Appendix I

Amendment 15 to the Sea Scallop FMP

Scoping Comments Received

Comment #	Author
1	Ochse, Arthur
2	Sachau, B.
3	Soares, John
4	Starvish, Ray
5	Raymond, Maggie
6	Welch, Edward
7	Gutowski, James
8	Environmental Defense
9	Fletcher, James
10	Pike, Jeffery
11	Starvish Jr., Ray
12	Coley, Thomas P.
13	Maine Department of Marine Resources
14	Didriksen, Harriet
15	Sirois, Louis F.
16	Maine Department of Marine Resources Scallop Advisory Panel
17	McLaughlin, Frank
18	Oceana
19	Maxwell, Robert
20	Stokesbury, Kevin
21	Fisheries Survival Fund
22	Fisheries Survival Fund
23	Capt. Bill
24	Hulbig, William

From: ochse@optonline.net [mailto:ochse@optonline.net]
Sent: Saturday, March 08, 2008 11:42 AM
To: Lorelei Stevens, Commercial Fisheries News; dhart@whsunl.whoi.edu; Glenn Nutting; Richard Taylor; Woneta M. Cloutier
Subject: letter to Council

Subject "capital reduction"

Dear, NEFMC members, Patricia Kurkul;

I am an owner of a limited access scallop vessel and am also the operator, therefore I may be fishing during the scallop scoping meetings. I wish to comment now about one of the issues, capacity reduction. I feel that we are over capitalized but am vehemently against some of the proposed remedies.one is permit stacking in any form.that remedy is put forward by a few large operators. I do not deny that anyone should make a lot of money, but at others expense is not right. Single and two or three boat operators would be put at a competitive disadvantage, all the best crews and captains would go on all the new "mega boats". The hundred licenses that are in the hands of the people who want stacking represent a small minority of actual people who hold licenses.These people already control tens of millions of dollars in boats and licenses. If stacking gets approved they will be handed monopoly's which are un- American, we all know the evils involved. In the case of the fishing industry all the fishing rights could eventually get sold abroad making U.S. Fishermen serfs of entities in other countries, maybe even our enemies. New England has a tradition of independence. Putting all the fishing rights in the hands of a few people is a plantation mentality. The actual fishermen will become slaves of the few owners with no hope of ever advancing.some of the other schemes around will lead to the same result, eg.; leasing of days at sea or trips and some of the sector ideas where people think that by being in a sector they can break the law and do what they want with fishing rights.

If indeed we have capital reduction it must be equitable. One I can think of is an industry buy-back or even a government buy-back or some sort of hybrid that falls in between. That way all the stakeholders will benefit equally.

Thank you for considering my comments.

Sincerely,
Arthur Ochse
Owner Operator of the Trawler
Christian & Alexa

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Subject: public comment on federal register of 3/5/08 vol 73 #45 noaa attention james burgess - re scallop quotas
Date: Wed, 05 Mar 2008 10:18:50 -0800 (PST)
From: jean public <jeanpublic@yahoo.com>
To: scallop.fifteen@noaa.gov, AMERICANVOICES@MAIL.HOUSE.GOV, COMMENTS@WHITEHOUSE.GOV
CC: MEDIA@CAGW.ORG

the best thing to do is to cut all scallop quotas for everyone by 50% this year and 10% every year thereafter. the overfishing going on is ludicrous and harms our children and grandchildren who will have barren seas throught he gross negligence of this agency, which has failed to observe magnuson stevens for at least 17 years and allowed horrible overfishing to continue. this harms every citizen of the united states.

b. sachau
15 elm st
florham park nj 07932

3

Sarah M. Pautzke

From: scallop.fifteen [scallop.fifteen@noaa.gov]
Sent: Wednesday, March 26, 2008 9:28 AM
To: Sarah M. Pautzke; Woneta M. Cloutier
Subject: [Fwd: In regerds to Amendment 15 to the Scallop Fisheries Management Plan]

Comment on Amendment 15 scoping.

-------- Original Message --------
Subject: In regerds to Amendment 15 to the Scallop Fisheries Management Plan
Date: Mon, 24 Mar 2008 19:52:37 -0400 (EDT)
From: Jnewbedfords@aol.com
To: scallop.fifteen@noaa.gov
CC: Jnewbedfords@aol.com

I'd like to comment on Amendment 15. I believe this plan will actually hurt the smaller business owner, or a fishing Captain who owns his own vessel, which at present is the majority of the industry. This stacking permit plan which is how it is referred to by our local fishermen will create chaos and lack of accountability in the scallop industry. Large and small vessels will be stacking their days in favor of the larger vessels which in open area trips will cause to deplete scallop stocks even further. This plan will also have a negative effect on the local economy because by eliminating approximately 1/2 of the scallop fleet you are eliminating the residual jobs that are created by maintaining and repairing these vessels. I being a boat owner would love to be able to make these comments in person but unfortunately I will be out of town during this period and will be unable to attend. I hope that the New England Fishery Management Council will look at all aspects of the plan and favor the small business owner like me.

Sincerely,
John Soares Santa Barbara Fishing Vessel

Ray Starvish
P.O. Box 231
Fairhaven, MA 02719

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3-18-08

Dear Ms. Kurkul,

it pleases me as a scallop boat owner that the N.E.F.M.C. has decided too address Capacity in the scallop fleet. I am in favor of putting two permits on one boat and that boat receiving a double allocation of days.

Too insure that the stacking process gravitates too the newer, and larger vessels for safety reasons, the baseline rule should be repealed.

Sincerely
Ray Starvish

MAR 24 2008

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Sarah M. Pautzke

From: Maggie Raymond [maggieraymond@comcast.net]
Sent: Monday, March 31, 2008 11:43 AM
To: Pat Kurkul
Cc: Sarah M. Pautzke; Deirdre Boelke; Peter Christopher; Paul Howard; Karen Roy
Subject: Atlantic Sea Scallop Amendment 15 Scoping Comments

March 31, 2008

Ms. Patricia Kurkul, Regional Administrator
National Marine Fisheries Service
One Blackburn Drive
Gloucester, MA 01930

Dear Pat:

I am writing, on behalf of our membership, to provide Atlantic Sea Scallop Amendment 15 scoping comments.

There are two issues of importance to our members that we would like to resolve through Amendment 15.

First, we fully support the issue identified as #4 in the scoping document, with regard to a rollover allowance for IFQ permit holders.

Second, we respectfully request consideration of an issue that has not been identified in the scoping document, that is, the current possession limit of 400 lbs for general category scallop IFQ holders. The current high price of vessel operating fuel is having a negative impact on vessel owners' ability to realize a profit on general category trips that are limited to a total possession of 400 lbs.

We encourage the NEFMC and NMFS to consider eliminating or raising the possession limit, in order to improve the economic outcome for vessels holding general category scallop IFQ.

As always, we appreciate your consideration of our views.

Sincerely,

Maggie Raymond
Associated Fisheries of Maine

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Sarah M. Pautzke

From: scallop.fifteen [scallop.fifteen@noaa.gov]
Sent: Wednesday, April 02, 2008 4:07 PM
To: Woneta M. Cloutier; Sarah M. Pautzke
Subject: [Fwd: AMMENDMENT 15]

-------- Original Message --------
Subject: AMMENDMENT 15
Date: Wed, 02 Apr 2008 15:17:18 -0400 (EDT)
From: BOATSETTLE@aol.com
To: scallop.fifteen@noaa.gov

Edward Welch
2 Timberledge Lane
Mattapoisett, MA 02739

April 1, 2008

Patricia Kurkul
1 Blackburn Drive
Gloucester, MA 01930

Dear Ms. Kurkul:
I am against amendment 15 as it is written and presented at this time.
I am a college graduate, a fisherman and boat owner by choice.
What a Slippery Slope Consolidation is! In every case from family farms, cranberry bogs, oil companies, banks airlines etc., once it starts the powerful gain more power and influence and jobs are lost in the name of efficiency.
Rationalization of the limited access scallop fleet is a Oxymoron. To say this will reduce capacity is ludicrous. If you allow stacking of permits what will happen is you will gain at least 10% more capacity.
Not one fleet owner has ever, nor will ever, transfer a permit to a smaller platform. Each transfer will go up by at least 20-10-10%, length, horsepower and tonnage, that is allowed by current formula.
These parameters are easily manipulated as tonnage regulations & horsepower ratings are ludicrous to start with.
Who will oversee this consolidation? Will it be the honor system, or the word of some paid consultant. I have yet to see the transfer of a permit to anything other than a much larger more fishing efficient vessel, more power, more deck space and bigger drags.
What happened to the jobs that were generated by all these "rationalized" vessels? There will be less resource and no recourse.
Fleet owners will argue that the jobs will be better, but they will also be more scarce. This will result in fisherman's wages being dramatically reduced as settlements change into per day wages, as has happened in the Canadian Scallop industry under a consolidation regime with fewer vessels and more consolidation of jobs there will be less resource for the fishermen. What about shore side support jobs, when there are 150 or less boats remaining.
These consolidators or fleet owners are for the most part scallop buyers which will allow them to put pressure

to sell out on the Industrial Owner Operator.

