,000 Tons](#)
- [Surimi Major Plant in Indonesia](#)
- [Live Eel Imports From Taiwan, China Seen to Total 10,000 Tons](#)
- [Coke-wide Group Firm Markets Tuna-Derived Nutrition Drink](#)
- [Eel Sales Ready To Heat Up With Sky-High Prices](#)
- [Fishery Agency Draws Blueprint for Marine Industry Revival From Quake](#)
- [Alaska Halibut Earned FAO-based Responsible Fishery Management Certificate](#)
- [Bristol Bay Sockeye Catch Totals 2.7 Mln Through](#)

The tsunami of 2011 is having severe effects in Aomori Prefecture, a hub of scallop production in Japan – harvest is down 72% presently....

Maine: Tom Pottle, 1999-2000

- Longtime fisherman and has family lumber business**
- Funding from National Fish and Wildlife Foundation**
- Scallop seed sourced from Canada**
- Bottom cage trials for growout in Cobscook Bay (using AquaTray equipment)**
- Routine water quality tests**
- Bi-weekly sampling for toxins in scallop tissues**
- Scallops grew from about 10mm to about 50 mm in 12 months**
- Developed a Memorandum of Understanding with ME DMR for sale of whole product**
- Used 4-5" scallops from an earlier experiment to do a market trial, sold into Portland and Boston for \$1.35 per piece**
- Tom discontinued the project to tend his fishing and lumber businesses, remains very supportive and optimistic about potential for scallop culture – willing to talk!**



Steve Backman – Magellan Aqua Farms

- Located in St. Andrews, Passamaquoddy Bay, New Brunswick
- Lantern net style of production, tended by diving
- Working on a super-size lantern net, can swim into it
- 2-4 year growout
- Sells animals whole, live
- Long process for leasing, virtually the only shellfish farm on the Fundy side of New Brunswick (biotoxin risks)







Water table, used for washing, sorting, grading, etc: careful handling is needed to minimize stress



10-tier lantern nets, serviced by diving. Harvest is 4-5" scallops.





Scallops are held wet during the workday – ripe female at right..



Steve's scallops as a special appetizer – Rossmount Inn, St. Andrew's, NB
Owner/Chef Chris Aerni holds them live in a display tank, until prepared.....

First harvest for New Brunswick scallop farm

By Ross Barnes

It took eight years for New Brunswick Magellan Aqua Farms to get through the approval process, but their first batch of scallops got rave reviews from the organizer of *Cuisine Canada* as well as a local restaurant owner.

Steve Backman, a veterinarian with Skreting, began the project back in 1996 in partnership with Peter McBride who has since moved on to other things, and his current business partner is Rob Mann.

The reason the approval process took so long, said Backman, was that it was the first shellfish farm to come under the Canadian Environmental Assessment Act so it was like a test case but, on the positive side, it was the first application that had zero opposition.

Backman said that there was a site previous to theirs in Grand Manan which was not successful and another one right opposite where theirs is located in Passamaquoddy Bay which is no longer there.

"We were third after two failures which probably slowed down the process, but Passamaquoddy Bay is an excellent scallop farming environment."

They tried different methods of growing the scallops, he said, but what they opted for was mid-water suspension. They use a submerged long line he said, and you could go right over the top of their site and never know it was there.

Their approval was received in 2003 then, after they had overcome some problems obtaining a spat collection permit from the Department of Fisheries and Oceans, they began collecting spat in the fall of 2004 to allow them to do some test work.

They had their first batch of 1000 scallops this year and their first customers were Chris Aerni at St. Andrew's Rossmount Inn and Anita Stewart, organizer of *Cuisine Canada*, a national alliance of Canadian culinary professionals who share a common desire to encourage the development, use and recognition of fine Canadian food and wine.

"She called us looking for some scallops. Her

big goal is environmental stewardship and Chris had told her how we were doing it and trying to be as sensitive to conditions as possible. We had a few we could give her and she rated them extremely highly."

"I think there is a huge potential to develop a shellfish cottage industry here and reduce food miles. As Canadians I think we are really mortgaging our food supplies by our lavish lifestyle and as time goes on it will be to our detriment."

They go out to their site every other weekend, he said, and it is usually a family expedition with both Backman and Mann taking their wives and children along too and they all work at it together plus McBride still comes out to help.

"It is all done manually. The sorting is done by hand, the cleaning and the scrubbing. We only have a small outboard so we use less fuel - five gallons does us almost a year - and we make the smallest footprint we can."

Eventually, said Backman, they will be able to harvest year-round and their goal is half a million scallops a year from their 20 acre site.

There is a worm (polydora) which can be a problem, but they have dealt with that by putting in sea urchins which graze the worms off the shells. Backman said they have received a lot of help from Dr. Shawn Robinson at the Biological Station.

A lot of the equipment they have used for the site is recycled, said Backman. They were able to use rope that could no longer be used by salmon farmers and they have an old feed barge that they refitted. He said other farms in the area gave them a lot of help and have been really supportive.

"Essentially everything that is out there we built ourselves. We refitted the barge to handle shellfish and built the sorting table."

"We didn't bring anything in from outside. We want to keep the native gene pool so we can collect ones that have evolved in the bay. They have evolved there and that is where they want to be."



Steve Backman and his wife Ann Robinson with newly sorted scallop seed.



Freshly graded yearling scallops



Some press for Magellan Aqua Farm.....

Getting to the Plate



***Northeast Aquaculture Conference and Expo
December 4, 2008***

Steve Presented at the 2008 NACE conference in Portland; presentation is available as a PDF document...



Steve is working on larger cages, will still be serviced by diving. Cages can be set on bottom or suspended.