If you want this successful fishery to look like the Canadian Scallop Fishery where it went from 400+ boats and abundant well paying jobs, down to less than 10 boats & jobs that have become nothing more than Indentured Servants with no opportunity for the young industrious fisherman, you will allow the rationalization to go forward.

Ask yourself, Where will this "Rationalization/Consolidation Stop?

Once the fleet is consolidated & there are only "Rationalized" vessels left, which one of the "Rational" fleet owners will object to consolidating again. The same arguments will apply and no one will be left of appose. WHERE WILL IT STOP? Perhaps this is what the council wants is to only have to deal with a handful of "Rational Business Men"

instead of fisherman.

I believe we should forgo this forge for "Rationalization" during this round and concentrate on the issues that affect the fleet as a whole.

In my view the council should concentrate rather than rationalization on an effort to complete the transition to a total rotational area management and controlled access to all managed areas. This would greatly increase catch per unit effort and minimize bottom time while reducing costs for industry. It would be the best way to increase efficiency and control ACL's.

In regards to changing the fishing year, Why bring up this issue again? so survey data sill be more readily available? It seems to me if they want to use survey data in a timely fashion the responsibility should be on the NMFS to see that the numbers are crunched in a more timely & efficient manner. This being beside the point as new surveys & survey vessels are in question as of now. To change the year, when the most optimal fishing is in March, April, and May does not make any sense. This will only serve to push more effort into the time of year when we are suppose to worry about TURTLES.

As for closed areas and EFH's for scallop industry being controlled by habitat and ground fish committees, this is ludicrous & should be changed. The only real successful fishery being regulated to the stature of a unwanted red head step child at the whim of power grabbing committee chairmen. It's a shame that New Bedford, #1 Scallop port in the country/world has no one on the council representing the Scallop Industry. Until this is changed it will be impossible to achieve policies that will make industry more efficient & able to deal with ACL issues.

I appreciate this opportunity to be able to express my thoughts and opinions.

Sincerely yours,

Edward Welch
Captain/Owner
F/V Westport

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James Gutowski
1809 Central Ave
Barnegat Light NJ 08006
Jamesgutowski@comcast.net

April 2, 2008

To: The Scallop Committee, New England Fisheries Management Council

Re: Comments on the scope of measures being considered for Amendment 15 to the Sea Scallop Management Plan.

1. **Annual Catch Limits and Accountability Measures**

The target F rate is considerably lower than both the maximum allowable rate and Amendment 10's definition of optimum yield thus Annual Catch Limits are already built into the scallop management plan. These precautionary measures should be all that's needed and are already a form of accountability measures.
Allocations set between the Limited Access and General Category should remain the same, and each of these groups should have their own ACL's and Am's.
Accountability measures that deal with scallop catches of other species should be developed, allowing any needed accountability design that have the least adverse consequences to the scallop management goals.

2. **Capacity Reduction in the Scallop Fishery**

If consideration of some type of a capacity reduction measure is required it should not do anything that undoes current allocation controls (DAS, and Access Areas).
At this time I do not see the need for an ITQ alternative. Development of an ITQ would raise all kinds of allocation issues possibly compromising the Amendment.

3. **Over fishing Definition**

Considered and rejected in Amendment 10 and no change in the Scallop fishery's rotation management scheme there should be no consideration to change the over fishing definition. With the target fishing rate being set at such a cautionary level localized over fishing is currently being prevented.

4. **General Category Adjustments**

I am not opposed to consideration of a limit rollover allowance, IFQ by area, a separate program for NGOM, or a mechanism for sectors in the general category however these should be in line with program approved in Amendment 11.

5. **Habitat Closures**

The habitat closure inside Closed Area I access area should be addressed ASAP, in this action if the EFH Omnibus is moving slower than Amendment 15.The top portion of Closed Area II should also be considered for scallop access with an over abundant amount of the resource there.
21% of the scallop biomass being lock up in habitat closures makes it impossible to achieve optimum yield and put a large portion of the scallop stock at risk of being wasted.

6. **RSA Improvements**

The current RSA program has been and remains in my view very effective, and a good use of that portion of the scallop resource.
Consideration of streamlining the program, multi year projects and subdividing the

current 2% set aside to reserve some portion for industry based surveys should be included.

7. Changing the fishing year

I am opposed to any consideration which would change the fishing year from March 1 to May 1.Since Amendment 4 in 1994 our industry has developed solid business plans around a consistent start of the fishing year.

With a potential plan to reduce Scallop efforts during summer month due to the recent turtle biological opinion changing the fishing year would; shift effort to the fall and winter months when scallop yield is poor, summer market demand is over, possible spawning is occurring, and weather deteriorates making fishing operation dangerous.

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ENVIRONMENTAL DEFENSE FUND

finding the ways that work

April 2, 2008
Via Electronic Mail
Scallop.fifteen@noaa.gov

John Pappalardo, Chairman
New England Fishery Management Council
50 Water Street, Mill 2
Newburyport, MA 01950

Dear Mr. Pappalardo,

Thank you for the opportunity to comment on the contents of Amendment 15 to the sea scallop fishery management plan. Environmental Defense Fund has a long history of working in New England to affect change for the benefit of the resource and those dependent upon healthy fisheries for their livelihoods. We are pleased to offer comments on the scope of this amendment with a particular eye to solving conservation problems with incentive-based solutions. To that point, there are five issues Environmental Defense Fund supports addressing in Amendment 15.

1) First and foremost, the Council must develop an individual fishing quota alternative in Amendment 15. As a single species fishery that has been operated under a limited access permit system for many years, the sea scallop fishery is ripe for transition to such a system. An IFQ program would eliminate excess capacity widely acknowledged as a problem in the fishery, and provide significant stability in both economic and biological terms.

In part due to the new provisions in the Magnuson Stevens Act (MSA) relating to IFQ programs in New England, there continues to be debate within industry and the Council regarding the potential for an IFQ system to be developed in the region. This debate cannot be fully explored unless the Council allows such an alternative to be developed. Therefore, we strongly encourage the Council to pursue an IFQ alternative while taking into account additional new MSA provisions encouraging all councils to consider limited access privilege programs in their NEPA-required range of alternatives.

2) Over the past several years, sector allocations have become a popular tool in the groundfish fishery. Participants in the sea scallop fishery expressed interest in this approach as well. Therefore, Environmental Defense Fund encourages the Council to include sector allocations in the range of alternatives under consideration in Amendment 15. Voluntary sector allocations (i.e. fishing cooperatives) would provide the offshore fleet with a means to eliminate excess capacity, while retaining control over how many boats permanently leave the fishery and the socio-economic shape of the fishery. Sectors would allow offshore scallopers to band together based on common home port or other shared interests to determine the nature of their sector. Significant control would remain in the hands of industry and fishing communities. Sectors would also provide regulatory relief while increasing confidence that catch limits, which are widely acknowledged to be expected to decrease in coming years, would not be exceeded.

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Sectors would also provide accountability measures in compliance with the new MSA requirements.

3) Bycatch of non-target species should also be addressed in Amendment 15. Yellowtail flounder bycatch continues to be a source of concern in the sea scallop fishery. It remains unclear under the new MSA requirements for catch limits and accountability measures what the status of the sea scallop fishery would be if the groundfish fishery reaches or exceeds the total allowable catch for yellowtail before the conclusion of the groundfish fishing year. Understanding that an effective Council policy regarding multi-plan issues has not yet been developed, with yellowtail flounder currently listed as a stock of concern in all three stock areas this is a critical issue to address in the context of the scallop fishery.

With the new MSA requirements for catch limits and accountability measures, the sea scallop fishery would have greater assurance of access to scallop beds where interaction with yellowtail is likely if tradable bycatch caps were established. This could be accomplished with an IFQ or sector program specific to yellowtail. Scallopers would have assured and flexible access to the scallop resource tempered by a specific allocation of yellowtail. The groundfish fleet would know the impact of the scallop fleet on the yellowtail resource – a win-win for these interacting fisheries as the Council implements catch limits and accountability measures.

4) In Amendment 11 to the sea scallop plan, the Council approved provisions allowing sector applications to be submitted by general category permit holders. In accordance with new MSA provisions encouraging limited access privilege programs and given the need for flexibility in this rapidly changing component of the fishery, Environmental Defense Fund strongly encourages the council to accept general category sector applications for consideration in Amendment 15. Sector allocations will give the inshore fleet greater ability to determine the shape of the fishery as it transitions to a quota based system, while providing additional assurance to managers that catch limits are not exceeded.

5) Environmental Defense Fund strongly discourages the Council from considering changes to habitat closed areas in the context of Amendment 15. These changes would be based on out of date essential fish habitat (EFH) designations which use data and analysis no more recent than 1997. Furthermore, the Council is now developing an omnibus habitat amendment that will amend all fishery management plans under its jurisdiction. In 2007, the Council approved new essential fish habitat (EFH) and habitat area of particular concern designations. And in 2008, the Council is developing measures to mitigate the impacts of fishing on EFH through the omnibus amendment, including new and modified habitat closed areas. Including changes to habitat closed areas in yet another Council action (Amendment 15) would only confuse a deliberate process that is expected to conclude in 2008/09 when the omnibus habitat amendment is submitted to the National Marine Fisheries Service.

Thank you for the opportunity to comment on the contents of Amendment 15. I look forward to working with the Council and with industry to develop effective and lasting solutions for this important fishery.

Sincerely,

Alexandra Bauermeister
Project Manager, Sea Scallop Fishery

cc: Captain Paul Howard, NEFMC
phoward@nefmc.org

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New England Fishery M
Management Council
50 water Street
Newberyport MA 01950
Fax 978-465-3116

WE ARE PROUD OF
FISHERMEN
123 APPLE RD. UNITED NATIONAL FISHERMEN'S ASSOC. N.C. 27953
252 473-3287
MANNS HARBOR

RECEIVED
APR 03 2008
NEW ENGLAND FISHERY MANAGEMENT COUNCIL

NMFS
Amendment 15 Scallops
One Blackburn Drive
Gloucester MA. 01930
Fax 978-281-9135

Dear Sir,

Amendment 15 comments,

Amendment 15 should address starfish predation, and all other strategies published in YAMAHA Fisheries Journal.
The Council, Committee, Plan Development team & NMFS has failed to address the published science in this issue published 18 years ago.
Due to improper management in the past; current management has less than 25% of the potential annual catch limits to allocate. Amendment 11 did not address starfish landings as a zero mortality goal on small scallops of the flawed amendment 11. Starfish management and roe on landings from the closed areas holds the potential to increase landed production to 200 million pounds Thus capacity & Annual catch limits can not be set at the present 40-60 million pound harvest limits. Current plan allows 30 million pounds to die of old age without being harvested. Habitat Areas do not address chemicals from man affecting scallop reproduction of scallops or growth of small scallops, or long term genetic selection of harvesting large Scallops resulting in smaller scallops in the future. Growth over fishing is in fact genetic selection for smaller scallops in the future. Amendment 15 should address the economics of scallop landed size. Imports supply mast scallops above 35 count thus past scallop management has decreased landings of small scallops giving imports greater market share. Amendment 15 through starfish reduction could allow greater poundage of scallops of all size.

Amendment 15 must address starfish & predation & allowed roe on scallop poundage from close area trips. No method exist to address Capacity or Annual Catch Limits, until the harvestable resource is known. Allowing roe on scallop landings would increase closed area production by as much as twenty five percent. Yamaha Journal addresses a ten year cycle, "science" & NMFS, plan development, committees, Council have not addressed cycles. How can annual catch limits be addressed without addressing published science? How can the council address or set over fishing limits of ACL's without addressing the resource capacity if THE RESOURCE IS MANAGED correctly?

Amendment 15 should require ALL SCIENCE & COMMITTEE MEETINGS to be broadcast live on the internet. Thus Allowing world wide sciences to view the

assumptions without spending the dollars on travel. Why does the Habitat Plan fail to address off land man made chemicals affecting scallops & scallop reproduction. Acid Rain & residual Jet fuel in the form of "Tryline" affects on scallop reproduction & growth? Habitat is a red herring, without addressing the chemicals that may cause the herring to be RED! Amendment 15 if habitat is mentioned, must address man made chemicals such as "Teflon" type molecules in flesh of marine life.
The scallop research set aside should be eliminated or be managed by the scallop permit holders. Amendment 11 if implemented will make scallops like surf clams a totally industry only harvested public resource. Thus all industry funded research should be industry controlled by permit holders. All research projects should be industry approved NMFS should be relieved from research management. Then starfish research & chemical research could be used to increase production to over two hundred million pounds. With roe on two hundred and fifty million pounds.
FISHING YEAR SHOULD REMAIN MARCH 1, Industry world wide and sales in the U.S. plus freezer inventory are set for the MARCH 1 TIME PERIOD!
Current science will not be better by moving the year, Current science has ignored publish science that would have allowed increased production. Council, plan development team, committee, & NMFS have failed to address roe on landing from closed area trips that would have increased economic benefits from the resource for 18 years. Moving the year to May 1 would increase pressure on pre spawning scallops, while decreasing economic benefit to the fishermen.
Logical science would not want the greatest effort on pre spawning and management should not want the season starting when turtle chains start on dredges.

A future amendment must address the sale of scallop permits to the North resulting in economic harm to the fishing communities the SOUTH.
SEA SCALLOP MANAGEMENT BY NEW ENGLAND COUNCIL IS CREATING ECONOMIC HARM IN SOUTHERN FISHING COMMUNITIES.

James Fletcher

James Fletcher 04-03-08

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April 4, 2008

Ms. Patricia A. Kurkul
Regional Administrator
NMFS Northeast Region
One Blackburn Drive
Gloucester, MA 01930

RE: ATLANTIC SEA SCALLOP AMENDMENT 15 SCOPING COMMENTS

Dear Administrator Kurkul;

I am writing to provide comments on behalf of the Scallop Capacity Reduction Coalition, a group of sea scallop vessels owners representing about 100 limited access permits. Since the Coalition was formed to address the single issue of capacity reduction in the sea scallop fishery these comments will be restricted to agenda item #2 identified in the scoping document (Measures to Rationalize the Limited Access Scallop Fishery).

- <u>Do you agree that something should be considered in this action to address excess capacity in the limited access scallop fishery?</u>

We strongly agree that there is excess harvesting capacity in the limited access sea scallop fishery and believe that rationalization of the fishery--reducing harvesting capacity to more closely match resource productivity--should be one of the highest priorities for Amendment 15. Future projections for the fishery estimate sustainable annual harvest levels of between 40-50 million pounds and this level of harvest can not economically sustain today's limited access fleet of more than 340 vessels.

When the days-at-sea (DAS) management program was adopted in 1994, the annual DAS allocation to full-time limited access scallop vessels was 204 DAS. This amount of fishing opportunity was sufficient to keep a vessel "active" year round and crews employed on a full time basis. As the DAS annual allocations were reduced over the next decade and a half, the only way for vessel owners to maintain their level of production and keep crews employed year round was to purchase additional permits and vessels. Because the management program does not allow DAS transfers, leasing or permit stacking, today virtually every limited access permit is active and there is overcapacity in the fishery.

For the 2008 fishing year (after the implementation of Framework 19) each full time limited access permit will be allocated 35 open area DAS and 5 Access Area trips (Trips). For a dedicated scallop vessel this level of fishing opportunity represents about 65-85 days away from the dock. This amount of fishing activity is simply insufficient to justify maintaining a dedicated scallop harvesting vessel. In addition to fewer fishing days, the tremendous increase in the cost of operating a vessel (such as the price of fuel, paint, repairs and insurance) further erodes the economic viability of an individual scallop vessel for both the owner and crew. As a result of all of these factors, most of the full time scallop fishing businesses have been forced to invest in multiple vessels. Typically a vessel owner will rotate his vessels and crew as the DAS and Trips are exhausted on a particular vessel. As a general rule one crew is responsible for two vessels since there are not enough fishing opportunities on one vessel to retain skilled fishermen. This practice of consolidating crews has provided a means for vessel owners to offer full time employment to fishermen. After the DAS and Trips are used up on one vessel, the crew will tie up that vessel for the rest of the year and use another vessel. In many instances, dredges, wire, electronics and other necessities are transferred among and between vessels. While vessel owners have been able to consolidate crews to maximize their income, they can not consolidate their vessels. Maintaining inactive vessels that have utilized all of their DAS and Trips is extremely costly and enormously wasteful.

Excess capacity in the scallop fishery and the resulting large number of scallop vessels tied to the dock for extended periods of time has caused overcrowding in many of the top fishing ports. In New Bedford, homeport to the largest number of scallop vessels and perennially ranked as the #1 port in the country, overcrowding has created a serious safety problem. Mr. Richard Canastra, co-owner of the Whaling City Seafood Display Auction, was recently quoted in the New Bedford Standard Times as attributing the port's overcrowding in large part to federal fishing regulations. "Years ago, boats were fishing 200 to 250 days a year. Now they are fishing 50 to 80 days a year". Congested docks and the practice of "rafting" in New Bedford received considerable attention just two months ago when the F/V Five Princesses caught fire at the dock and seriously threatened several vessels rafted to it.

- <u>If so, what specific measures should be considered?</u>

The highest priority for the Coalition is to include measures in A 15 that will promote a reduction in the size of the scallop fleet and the excess capacity of idled vessels. We believe that permit stacking—allowing two limited access permits to be assigned to the same vessel—and DAS leasing are the two most promising tools for capacity reduction. Under all capacity reduction strategies and for fairness to all vessel owners we believe the existing mortality controls of Amendment 10 should be maintained.

In analyzing permit stacking we would ask NMFS to evaluate the impact of not retaining the current vessel replacement criteria and upgrade restrictions. Since the majority of the fishing activity occurs during Trips (where there is a strict trip limit) less effort is being exerted in the open areas and the vessel replacement criteria may no longer have an impact on fishing mortality (while providing vessel owners added flexibility). As a general rule we do not want the stacking of limited access permits to result in an increase in fishing capacity so an analysis of the impact on eliminating the upgrade restrictions would be most helpful.