Bay Tender Shellfish – Mahone Bay, NS

Duncan Bates, operator

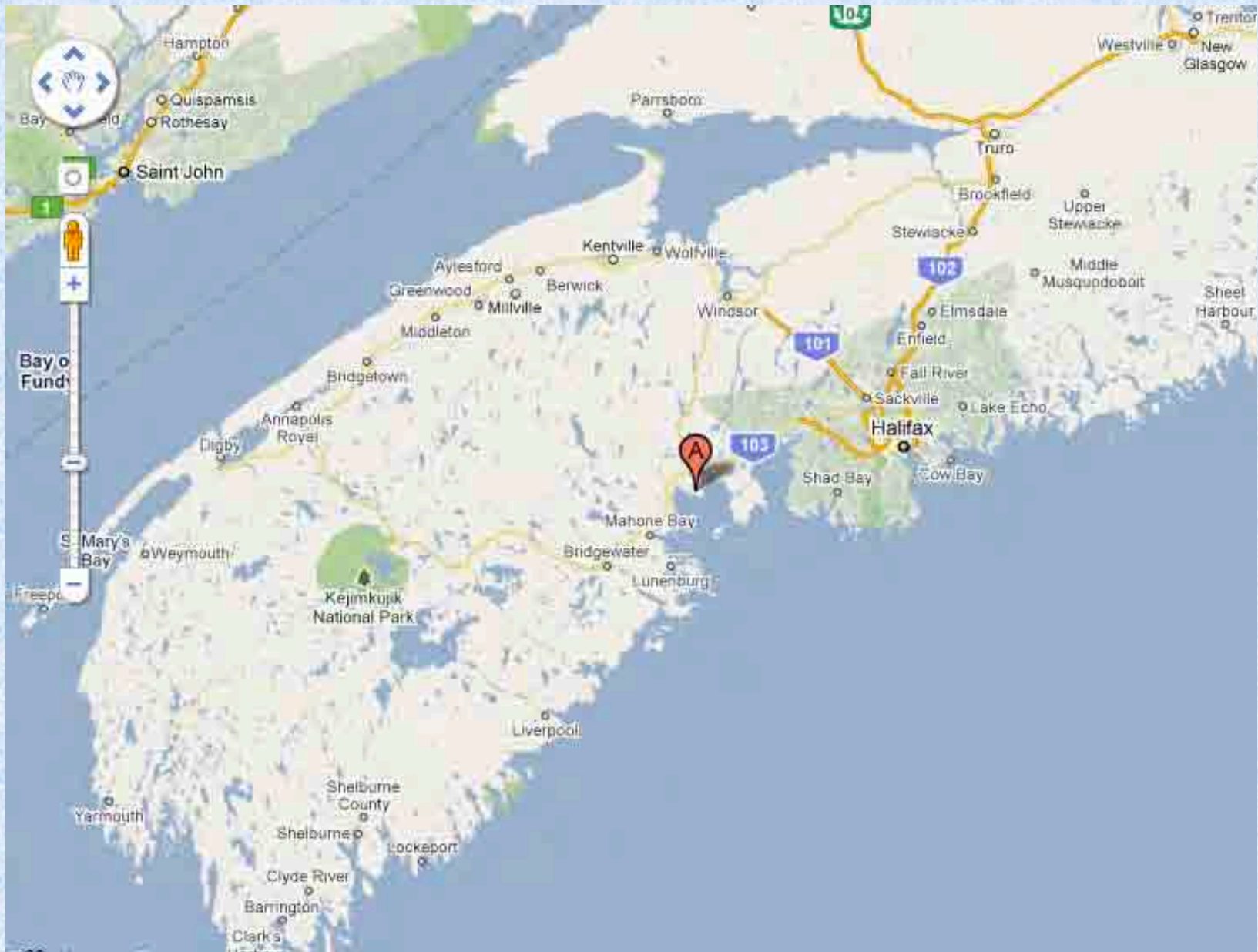
Former grad student of Dr. Mike Dadswell (Acadia University), had worked the site for Mike, then took it over as a business opportunity

Collected spat on site and purchased some as well, used pearl net and lantern nets for growout, on suspended longline

Site was well protected and well flushed – his farm helped local spat collection

Sold live scallops at about 70mm size, for about \$0.35/ea., sold principally to Pec-Nord (Paul-Aime Joncas)





Mahone Bay, near Chester, NS



Typical spat collector bag (left) and re-stocking pearl nets. He used a little plastic tray for holding a corn cob to regulate volume, covers about 20% of the bottom to start



Hydraulic star wheel to pick up a longline float, and then run the longline in – can move back and forth



Lifting a line of pearl nets,
bottom of the nets don't foul much,
top net fouls a lot. 10 nets in a string,
starting about 15' down.



Strings of pearl nets, spaced about 2.5 feet apart on the longline.



Swapping fouled nets for clean ones,
fouled nets get cleaned at home..

Many lantern nets also for larger product.
Below, male and female scallops in
spawning condition





Harvesting – product ready for market gets stored in a lantern net temporarily.



Unusual colors and shell patterns occur (left), and even really damaged shells can repair (right)



SCALLOP CÉVICHÉS

SCALLOP CÉVICHÉS

RETAILERS

NUTRITIONAL INFO

SERVING TIPS

[Français](#)

HOME

OUR COMMITMENT

COMMENTS / LOG BOOK

SITE MAP

CAREER OPPORTUNITIES

CONTACT



Pec-Nord
Scallop
Cévichés



NEW FLAVOR

Lime-Strawberry



Scallops, sold to Pec-Nord, were destined for products like these:

http://www.pec-nord.com/en/a_accueil.htm



Sea Perfect Cultivated Products

W. Arichat, Cape Breton, NS

Ron Boudreau (L) and

Rodney Fougere

Spat collection specialists,
often 10k+ scallops per bag,
collectors set right in the
harbor

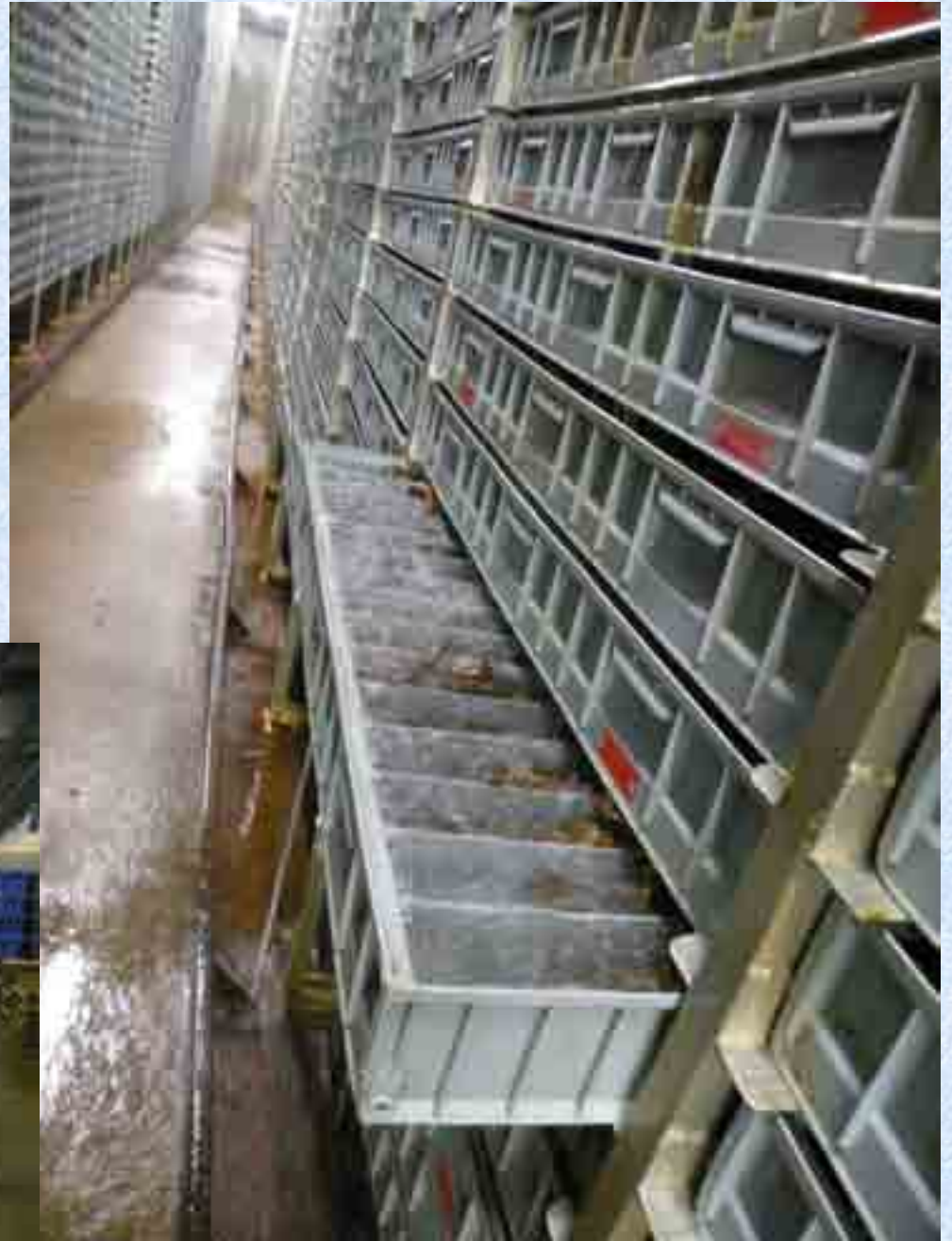








Clearwater Seafoods LTD
Lobster pool system (L), and
refrigerated, individual
holding system







Processing line for sorting/grading scallop spat from bags. Hopper (L), conveyer, grader.





Scallop seed grader, rotates in and out of a water bath. Scallops pass through parallel spaces, mussels and other shellfish pass through holes. Several panels, with increasing space and aperture sizes.







Shoreside facility (red barn) for sorting bags, adults, etc..



Rotating drum grader of SDR pipe. Driven by a small electric motor on a belt – Ron thought 7 grades was too many, should be 3 or maybe 4..













Savory Tray for suspension culture. Photo: Cyr Couturier

Culti-Mer

Located in the Magdalene Islands,
Quebec, Canada

Originally started as stock
enhancement for scallops

Mixed results, but learned a lot
about culture operations and equipment

Now focusing on scallop culture

Fresh, Frozen, Half-shell, marketing
through Pec-Nord

Facebook: **Cultimerilesdelamadeleine**

Principals:

Sylvain Vigneault

and

Melanie Bourgeois



Magdalene Islands:
4 hour ferry from Souris, PEI
Gulf of St. Lawrence



Les Îles de la Madeleine

- Lieu important
- Autre lieu
- Route
- - - Service de ferry
- ⊗ Aéroport

0 5 10 15 20 km

www.wikipedia.fr; Mikmaq, 2007; cc-by-sa/2.5/de



Melanie Bourgeois

Culti-Mer is fully mechanized;
Netron beater in foreground to
shake scallops out of spat collector
material, leads into the spat
grader.



Drum grader in background



Spat grader – large size...

Spat sorter/grader does an exceptional job of separating scallops from other species like mussels and rock borers....