Maintaining two separate permits would also allow a vessel owner to "de-stack" or allow for the reassignment of that permit to another vessel at some future point if it made sense to do so. We do not support the combining of two limited access permits into one—which is authorized for the groundfish fishery---because it would create a jumbo permit or another class of limited access permits. Unlike the groundfish fishery where limited access vessels receive different amounts and categories of DAS, all full time limited access scallop vessels receive the same number of DAS and Trips. Allowing two permits to be assigned to one vessel, where each permit retains its individual identity, would be the simplest and most straightforward manner to create more fishing opportunities on one vessel. The restrictions on permit splitting—splitting off a permit for a non-scallop fishery from the limited access scallop permit—should continue, however a vessel to which two permits are assigned should be able to fish under either permit. For example, if a sea scallop limited access permit that also had a monkfish permit was taken off a vessel and stacked on another sea scallop limited access vessel that did not have a monkfish permit the receiving vessel would be allowed to fish for monkfish but only to the extent allowed under the stacked permit. If both permits had a monkfish permit, then the receiving vessel should be able to fish for monk to the extent authorized under both permits. This measure would prevent an expansion of fishing activity into non-scallop fisheries while allowing vessels to participate in fisheries in which they are duly entitled by their existing fishing permits.

The coalition also supports a DAS leasing program because it provides added flexibility to vessel owners to more rationally assign fishing opportunities to their vessels while reducing fishing capacity in the fleet. For example, stacking may not make sense for an owner of three vessels, but leasing would allow that owner to lease DAS to two vessels and retire the third. If a vessel breaks down in the middle of a fishing year, leasing would allow that operator to lease his DAS while replacing or repairing his vessel. Finally, leasing is not permanent and allows vessel owners to make these important decisions on a year-to year- basis. A leasing program in the scallop fishery provides a mechanism for vessel owners to increase their fishing opportunities (by leasing DAS) on their vessels while reducing fishing capacity in the fishery.

- What impacts would a reduction in capacity have? Please discuss expected positive and/or negative impacts on vessel owners, crew, processors, employment and associated industries, fishing communities, other fisheries, etc.

Capacity reduction achieved through stacking limited access permits or leasing DAS in the scallop fishery will yield many positive benefits. First, vessel owners will be able to downsize their fleets and create more fishing opportunities on individual vessels. Eliminating un-needed vessels means that owners will avoid the costs of maintenance, repairs, insurance and other costs associated with operating larger fleets. Today the cost of maintaining excess capacity in the scallop fleet (because of the prohibition on stacking and leasing) is very significant and wasteful and capacity reduction will eliminate much of this waste. Additionally crews will not have to rotate from vessel to vessel which will increase their familiarity and understanding of the fishing platform and improve safety.

Single vessel owners of full time limited access scallop vessels currently have fewer opportunities than multiple boat owners and are having a very difficult time due to the reduction in fishing opportunities and the inability to stack permits or lease DAS. Maintaining a good crew is also quite difficult. In many cases these owners tie their vessels up when Trips and DAS are fully used and work in some other field or collect unemployment. This is one of the major reasons why so few single vessel owners exist today. Capacity reduction through stacking or leasing DAW will increase the value of these businesses because the DAS and Trips allocated to the vessels can be stacked or leased and other owners will want to purchase them. Stacking and leasing would also allow the individual vessel owners to purchase other permits or DAS without having to purchase and operate another vessel. A stacking or leasing program in the scallop fishery would provide single vessel owners with the same competitive advantage enjoyed by multiple vessel owners.

In the process of reducing capacity, the oldest and less safe vessels will likely be filtered out of the fishery. As owners downsize their fleets, other scallop vessel owners may seek to purchase these un-permitted vessels to replace their older vessels. We fully expect that capacity reduction (especially through stacking) will decrease the average age of the scallop fleet and increase overall safety as the oldest vessels leave the fleet.

As fishing capacity in the scallop fleet is reduced we would not anticipate a reduction in the number of crew jobs. The crew size requirement imposed by Amendment 10 (from an average of 11 to 7) already reduced crews and because crews rotate among vessels today we do not expect any additional loss of jobs. Rather, by creating more fishing opportunities on individual vessels we expect more job stability and predictability for crew members. In other words, we do not expect capacity reduction to impact the number of crew jobs but it will improve job stability and year round employment.

With respect to processors, we would not expect any change since the amount of fishing time and scallop landings will not change. Similarly we would not expect any real impacts on associated industries. While there will be fewer vessels, there will also be fewer idled vessels. The vessels remaining in the fleet will be more active and will therefore require more services such as welding, paint, etc. Since the amount of fishing DAS and Trips will remain constant, the same amount of fuel, ice and necessities will be required. We also believe that improving the economic viability of individual scallop businesses will strengthen fishing communities. The stability and predictability of crew jobs on full time scallop vessels will undoubtedly strengthen fishing families as well. The anticipated reduction in the size of the scallop fleet achieved through stacking and leasing will also ease overcrowding in major ports, a major benefit to the ports and other vessel owners. Lastly, the stacking and leasing proposals put forward by the Coalition is not intended to increase fishing effort in other fisheries. We believe this is an essential component of any capacity reduction effort. On the other hand, we would expect that some of the newer excess scallop vessels (with no permits assigned to them) will be purchased as replacement vessels in other fisheries and improve the overall condition of those fleets. Because the excess scallop vessels will not be permitted, they could be purchased at reasonable prices particularly since the owners would seek to avoid the cost of maintaining them.

Finally, we expect that stacking and leasing in the scallop fishery could reduce the fleet size by as much as 75-100 vessels. This level of capacity reduction would have a tremendous positive impact on fishery management and important fish habitat. Reducing the number of vessels will mean less bottom time for scallop dredges. It will also reduce the level of pulse fishing and the associated localized habitat impacts and it will more evenly spread out the harvest over the year. Monitoring and by-catch management will be easier with fewer active vessels.

- <u>If you support consideration of IFQ management as a strategy to reduce capacity and rationalize the fishery, what specific considerations should be taken into account?</u>

Many members of the Coalition support IFQ's and believe that they could help rationalize the fishery. However, we are concerned that inclusion of IFQ's in A 15 would significantly delay completion of the amendment, particularly given the many unanswered questions relating to developing a sound IFQ program. Consequently, we respectfully request that IFQ's be dropped from consideration in A 15 and that they be considered in some future management action.

Sincerely,

Jeffrey R. Pike /for
Scallop Capacity Reduction Coalition

11

April 3, 2008

Patricia Kurkel, Regional Administrator
National Marine Fisheries Service
One Blackburn Drive
Gloucester, Ma. 01930

RE: Atlantic Sea Scallop Amendment 15 Scoping Comments

Dear Ms. Kurkel,

The purpose of this letter is to comment on measures under consideration in Amendment 15 to the sea scallop fishery as follows:

1)Compliance with new Magnuson requirements for ACLs and AMs
ACL components should be created from participants that already have a distinct historical place in scallop fisheries management. ACL of bycatch should be allocated, monitored and acted upon in a manner that maximizes access to scallops while making it a priority of each scallop vessel to reduce bycatch. ACL allocated on a component/individual basis would promote vessel harvesting behavior that would avoid exceeding ACLs and the accompanying AMs. I support ACL/AM on an individual basis.

2) Measures to rationalize the limited access scallop fishery
I am in agreement that there is excess capacity in the scallop fishery. All measures to reduce capacity have there unique methods to achieve a reduction. Without commenting on any measure specifically, a reasonable goal of the selected measure would be to allow any like limited access permits to be combined on a single vessel without regard to baseline restrictions. An example would be a combination of two full-time limited access permits, on the choice of either boat that would then effectively double the allocation of the selected vessel. The rationale for the lack of baseline consideration is to afford flexibility and practicality in the combination of effort among permit classes and the ever increasing insignificance of the level of landings among permit class. Flexibility and practicality would be enhanced by allowing a permit holder to combine his permit with another to create the best, safest fishing platform and afford the permit holder a greater population of potential business partners to choose from. Vessel fishing effort concerns are nonexistent under access area rotational management. Access area rotational management has created defacto equality among the permit classes without regard to the platform each captain uses. With regard to open access days-at-sea, the platform used is having a diminishing affect on the pounds landed by distinct vessels as a result of a marked decrease in the biomass available outside access areas to the extent that that vast majority of scallop beds in the open bottom produce very similar landings per unit effort fleet wide.

3) No comment

4)Modifications to Alternatives recently developed under Amendment11

It is reasonable to allow for a IFQ rollover allowance limited to a percentage of the total (say 10%) to avoid the "banking" business with the currency being GC IFQ access. GC effort should be designed to be consistent with the limited access fleet effort in order to control the volume of area landings for scallop management purposes.

5)Measures to address EFH closed areas under Scallop FMP if Phase II of the EFH Amendment is delayed

I agree amendment 15 should consider making the EFH closed areas in the scallop FMP consistent with the Groundfish FMP.

6) Alternatives to improve the research set-aside program

I agree that this action should consider alternatives to improve the current research set-aside program. Specifically, potential measures to be considered are as follows:

-RSA funds should be used solely for projects that will produce results that have a distinct and quantifiable benefit to the funding source that is the industry stakeholders. Regardless of the availability of RSA dollars, entities engaged in scallop research of any type should be required to demonstrate how the use of RSA funding in their project will have a direct positive impact on the scallop fishery, rather than a convenient source of funding because it's available and the entities primary funding is lacking. Specifically, the funding of NMFS activity in fisheries surveys should be exclusive of RSA program funds.