Netron beater, Culti-Mer

My recommendation for collectors:
Cut Netron lengthways, so that
each piece opens into a sheet
(not a tube), or use roll netting
(a la Jerry Gallagher,
North West Shellfish Limited,
Donegal, Ireland)

<http://www.scallops.ie/index.htm>



Crew is gearing up to produce spat collector lines, and remove spat from other lines. Employment looked to be about 12-15 seasonally, with 4-6 regular employees.





Spat bags are hog –ringed to vertical lines, at both top and bottom of the bag, and set in pairs, one opposite the other. They put a little slack in the bags, so they don't tear.



Lines of spat bags are assembled, then put into the form on the right; a big concrete block lowered on to them, then tied in a bundle to save room on the vessel.



Bundles of assembled lines ready for deployment



Very small spat is put into a spat bag, inside a lantern net, while the crew can service the larger seed first. Temporary storage.

Otherwise, scallops go into lantern and pearl nets for growout; 2-4 years





Lantern net stretcher

VERY nice, welded-aluminum vessels are all over Atlantic Canada. This is outfitted to service longlines..





2009 Packaging
6 Females and 6 Males
Digestive Gland removed

Note the placemat/
poster below, on the
counter....



2011 Packaging:
Frozen half shell, and
live in net bags (holds
the shells shut, only 2-4
days shelf life)



Other shots from the Culti-Mer FB page, give a hint as to the products for sale, the markets being accessed, and how they want their product to be viewed.
Note the smoothness of the shells, few heavy stress checks..









Also experimenting with ear hanging:
shells will foul, so this technique is best for
meat market, but higher volume.
Machines are finicky.....



Hillsburn Basin Scallop Group, LTD, Annapolis, Nova Scotia, 1994-2000
via: Blair Cooper, former Operations Manager

- Tale of 'too many chiefs'
- Production company selling Princess scallops (<75mm) to the fresh and frozen half shell market
- Wrote live animal protocol to sell live product
- Bottom cages with ADPI-style shellfish bags in large rack (strong tides)
- Purchased spat from Sea Perfect
- Product sold for ~\$0.35/ea., meats-only market viewed as not feasible
- Had knowledgeable brokers for the product, selling into a niche market
- Product was differentiated from wild
- Reason for failure was corporate structure; 17 shareholders wanted to grow too quickly and could not agree. Meetings often had no quorum, impossible for production and marketing crews to function
- Greatest success was the development and marketing of the unique (at the time) product: half-shell IQF. Buyer was pre-paying for shipments. Even had buyers wanting seed as garnish for salads.....



Scallops at Darling Center, for experimentation, demonstration.





Top two trays (AquaTrays) are left empty (need a better system) so that predators are excluded better (below). Trays are nested, rather than stacked.





Smooth shells indicate low stress, even though overcrowded - good meat size per shell size



Scallops in pumped-system lobster pounds?

- Possible to use as interim culture method: between spat bag and field site?
- Some facilities have unused/under utilized tanks, or could capture exhaust water
- Part of an MAIC-funded project tested scallop growth in three indoor systems
 - Ready Seafood, Portland
 - Atlantic Edge (the Freezer), Boothbay
 - Robinson's Wharf, Southport
- ADPI bag with 30 scallops deployed in November 2007, retrieved May or June 2008
- Winter growth at each site
 - Ready Seafood – 2.5mm
 - Atlantic Edge – 7.4mm
 - Robinson's Wharf – 13.8mm
- Conclusion: scallops will put on shell during the winter and early spring, should be investigated more thoroughly



Ready Seafood (left) and Robinson's Wharf: white ring is new shell



Bottom Seeding as a Potential Culture Strategy?

- Lower cost than suspended culture, but more extensive – need more lease area
- Used with other pectinid species: *Pecten maximus* (King scallop) and *Patinopecten yessoensis* (Japanese scallop). These species seem to be less active than *Placopecten*
- Brian Beal/Jonesport Fishermen project indicated that larger scallops would stay put on a bottom site
- SeaStead project in Massachusetts deployed animals 40-100+mm, and found that scallops stayed reasonably in the area.
- Problems include:
 - Why put large scallops down at a large size, when they can be sold?
 - Investment needed to get scallops to a larger size (50+mm)
 - Seeding small scallops results generally in high mortality and emigration off-site



<http://www.mamut.net/hellandskjell/>



Helland Skjell A/S
Manger, NORWAY

Rigid and flexible
bottom fences
P. maximus



Spat Collection for Sea Scallops in Maine Waters

One outcome of the visit to Aomori Prefecture, Japan, in 1999

Good success in Maine, many sites in excess of 1000/bag, most areas still untested

Results vary strongly by location: species mix, size and growth, fouling

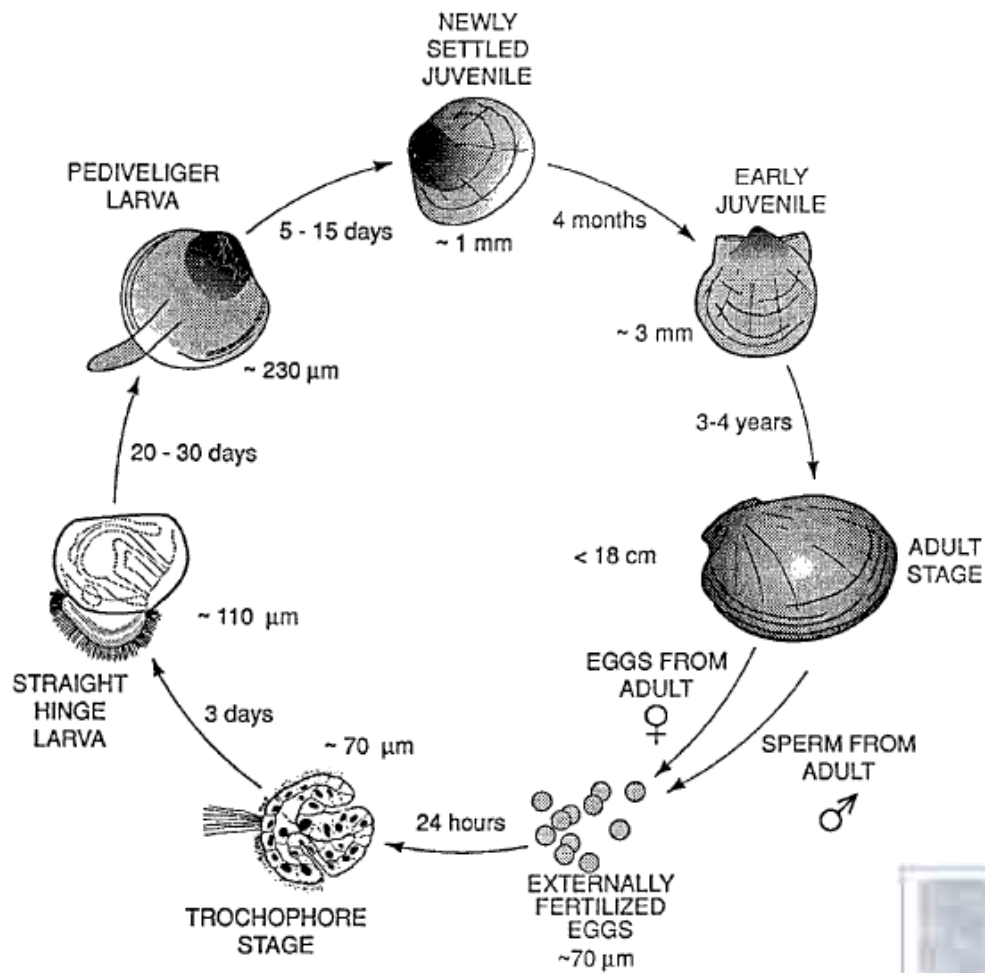
Best spat collection time appears to be September; watch for storms and rapid water temp changes

Soft bottom areas seem to produce high spat sets

Further offshore is much better than inshore areas

Need to determine max deployment time for spat bags: to achieve max growth without suffocation or predation of scallops

Best done by fishermen who know the local area, are known by their colleagues, and who can check gear frequently.



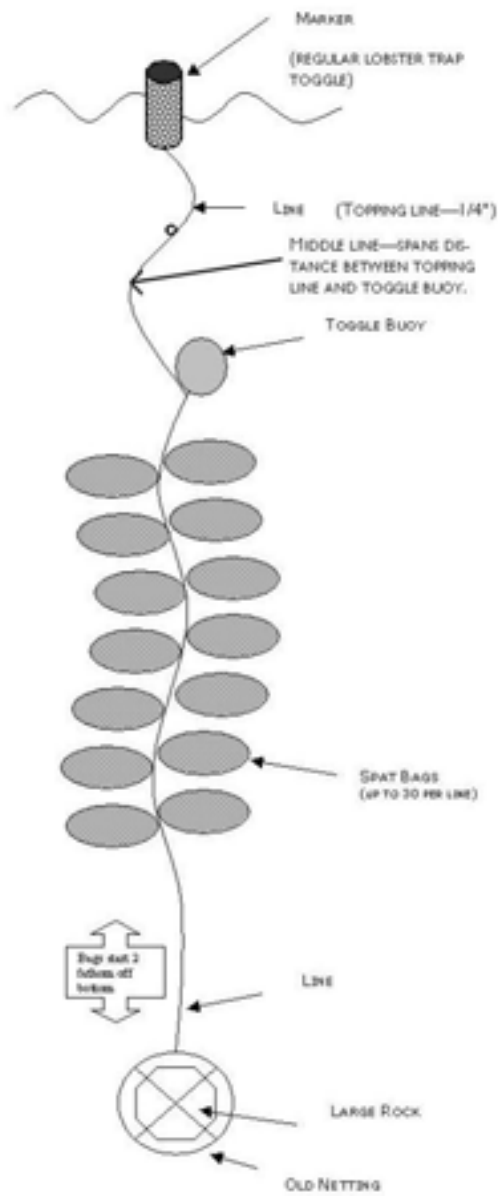
Scallop Life Cycle:
From fertilization to
settlement is
about 45 days....

Figure 2. Generalized life cycle of the sea scallop, from Stewart and Arnold (1994).

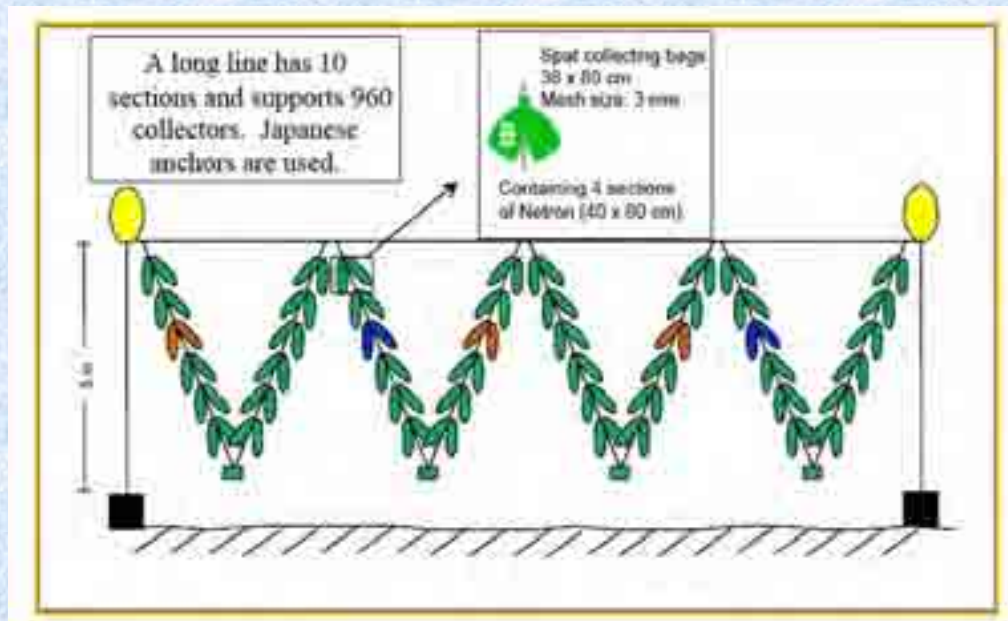
Young scallops and the end
of a paper clip