-The creation of the scallop survey advisory (SSAP) panel is a good mechanism for industry to participate in the decision making process. However, it is important that the advisory panel be given a clear mandate as to its roll in the process and what place and authority it has in the overall hierarchy of the realm of scallop surveys. Additionally, good advisory panel practice should require any member to remove himself from any process that might have an impact on an RSA proposal that he has an interest in.

-The process of reviewing RSA proposals should be transparent to the extent that the party submitting the proposal is made aware of the specifics of what agency/dept./individual has reviewed the proposal, what the results of each reviewer was and, if the proposal was rejected, what, if any, merit the proposal contained for consideration in a future submission.

-Any effort to increase the transparency of the RSA proposal selection process should include industry stakeholders in a roll that creates a "buy-in" on the part of industry as a whole to the entire RSA process. My opinion is that industry has the impression that the 2% set aside has already been "sold" to the powers that be as a necessary part of scallop fishing as a whole but are disconnected from the results and direct benefits each vessel receives from RSA programs. All efforts to open the process to stakeholder observation and comment would add industry confidence in the results generated.

-A mechanism should be established to utilize unused RSA funds by either returning the unharvested scallops to industry in the form of DAS or an increase in controlled access landings or roll the funding forward to approve a greater number of research programs that demonstrate merit but may not fit the immediate priorities established.
-The timing of RSA proposal submission and corresponding approvals is currently occurring several months into the fishing year. As a result the timeframe available to complete the research and harvest the scallop set-aside for such research is compressed to the point that there is no flexibility in the budgeted schedule of events to account for disruptions of any kind such as mechanical failure, weather or staff issues. I propose that the timing of RFP through review and award be such that the entire fishing year (3/1-2/28) is available to conduct the research and harvest the set-aside. Along with the timing concerns raised prior, the availability of an extension to conduct research and/or to complete the set-aside trips would provide a mechanism to request an extension reviewable for cause that might be preferable to grant than to force research and/or trips to be done in less than the best possible conditions available.

I support a sub-division of the current 2% set-aside solely for access area related surveys.

I support measures that contribute to improving any RSA project's usefulness to industry including a rollover of "leftover" funding as far as this measures does not create a "lets earmark funding for pipeline proposals" rather than address the current round of funding requests. Multiyear projects that advance knowledge not obtainable otherwise should be considered.

7)Change the scallop fishing year to May 1
I support a change in the scallop fishing year for the purpose of improving the overall effectiveness of scallop fishery management.

Thank you for consideration of my comments.

Sincerely,

Raymond W. Starvish Jr.

(12)

Sarah M. Pautzke

From: scallop.fifteen [scallop.fifteen@noaa.gov]
Sent: Friday, April 04, 2008 3:26 PM
To: Woneta M. Cloutier; Sarah M. Pautzke
Subject: [Fwd: Atantic Sea Scallop Amendment 15 Scoping Comments]

-------- Original Message --------
Subject: Atantic Sea Scallop Amendment 15 Scoping Comments
Date: Thu, 03 Apr 2008 15:25:19 -0700 (PDT)
From: thomas coley <tpcoley@sbcglobal.net>
To: scallop.fifteen@noaa.gov

To: Patricia Kurkul, Regional Administrator
National Marine Fisheries Service
One Blackburn Drive
Gloucester,MA. 01930

Please accept this letter as my comments on Amendment 15 to the Atlantic Sea Scallop Management plan. I am a hired skipper working in the full time limited access fleet since 1980. Concerning annual catch limits [ALC's], for all practical purposes isn't the fishery already fishing under [ALC's], because you look at the survey results and then allocate DAS and number of access trips at levels to prevent overfishing. This process seems to be working as the fishery is not subject to overfishing at this time.
As for the allocation of available catch, it should be allocated to the limited access fleet,and then to other components such as general category and incidental catches as a percentage of this allocation.

Concening measures to rationalize the limited access scallop fishery, I do not agree that any measures should be considered to address the so called excess capacity in the limited access scallop fishery. It seems to me that this issue has nothing to do with the resource except to increase profits for multiple boat owners, and strenghten the platform from which some of these permits are fished. I believe if the fleet is consolidated, there will be loss of jobs for many fisherman, because alot of boats fish during the same time of year because the catches are better. More boats equal more jobs. Also for people on the shore side of matainence and repairs for these vessels there will be less jobs. And where are all these boats that have permits taken off them going to go? I am against any type of IFQ's or transfer and leasing of DAS. If any type of IFQ's are considered in the scallop fishery, all permit holders of the same type should recieve the same quota. The quota allocations should not be based on historical catches. All permit holders should be treated equally. I am against the "stacking" of permits or quota, because this just opens the door for big business to buy up all the quota or permits.

Concerning the approval of a mechanism that would allow limited access scallop vessels to form a sector or cooperative to harvest thier collective shares, I am against this measure because I don't think vessels in the same fishery should be operating under different rules. Unless the entire limited access fishery is under IFQ's, I don't see any way to determine allocation. I am against forming sectors and allocating quota based on historical catches. No individual vessel or group of vessels'
should recieve a
greater allocation of quota than anyone else in the fishery.

I am in favor of including the measure to address EFH in amendment 15. i agree that the EFH closed areas in the scallop FMP should be consistent with the groundfish FMP.

I do not agree that the council should consider changing the scallop fishing year start to May 1st. A March 1st start is more benificial to the scallop fleet because the natural cycle of scallops result in a higher yield during

March and April.

In conclusion I would like to say that I believe the limited access scallop fishery can operate under the new Magnuson requirements for ACL's and AM's without going the route of IFQ's and Sectors. If we have a good survey of the biomass each year, we can set DAS and access trips at a level that will prevent overfishing and a sustainable fishery. Thank you for your consideration of these comments.

Sincerly,

Thomas P. Coley

USCG licensed Captain

(13)

SF

STATE OF MAINE
DEPARTMENT OF
MARINE RESOURCES
21 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0021

JOHN ELIAS BALDACCI
GOVERNOR

GEORGE D. LAPOINTE
COMMISSIONER

April 4, 2008

Patricia A. Kurkul
Regional Administrator
NMFS, Northeast Regional Office
One Blackburn Drive
Gloucester, MA 01930

Dear Pat:

This letter constitutes the Maine Department of Marine Resource's (DMR) comments towards the development of Amendment 15 to the Atlantic Sea Scallop Fishery Management Plan. Upon review of the Federal Register Notice concerning the scoping process, we offer the following comments:

1) Concerning compliance with new Magnuson requirements for ACLs and AMs:

- The Council must strive to manage the scallop fishery to achieve optimum yield, and should therefore consider minimizing the buffers between the ACL and the annual TAC to achieve that goal. The Council must also develop and implement accountability measures that deal with the scallop catches in other fisheries to result in the least adverse impact upon the overall scallop management plan.

2) Concerning measures to rationalize the limited access scallop fishery:

- There are a wide range of opinions as to whether or not the limited access scallop fishery requires capacity reduction measures. If capacity must be reduced, the PDT should conduct an analysis in order to determine the effects of reductions via a quota based system or by projecting DAS reductions to achieve the desired amount. Capacity management measures including DAS leasing and transfer programs are likely to be complicated, costly, difficult to administer, and therefore ultimately less effective than a quota-based system.

3) Concerning revision of overfishing definition to make more area-based:

- Spatial heterogeneity should be accounted for by averaging fishing mortality over time rather than space. However, DMR is concerned that doing so may result in a reduction in allowable catch if F (in open or access areas) is not adjusted to account for the presence of closed areas. If F is currently set at 0.29 for the entire resource (including areas where F = 0), it follows that F should be increased if it is to be determined solely within open areas. Although the PDT agrees that F should be averaged over time, there appears to be some disagreement concerning whether

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or not F should be adjusted accordingly. DMR believes this is an important point, and should be investigated further by the PDT before the overfishing definition is revised.

4) Concerning modifications to alternatives recently developed under Amendment 11:

a) Allocation of IFQ by area for GC vessels:

- IFQ should be allocated by area in order to avoid derby fishing. A trading system should be established to account for those who wish to fish in some areas but not others.

b) Method for determining the NGOM TAC:

- The method for establishing and accounting for the NGOM TAC must be revised. The current NGOM TAC is based exclusively on federal waters landings, but landings from both state and federal waters are counted against it. Historically, Maine general category scallop fishermen have harvested approximately half their NGOM landings from state waters. Since all federally permitted fishermen must cease fishing (in both state and federal NGOM waters) once the NGOM TAC is reached, this TAC limits general category fishermen to roughly half their historic NGOM landings. Either state waters landings should be included in the NGOM TAC development, or state waters landings by federally permitted scallopers should not count against the NGOM TAC.

- All scallop vessels that fish in the NGOM should be bound by its conservation measures. Currently, limited access vessels have no harvest limit in the NGOM, and their unlimited landings are not counted against the NGOM TAC. The NGOM TAC and the 200 pound limit are in place to ensure that the NGOM is not overfished. To allow limited access vessels unlimited access to the NGOM area until the NGOM TAC is reached by general category vessels fishing with a 200 pound daily limit is not consistent with the conservation goals of the NGOM scallop management plan.

- Efforts should be made to fund and conduct a comprehensive assessment of the NGOM resource so that the NGOM TAC is based on fisheries-independent data.

c) Sectors under Amendment 11:

- As the mechanism for sectors was approved under Amendment 11, it is fair that sector applications be considered under Amendment 15.

5) Concerning measures to address EFH closed areas under the Scallop FMP if Phase II of the EFH Amendment is delayed:

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- DMR provides no comments.

6) Concerning alternatives to improve the research set-aside program:

- DMR supports the subdivision of RSA funds so that one allocation is always available for assessment surveys. NGOM assessment proposals should be eligible to apply for these funds.

- DMR supports all means of streamlining the RSA process so that RSA announcements and decisions are delivered in a timely manner. When announcements are delayed, as they have been this year, it may be difficult or even impossible to conduct desired RSA research within the allocated time period.

- Whether or not RSA funds are "rolled over" from year to year, the RSA proposal process must be made more user friendly so that this question becomes irrelevant. The RSA program is intended to enhance the understanding and management of the scallop resource. The fact that these funds routinely go unused is disconcerting. Perhaps a default use of RSA funds should be to increase observer coverage in the scallop fishery, or in other fisheries that catch scallops incidentally.

7) Concerning changing the scallop fishing year to May 1:

- The start of the scallop fishing year should be changed to May 1 so that the fishing year is more aligned with management. The current start date of March 1 results in inefficiencies and a reliance on older data. In addition, the new requirements for ACLs will necessitate more cooperation between fisheries management plans, which will be facilitated by a synchronized fishing year.

I appreciate the opportunity to comment and would be pleased to follow up with you on these issues as needed.

Sincerely,

Terry Ste

Terry Stockwell
Director of External Affairs

OFFICES AT STEVENS SCHOOL COMPLEX, HALLOWELL
PHONE: (207) 624-6550
FAX: (207) 624-6024

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April 4, 2008
Frontier Fishing Corp.
F/V Settler
113 MacArthur Dr.
New Bedford, MA 02740
Fax# 212-346-9776 04/04/08
Fax# 508-993-4108 04/05/08
Fax# 508-993-4108 04/10/08

RECEIVED
APR 07 2008
NEW ENGLAND FISHERY
MANAGEMENT COUNCIL

Paul Howard, Executive Secretary
New England Fishery Management Council
978-465-3116 04/04/08
04/05/08
04/10/08 (final copy)

Subject: Atlantic Sea Scallop Amendment 15 Scoping Comments

I.
#2 Measures to rationalize the Limited Access Scallop fishery

No: I do not agree that the Limited Access Scallop Fishery needs to be rationalized. DAS and/or permit leasing, permit or DAS transfers, and all ITFQ and IFQ programs will **INCREASE the CAPACITY** now in the limited Access Scallop Fleet such actions would do exactly the opposite of what you say you want to do.

Any permit or DAS leasing, permit or DAS transfers, will be moved to vessels that are bigger, more horsepower, more efficient platforms then they are presently fished on. Plainly said all fishing will move from old vessels to bigger and better vessels therefore the fishing capacity will **increase**. All Fishing People know this to be true. What Mr. Pike is asking for is more profit for some boat owners, but the capacity to catch scallops will be concentrated on more powerful platforms, bigger, more horsepower, thus, the capacity to harvest will **INCREASE NOT DECREASE!**

Access Area Trips:

The access area trips (18,000lbs. at present). Are quasi-quotes therefore the movement of these LBS. to other vessels would be quote transfer calling for a REFERENDUM (VOTE BY INDUSTRY-FISHERMAN). As required by the ACT.

Rationalization; (DAS transfers, permit transfers, stacking) Impacts: It has the same result as the ITQ's. It is ITQ's put in different terms but giving the same bottom line results. The impact verdict is in on the Surf Clam & Ocean Quahog ITQ's fisheries and the negative results it has had, loss of jobs for crew members, cuts in pay, loss of employment across the board in all associated industries & fishing communities and loss of processors and dealers. The only ones left in the end are buyers and processors that are vertically integrated. It is my belief that the bulk of the permits represented by Mr. Pike are those people (vertically integrated). This so called rationalization (quotes) will give EXCESSIVE QUOTA-RESOURCE OWNERSHIP to a few people just like what has happened in the Surf Clam and Ocean Quahog Fishery and then into the ownership's of **BANKS** as the permit holders pledge the (permits-quotes) for credit and the **BANKS** take ownership. Please note the list below, which I believe is from the Mid Atlantic briefing Manual.

Ocean Quahog % of quotes owned and owners

1. Bank of America NA -21.7%
2. Senger Island Venture Inc. –14.4%
3. Commerce Bank NA –7.4%
4. Sun National Bank –7%
5. Wachovia Bank – 4.5%

Surf Clam % quote owned and owners

1. Senger Island Ventures Inc. 11.3%
2. Myers Clam Co. 11.2%
3. First Pioneer Form Credit – 7%

4. Wachovia Bank (ITF-LET) – 7%
5. Wachovia Bank (ITF-TMT) – 6.4%
6. Wachovia Bank (ITF-SPISULA) 4%

Soon the entire American resource could be in the hands of foreign banks and ownership. So much for the American people and their 200-mile limit. (The 5% ownership limit in the scallop fishery has proven to be a farce. Example: the husband owns quota, the 1st wife owns quota, the 2nd wife owns quota, the children own quota, who really directs the quota? This example was presented at the IFQ NMFS sponsored seminar in the late nineties which I was member of the industry panel of that meeting. A scheduled speaker who worked for NMFS used the above example. His example demonstrated how quota percentage is false security and easily undermined.) Rationalization would be another mistake by the New England Council as was Framework 2.

Framework 2 created latent and history permits, inflated the fishery and undermined Amendment 4 language that kept the capacity in check by requireing all permits had to be on vessels by Dec. 31, 1994, Amendment 4 had years of public meetings and industry input and had language that kept the speculation out of the fishery. DAS was the germane control to Amendment 4 and Framework 2 undermined this by bringing speculation into the fishery .

NFMC through lack of vision and knowledge of what was happening in the ports and against the advice and better judgement of Dr. Peterson, then Regional Director and Head of WoodsHole, passed Framework 2. Dr. Peterson through the appeals process had accommodate those people who could not make the deadline for legitamte reasons and refused those speculating in the fishery.

II Habitat Closures

Amendment 15 should address the habitat closures in the Access Areas to conform to groundfish boundaries.

There is a large amount of resource in these areas. The Council and NMFS agreed that under (Framework 16-39) to have this done years ago it should be the **Priority** for this Amendment 15. Do not wait for the EFH omnibus Amendment part 2, which is the more difficult part of EFH Amendment. The boundaries in these Access Areas should be in line. The boundaries in these Access Areas should be in line with the groundfishing boundaries ASAP, and the very top portion of Area II should be made open to fishing this action is long overdue. The opening of these larger areas of the Access Areas would balance out the fishing and resource in the open area and benefit all permit holders and crews. We need a full rotation of the access areas as promised in Amendment 10. Better science is needed and **timely** science is important to accomplish the full potential of the scallop resource and to meet the mandates of Maximum Sustainable yield.

III

#1 Acl-Am

There is already more than enough precautionary measures in the scallop plans. Overfishing is not occurring and the fishery is not overfished. The precautionary approach is throughout the NMFS management system. The F20 when the CASA model calls for F29. The 4" rings alone is enough management. The fishery is accountable and managed with precaution.

It has poundage limits for trips in the access areas; the Access Trips are the larger part of the harvest at present. No more needs to be done. I feel it complies at present with the ACL-AM.

IV

#3 OFO-No change

No change is needed.

V

7Change of years to may 1- **NO**

Leave the March 1st start, as it is the right start according to the natural cycles of (Placopecten magellanicus) it is in sync with "Mother Nature". This has always been the start of the fishing year. In the years passed many Norwegian men traveled back and fourth from Norway to the US- to New Bedford to fish for scallops and many went back to Norway for Christmas and returned in the Spring for the start of the year when many boats went 9 men in winter and 11-13 in the Summer. It has always followed the growth and appearance of the resource.

No change.

Sincerely

Harriet Didriksen

Harriet Didriksen, Scallop Advisor 1985-97

(15)

March 27, 2008

Captain Louis Sirois

Re: Comments on Scallop # 15

Dear Ms Kurkul,

I have been a Scallop fisherman for the past 26 years of which I have been a Captain for the past 11 years. During the past 6 years I have been running 2 boats. I know it would be beneficial for me and my crew to be able to fish on one boat. I am in favor of stacking more than 1 permit on a vessel. This would create a tremendous savings for us, mainly on the fuel and ice. It would also eventually free up some much needed docking space.