Typical setup for Maine (left) and Canada (below)



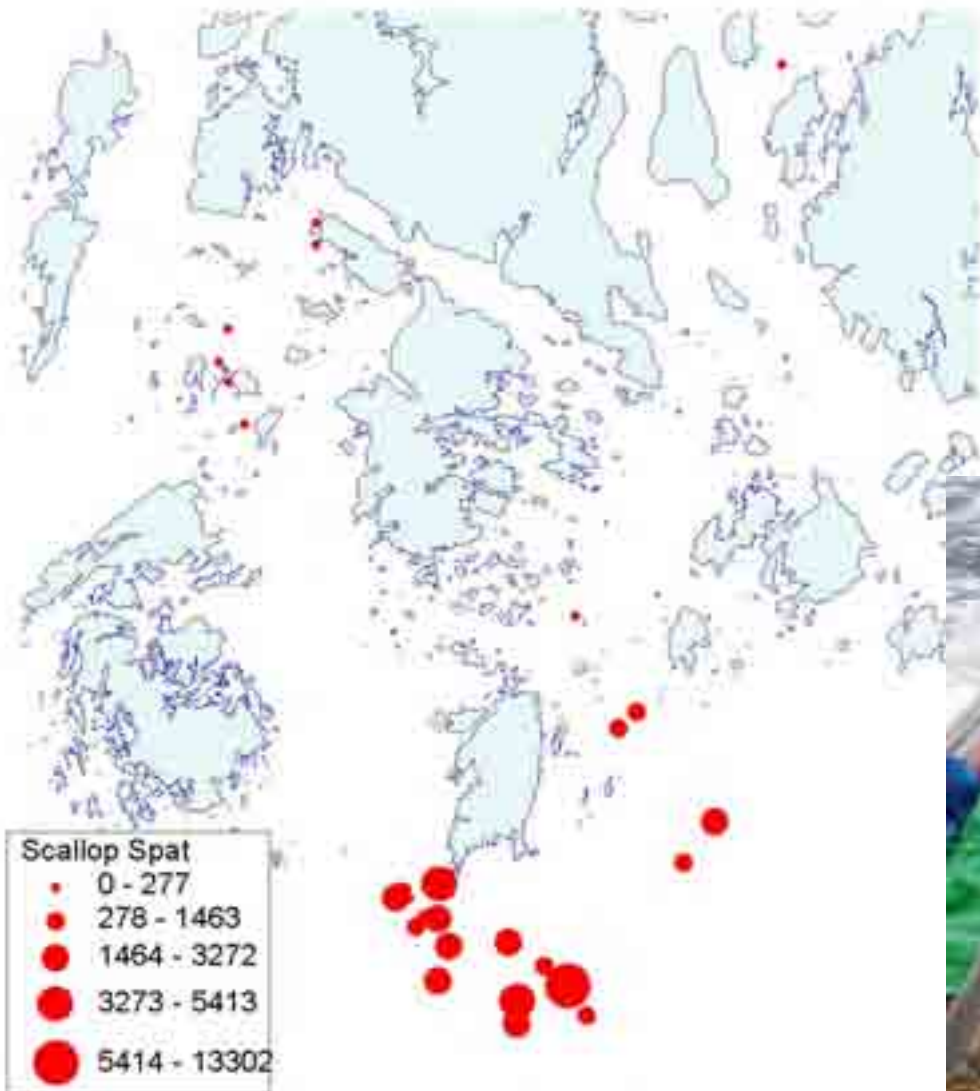
IMPORTANT: THE LENGTH OF THE LINE FROM ANCHOR (WEIGHT) TO MARKER BUOY SHOULD BE SIMILAR TO WHAT WOULD BE FISHED ON LOBSTER GEAR IN THE SAME AREA. THE MARKER BUOY SIZE SHOULD ALSO BE SIMILAR.