Sincerely,

Capt. Louis F. Sirois

Captain Louis F Sirois

F/V Courageous & Defiant

APR - 2 2008

16

Maine Scallop Advisory Council
21 State House Station
Augusta, ME 04333-0021
207-624-6558

April 7, 2008

Patricia A. Kurkul
Regional Administrator
NMFS, Northeast Regional Office
One Blackburn Drive
Gloucester, MA 01930

Dear Ms. Kurkul:

Maine DMR's Scallop Advisory Council (SAC) represents Maine's scallop industry, and advises the Department of Marine Resources on research and management issues. We have reviewed the Federal Register Notice concerning the scoping process for Amendment 15 to the Atlantic Sea Scallop Fishery Management Plan and offer the following comments:

1) Northern Gulf of Maine (NGOM) TAC development and management:

- We appreciate the fact that the NGOM Management Area was created so that fishermen with a historic dependence on the NGOM resource could maintain access to it. However, while the NGOM TAC was developed based exclusively on the Federal portion of the resource, both state and federal waters landings will be counted against it. Since roughly half of all landings in the NGOM are harvested in state waters, Maine scallop fishermen with a NGOM permit will be limited to half their historic landings. Fishermen should not be forced to choose between future access to federal waters and current access to state waters. If the NGOM TAC is reached prior to the beginning of the Maine state scallop season (December 1), the 571 Maine fishermen who qualify for a NGOM permit will be excluded from the state fishery. The state scallop fishery provides important income at a time when other options are not readily available. The SAC hopes the NGOM TAC development process will be corrected so this un-equitable situation does not extend beyond Fishing Year 2009.

- All scallop vessels in the NGOM should abide by the 200 pound daily catch limit, and should have their landings applied toward the NGOM TAC. To allow limited access vessels unlimited access to the NGOM resource until the NGOM TAC is reached by other vessels that abide by a 200 pound limit is irrational.

- General Category fishermen's IFQ is allocated based on an assessment of the scallop resource outside the NGOM. Accordingly, scallops caught in the NGOM should not count against it. Just as scallops caught in the Elephant Trunk should not be applied toward the NGOM TAC, scallops caught in the NGOM should not be applied toward an IFQ tailored to a resource outside the NGOM. These areas were established as separate entities and should be managed as such.

- The NGOM resource should be surveyed as soon as possible so that survey data can be used in the NGOM TAC development process.

- The SAC recently worked with the Maine Department of Marine Resources to implement mandatory harvester reporting and to introduce a bill that limits entry to Maine's scallop fishery and increases ring size to 4". We will soon be developing a variety of other measures to enhance the recovery of the scallop resource in Maine waters. Items under consideration include daily catch limits, rotational closures, and even a complete closure of the state scallop fishery. We hope that the NEFMC and the NMFS will recognize our commitment to the NGOM, and will work toward a more collaborative approach to management within the area.

2) Concerning measures to rationalize the limited access scallop fishery:

- If capacity is to be reduced in the limited access scallop fishery, it must not be done in a way that negatively impacts small businessmen. If limits are not put on permit stacking, IFQ transfers, DAS leasing, etc., a few large corporations could eventually out compete others in the industry and force owner operators and smaller businessmen to sell out. The SAC feels it is important to ensure this does not happen.

3) Concerning changes to the RSA Program:

- The SAC is interested in pursuing research projects to better understand the NGOM scallop resource. We are strongly in favor of any means of streamlining the RSA process.

The SAC appreciates the opportunity to comment and would be pleased to follow up with you on these issues as needed.

Sincerely,

Dave Sinclair
Chairman of Maine DMR Scallop Advisory Council

9-4-08

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Chesapeake Bay Packing, L.L.C.

Patricia Kurkul
Regional Administrator
National Marine Fisheries Service
One Blackburn Drive
Gloucester, MA 01930

Via email scallop.fifteen@noaa.gov

Dear Ms. Kurkul:

The following comprise our primary concerns regarding the sea scallop management issues presented in the scoping document for Addendum 15 to the Sea Scallop Management Plan.

Fishing year
A significant change in the fishing year, as proposed, would have a highly disruptive effect on our annual business plans, which have been build around the March 1 start date for many years. The proposed change in the fishing year to May 1, coupled with the draconian terms and conditions proposed in the recent sea turtle Biological Opinion, would have a catastrophic impact on the sea scallop fishery in the Mid-Atlantic region. The proposed changed has been presented, debated and defeated for similar reasons in the past, and we believe the detriments of the proposed change far outweigh any benefits.

Overfishing definition
Changing the overfishing definition in a manner that would allow a much higher rate of fishing mortality in access areas, for limited periods of time, in a time-averaged approach, poses a significant risk to the management of the access areas. The rate of removal of scallops from the access areas, over a short period of time, under a time-averaged approach would be much higher than the current rate of removal in the same areas. Fishing at a much higher F rate, albeit over a shorter time period, introduces risk to a system that has been proven effective in the past. We would prefer to avoid this risk and maintain the current overfishing definition.

EFH area access
We strongly support immediately improving access to the sea scallop resource currently located in EFH designated areas in Closed Area I and Closed Area II, by making the EFH closed areas consistent with A13 to the Groundfish FMP. National Standard I requires management of the resource for optimum yield, and the fact that over 20 percent of the

resource is inaccessible due to EFH and HAPC designations warrants thoughtful and immediate attention. Making the scallop EFH areas in Closed Area I and Closed Area II consistent with the EFH areas in Groundfish A13 would improve access and yield in the fishery without compromising Groundfish EFH.

Thanks in advance for your consideration on these important issues.

Sincerely,

Frank McLaughlin

FM/-

703 Jefferson Avenue
Newport News, VA 23607
Tel. 757.244.8400 Fax 757.244.8500

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April 4, 2008

Patricia Kurkul, Regional Administrator
National Marine Fisheries Service
One Blackburn Drive
Gloucester, MA 01930

Via electronic mail to: scallop.fifteen@noaa.gov,

Re: Atlantic Sea Scallop Amendment 15 Scoping Comments

Dear Ms. Kurkul:

As the New England Fishery Management Council begins development of Amendment 15 to the Atlantic Sea Scallop Fishery Management Plan, Oceana would like to highlight critical issues that the Council must address in the amendment to fully comply with the Magnuson-Stevens Reauthorization Act (MSRA), and other provisions required by litigation and agency guidelines.

Annual Catch Limits and Accountability Measures- The Council has identified compliance with the Annual Catch Limit (ACL) and Accountability Measure (AM) requirements of the MSRA as the primary objective to be addressed in Amendment 15. Although the agency is extremely tardy in issuing guidelines for these important measures, the Council should move forward and develop a range of alternatives to implement these elements in Amendment 15.

As Oceana commented to the agency earlier in the development of the agency guidelines for ACL and AMs (4/17/2007 letter attached), a complete set of ACL/AM's must:

Count--Count all sources of fishing-related mortality (landings+discards).

Cap--Limit fishing mortality to acceptable and scientifically supportable limits.

Control--Manage fisheries' limits to end overfishing and limit bycatch.

Specific to the scallop fishery, it is essential that the Amendment 15 include hard ACLs on not only catch (landings + discards) of scallops but also establish limits on species that are caught as bycatch in the scallop fishery. These limits should include scallop discards, finfish species, non-managed species, and protected species such as the sea turtles that the fishery is known to catch in significant numbers each year. The Council should allocate the individual species ACLs to the sectors of the fishery to reward cleaner fishing and not punish clean sectors for the behavior of other dissimilar sectors.

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Additionally it is essential that the amendment fully develop a system of AMs that will effectively monitor, report, and account for all sources of mortality (catch and discards) in the fishery to ensure that the Annual Catch Limits are not exceeded.

Failing to account for all sources of scallop mortality, to develop bycatch limits for all known bycatch species, or to enact a strong system of AMs, will leave the FMP deficient.

Essential Fish Habitat Measures- The fishing industry has repeatedly attempted to modify closed areas through unrelated and inappropriate scallop management actions. With an ongoing Council process to develop the Omnibus EFH amendment in motion, it is wholly inappropriate to consider habitat management measures in Amendment 15. The Council should take action to remove this issue from Amendment 15 and focus its limited habitat staff on primary management actions like the Omnibus Amendment.

Sea Turtle Conservation Measures- Despite a series of actions in recent years, the scallop fishery continues to have a problem with bycatch of threatened and endangered sea turtles. Actions to address this issue must be included in Amendment 15 or addressed in a separate management action. A recently issued Biological Opinion for the scallop fishery imposed a set of significant management measures that *must* be in place by the 2010 fishing year. Included in these mandatory measures are significant seasonal effort reductions in the Mid-Atlantic to reduce the interactions between sea turtles and scallop dredges. Considering the lengthy amendment development process, the Council should include a range of seasonal effort reduction measures in Amendment 15 and avoid a hurried action in the future that may have unnecessary impacts on the fishery.

Oceana looks forward to participating in the development of Scallop Amendment 15 and supporting the development of sound Annual Catch Limits, Accountability Measures and Sea Turtle Conservation Action within the amendment.

Thank you for considering these comments,

Gilbert A Brogan

Gib Brogan
Campaign Projects Manager
Oceana Inc. Wayland, MA

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April 17, 2007

By E-mail

Mr. Mark Millikin
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
1315 East-West Highway
Silver Spring, Maryland 20910
Email: annual.catch.limitDEIS@noaa.gov

Re: Scoping comments on annual catch limits DEIS

Dear Mr. Millikin,

Oceana is encouraged by the improvements to the Magnuson Stevens Act that have been included in the recent Magnuson-Stevens Reauthorization Act (MSRA). The provisions of the new Act have the potential to expand approaches to management that have been successful in a limited number of fisheries to all federally managed fisheries. Establishing strong Annual Catch Limits (ACL's) and Accountability Measures will be the foundation for improving the nation's troubled fisheries.