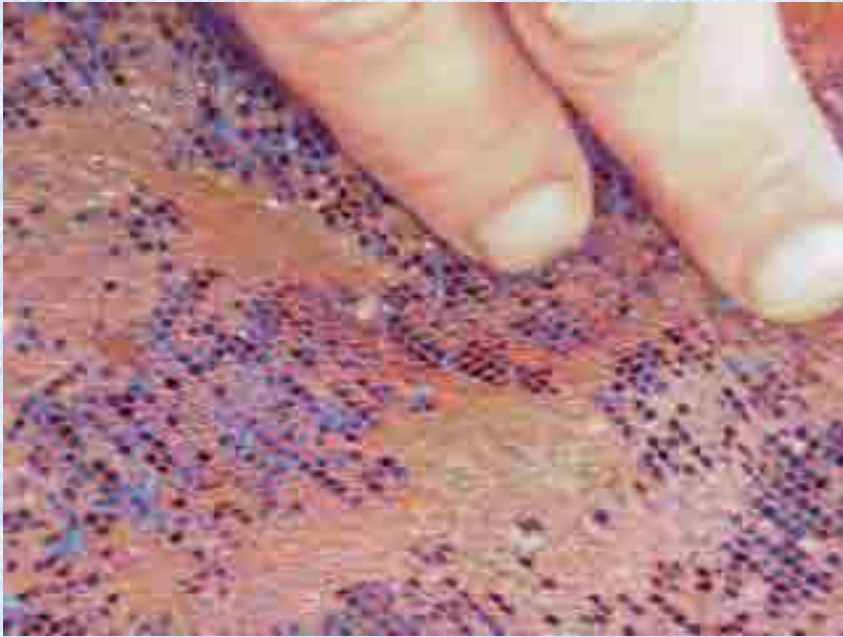


Scallop Stock Enhancement Project Year 2
July 2000 to June 2001
Marsden Brewer



Marsden Brewer photos





Scallop seed just barely visible,
during early winter

Sally McCloskey, with 1 bags' worth
of scallop seed, W. Pen Bay





Bags set in Sept 2005, retrieved Dec. 2006. 17% alive, average size ~22mm, max. 41mm
1000 total per bag, minimum fouling, few other shellfish, many starfish.

How long to leave bags deployed???



BIOTOXINS and Public Health



The Impact of Toxic Algae on Scallop Culture and Fisheries

Sandra E. Shumway

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Brookville, Ontario, M2 9A7

Allen D. Cembella

Department of Marine Resources, National Science Foundation, 2025 Crystal Drive, Suite 500,
Arlington, Virginia, USA 22202

ABSTRACT: Harmful algal blooms occur worldwide and have caused significant mortality in the feeding tissues of scallops. However, the associated mortality of scallops has been inadequately studied. Scallop aquaculture usually provides an optimal rearing environment of several months of rearing both juvenile and "brood" scallops from hatchery or gillnet traps. In doing so, established aquaculture systems in areas prone to toxic blooms have provided public health concerns regarding the safety of the scallop.

The present study focused on the aquaculture and broodstock mortality of *Argopecten irradians* scallops that were exposed to a species of harmful algal bloom that had been introduced from the United States through the scallop culture system. Mortality was observed in the muscle and digestive gland of some scallop larvae and digestive glands and muscle, respectively, that, throughout the year, produced viable gametes. To the best of our knowledge, between individual studies, carried out at the same time, the environmental conditions were similar, and mortality in gametes and other tissues.

Scallop culture with commercial fisheries can occur in areas prone to algal blooms. While the adverse effects of harmful algal blooms on scallop culture have been studied during large-scale harvesting of scallops in some scallop farms, the impact on the health and growth of scallops, and the effects on reproduction, have not been studied. It will be a major goal of the present study to determine whether the presence of harmful algal blooms in aquaculture systems can be predicted. The present study will provide information on the impact of harmful algal blooms on the health and reproduction of scallops.

KEY WORDS: Harmful algal bloom, scallop, *Argopecten irradians*, aquaculture, mortality, reproduction

1. INTRODUCTION

Scallops are common marine bivalves that have been harvested through the world and have important cultural and economic value. The scallop is one of the most important bivalve species in the world, and is harvested in many areas of the world.

SCALLOP CULTURE

SCALLOP CULTURE

Important Reading!

Shumway and Cembella
Reviews in Fisheries Science
Volume 1, Number 2
Pages 121-150, 1993

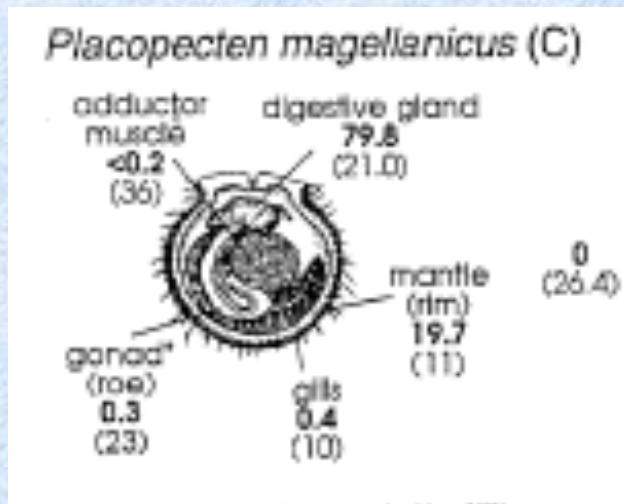
Shumway and Cembella, 1993

Some major points

1. Toxins are not evenly distributed in tissues, more in digestive gland and mantle
2. Some scallop tissues may stay toxic for months or longer
3. Toxicity varies greatly between animals in close proximity
4. No correlations seen between toxins in gonads and other tissues

Recommendations and cautions

1. Adductor-only culture can happen in areas prone to toxic blooms
2. Marketing of mantles or whole scallops is feasible under only strict regulation
3. Public health risks are real, and therefore extensive monitoring is critical



Graphic from:

Paralytic Shellfish Toxins in Bivalve Molluscs:
Occurrence, Transfer Kinetics, and Biotransformation

Monica Bricelj and Sandy Shumway

Reviews in Fisheries Science

Volume 6, Number 4

Pages 315-383

1998

Clear documentation and agreement of testing and sale of product is critical!

2000 - Memorandum of Understanding (MOU) for Tom Pottle project with ME DMR included:

- Scallops to be tagged according to DMR regs
- Details of landings and sales to be maintained: site, date, toxin analysis, etc
- Samples will be determined safe prior to any sales
- Testing regime (A TEMPLATE ONLY!) 12-scallop samples sent to DMR lab
 - Nov. 1 through May 1: monthly
 - May 1 through June 1: Bi-weekly
 - June 1 through Oct. 1: weekly
 - October 1 through November 1: bi-weekly
- Any shellfish closure in the harvest area prohibited sale
- Harvests were limited to the open season of scalloping (Dec. 1 – Apr. 15 at that time)
- Lot being tested is removed from the water during testing, to avoid potential toxicity during the time test is run

A personal observation: a land-based facility might be well worth it for a scallop farm:

- Stage product for shipment
- Cool product down to low temps to increase shelf life
- Allow some depuration: ie. empty digestive tract, which runs through gonad tissue

Diseases, Pests and other Problems for Prospective Farmers



Mud blister worm



Undetermined



'Pus spots' likely caused by
marine bacterium
Williamsia maris

Grey or off-color meats




Permitting and Regulation for Scallops in Maine

Two Major Areas:

1. There is now a clear regulatory pathway to collect seed and retain on lease or license:
 - A - LPA or Lease (preferred by DMR)
 - B - Special License (not preferred, but certainly possible)

However: Would it be better to develop a spat collection license specifically?

2. We have a template for a biotoxin testing program, from the Tom Pottle project. This will need to be revisited, perhaps adjusted, and revived..*data needs to be collected and shared, for confidence in the public health issue*



APPLICATION FOR A LIMITED PURPOSE AQUACULTURE LICENSE

This is an application for a limited purpose aquaculture (LPA) license. A license may be issued by the Commissioner of Marine Resources (DMR) upon approval of the application and upon payment of the fee set forth herein. You are encouraged to review Chapter 252 of the Maine Code of Regulations in order to more fully understand the license process. Applicants, retail and wholesale, are an applicant at the DMR website - www.maine.gov/dmr

The Maine Department of Marine Resources reserves a non-refundable fee of \$100 for LPA license applications.

Meeting requirements:

Please refer to the application for the DMR website for more information.

DEPARTMENT OF MARINE RESOURCES
ATTN: Aquaculture Administrator
P.O. Box 6
Windy Hill, Maine 04920

The Department will provide a copy of this application to the US Army Corps of Engineers (USACE) if the applicant is a USACE permit holder.

USACE permit holder: Yes No

Market Questions and Considerations:

- Two seasons for roe-on production: June-Aug and Jan-Mar?
- Roe-on products can be offered fresh or frozen
- "Princess" size (2.5-3.5") offer quick return, reduced risk, and possible 1 year crop post-spat bag
- Diversification in products would be wise, as in Japan: sell seed, small scallops, meats, meats attached to shell, and value-added products (Japanese produce smoked meats, dried mantles, boiled whole, etc)
- Use the local chef and food community to test products and get to know the consumer
- A current economic review would be helpful, in light of today's scallop prices and the loss of Japanese production. Boat prices for meats for 2011/2012 in the \$12-14/lb range?
- A focus on roe-on/live/value added would keep competition to the wild fishery at a minimum

- Premiums being paid in the marketplace today for local and high quality product
- \$0.35-\$1.00 per scallop (for whole or roe-on) seems likely, at least for modest or moderate volumes; must increase the market along with increased production to maintain price stability
- Kuenster market study (NMFS, 1998) indicated that price is biggest factor in scallop meat purchases, also estimated costs of production ranging from \$0.19 to \$0.42/scallop. No information on price sensitivity for roe-on, whole, etc....
- Penney and Mills bioeconomic study (*J. Shell. Res.*, 2000) recommended vertical integration; with processing and marketing done in-house, and stock going to market at the "Princess" size of 50-65mm (~2" to 2.5")

Thumbnail SWOT Analysis for the Development of a Scallop Industry

Strengths

- Good spat supply
- Good growth
- Available industry knowledge
- High quality product
- Access to knowledge in Canada and elsewhere
- Good regulatory process for collection and culture (not sale)

Opportunities

- Ramp up spat collection
- Find max growth for spat in bags
- Site trials
- Diversification for fishermen, markets
- Feed the market year-round
- Product development
- Gear innovation
- Stock enhancement

Weaknesses

- Few economic models
- Need site selection data
- Need PSP testing data and clear regulatory process
- Niche market
- Potential for conflict with capture fishery
- Short shelf life for live product, shore-side facility necessary?
- Need processing knowledge and training

Threats

- PSP and public health
- Monitoring capacity and cost
- Disease, fouling, pests, predators
- Backlash from wild harvest
- Availability of lease sites

Suggestions for a Developing Scallop Aquaculture Industry in Maine

- Review Biotoxin data for 5-10 years, produce maps to guide farm siting
- Stimulate experimentation, particularly with members of fishing industry (I suggest avoiding pearl net or lantern net operations, in favor of bottom cages or ear hanging)
- Base operations on selling half shell, roe-on product, fresh and frozen; avoid meats-only market (perhaps sale of meats, but only outside of the scallop season?)
- Support efforts to market Maine scallops, both wild AND cultured. Two messages: First – if it's Maine, it's Good. Second: educate the buyer and consumer about the differences between the two, and play to the strengths of both.
- Consider risks with respect to movement of seed scallops, create appropriate testing or monitoring, or restrictions

Recommendations cont'd.

- Continue to experiment with locations for spat collection, and deployment duration
- Work with restaurant/chef community to develop/refine products
- Integrate production with processing; land-based facilities helpful
- Create conditions for collecting and sharing biotoxin data between regulators, growers and scientists
- Require spat collection activities to return some percentage of the catch to the wild



Opportunities.