Without firm guidance from the Agency, region-by-region interpretation of the Act will continue the past pattern of manipulation of the law. This manipulation has allowed overfishing to take place despite the requirements of the Sustainable Fisheries Act (SFA). To fulfill the intent of Congress to end overfishing, the National Marine Fisheries Service must issue a set of guidelines to the regional fishery management councils which give firm guidance about the exact manner in which the new elements of the Act must be included in Fishery Management Plans and carried through in fishery management actions.

Ultimately, the combination of Annual Catch Limits and Accountability Measures should:

Count--Count all sources of fishing mortality.

Cap--Limit fishing mortality to acceptable and scientifically supportable limits.

Control--Manage fisheries' limits to end overfishing and limit bycatch.

<u>Annual Catch Limits</u>

The Act clearly lays out the standardized process by which Annual Catch Limits (ACL) will be established for every Fishery Management Plan (FMP) managed by each of the Councils. Oceana believes that the agency should direct the Councils to follow a process where the Scientific and Statistical Committee (SSC) will develop recommendations for fishing mortality limits that will meet rebuilding

targets[1] and a process in which the Councils will be obliged to set mortality limits each year that do not exceed the limits recommended by the SSC[2].
In addition to a straightforward process that the Councils and its SSCs will follow to set ACLs, Oceana believes that the agency should issue guidance and clarification of the following issues to prevent jeopardizing the success of efforts to end overfishing in federal FMPs.

Overfishing Definition--The Agency should strengthen the guidance related to the definition of overfishing to avoid inconsistency among regions and to reduce political pressure on the SSC and stock assessment process. The Councils should be required to comply with these definitions in all of its FMPs. Allowing the Councils flexibility to define overfishing could lead to continued overfishing under new, more lenient definitions of overfishing.

Optimum Yield--The MSRA continues to include the strong language defining Optimum Yield (OY) which requires fishing levels to be set with consideration of the ecological role of the species[3]. The development of Annual Catch Limits must explicitly consider the effects of fishing on the ecological role of the target species and the effects of fishing on all other relevant ecological factors, and specify how OY was calculated with consideration of those ecological factors.

Fishing Mortality--All fish or other marine life killed or injured as a result of fishing--whether landed catch or bycatch--should be factored into the calculation and monitoring of Annual Catch Limits. If the ACLs focus solely on landed catch, the unreported or underreported mortality associated with bycatch and discards could undermine efforts to end overfishing. Guidance to Councils must mandate that bycatch and discard mortality be included in ACL calculations.

Allocation of Catch/Bycatch--After ACLs are established it will be the responsibility of the Councils to allocate mortality to directed fisheries and bycatch in other fisheries. Over time, it will be the responsibility of the Councils to minimize bycatch under the ACL to meet the requirements of National Standard 9.

Accountability

The MSRA requires all Fishery Management Plans to include measures which ensure accountability[4].

Fully accountable Fishery Management Plans will:

[1] Each scientific and statistical committee shall provide its Council on going scientific advice for fishery management decisions, including recommendations for acceptable biological catch, preventing overfishing, maximum sustainable yield, and achieving rebuilding targets, and reports on stock status and health, bycatch, habitat status, social and economic impacts of management measures, and sustainability of fishing practices. Sec. 302 (g) (1) (B)

[2] develop annual catch limits for each of its managed fisheries that may not exceed the fishing level recommendations of its scientific and statistical committee or the peer review process established under subsection (g); SEC. 302 (h) (6)

[3] (33) The term "optimum", with respect to the yield from a fishery, means the amount of fish which--
(A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, *and taking into account the protection of marine ecosystems*;
(B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or *ecological factor*; and
(C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

[4] Establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability. Sec 303 (a) (15)

Mandate Public Reporting/Accounting Protocols--All dead or injured fish and other marine life affect the success of an FMP--whether caught and landed or thrown back as discards. FMPs must include measures which will require at a minimum, annual public reporting of all mortality and injury under the auspices of the FMP. Failing to discuss the potential impacts of bycatch on the success of a management or rebuilding plan is shortsighted, and the agency should issue strong guidance to the Councils to factor bycatch information into all assessment and management actions.

Provide a transparent discussion of calculations of OY, ABC, MSY and ACL--The Agency should use this opportunity to advance ecosystem-based management and wide use of the precautionary approach to managing our nation's oceans. Rather than focusing on exploitation and removal of marine resources for profit, fisheries management should fully consider the role of managed species in the marine ecosystem and manage the oceans as a whole. A full account of the calculations of overfishing metrics such as Optimal Yield, Maximum Sustainable Yield and Annual Catch Limits must be provided as part of the mortality accounting report in a way that the public can comprehend. Included in this discussion must be a full analysis and discussion of the known information on the ecological role of a species, the effect of the current level of fishing on overall optimal yield, a risk assessment of the proposed limits, and the probability that the limits will achieve the goals of the management action.

Mandate Monitoring of ACLs--Without a strong mandate to accurately and precisely monitor ACLs the efficacy of the law may be significantly diminished. The agency should use this opportunity to commit to developing the necessary tools and programs to monitor catch and bycatch in all fisheries by the 2010 deadline established in the MSRA. Included in this program should be real time catch and landings reporting, bycatch monitoring and reporting, a program to provide precise and accurate information about catch and bycatch to managers in a timely fashion, and the authority to manage fisheries in real time to avoid overages.

Mandate requirements to account for overages--The agency must provide strong guidance to the Council to ensure that when an ACL is exceeded that the overage will be deducted from the following year's ACL. The MSRA *requires* the development of ACLs to be set 'such that overfishing does not occur in the fishery, including measures to ensure accountability'. Failing to mandate the way that Councils account for overages would allow overfishing to continue in fisheries despite fishermen knowingly exceeding an established limit. This is illegal and cannot be encouraged by the agency's guidelines.

Oceana looks forward to the Agency's EIS and to participating in the development of the guidelines for the Councils. The expansion of successful fisheries management approaches in some councils to other regions is a promising way forward for the nation's oceans. Oceana hopes that the agency will take strong action with this opportunity to safeguard our oceans for the future.

Sincerely,

Beth Lowell

Beth Lowell
Federal Policy Director
Oceana
Washington, DC

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April 4, 2008

NE Region, NMFS, NOAA
Patricia Kurkul, Regional Administrator
One Blackburn Drive
Gloucester, MA 01930-2298

Fax #978-281-9135

Re: Atlantic Sea Scallop Amendment 15 Scoping Comments

Dear Ms. Kurkel,

My name is Robert Maxwell, I am currently a General Category owner from West Creek, NJ and I have been attending many of the Amendment 11 Advisory, PDT & Council meetings. I am writing this letter asking and urging the council to include the following 2 (**A & B**) items to the scoping comments in Amendment 15, under #4 Modifications to alternatives recently developed under Amendment 11 (General Category Limited Entry Program):

A) Revisit 3.1.2.5.4.4 Vessel Allocation – I believe the Council may have over viewed the allocation per vessel of 2% and it should be adjusted to 2 ½ % to be consistent and coincide with 3.1.2.5.8.1 5% ownership.

B) Increase day limit from 400 to 600 lbs per day. Currently under Amendment 11 we will be bound to 400 lbs per day. Due to the current fuel price crisis and the economy, I urge the Council to reevaluate and increase the lbs per day limit. This should have no impact on the scallop fishery or on the management issues at hand. When Amendment 11 is implemented all General Category Limited Access vessels will have their own allocations. This will reduce the days a vessel will fish and reduce expenses, increase profits and overall economic efficiency in the fishery.

Comments regarding actions the council is considering:

1) Rollover Allowance – A maximum of 15% - Example: If a vessel has an allocation of 40,000 lbs x 15% = 6,000 lbs divided by 400 lbs = approx. 15 fishing days. This measure will allow you to regain lost revenue from mechanical breakdowns, etc.

2) IFQ by Area – If a vessel has allocation or percentages in near shore areas, it is positive. In off shore areas I believe it would not be cost efficient. This may be a good thing we need to research this and come up with some alternatives. If a sector was approved properly it would work well.

3) (NGOM) TAC -

a. What would happen if we allowed NGOM to include LA vessel landings? I believe this will get very complicated. How would you account for the landings on LA vessels that would go to (NGOM) TAC and then go against the total TAC for (LACG)?
b. What would happen if (NGOM) and the majority of the LA vessels started fishing that area?
c. If there was a scallop closure in that area, it would be clearer.
d. I believe the (NGOM) needs to do a stock assessment and survey that area and then revisit or adjust there TAC. There should be set aside allocations to fund these measures to be consistent with current measures.

4) GC Sectors – Currently if Amendment 11 is implemented sectors will be bound to 400 lb limits regardless if there are 10 vessels and 20% of allocation in that sector, you still could only land 400 lbs per day. This should be revisited and each sector application should be treated on an individual basis considering the pool of vessels and there allocation. Each sector application should be capable of landing a maximum of 5% of there combined sector application. For example: considering a 2.5 million TAC, and a sector has 10 vessels and a combined allocation of 12% (300,000 lbs) and a maximum of 5% trip catch (15,000 lbs), this would equate to 10 vessels @ 1500 lbs per vessel trip. With a stipulation of a minimum number of 5 catch vessels.

I thank you for your time and considering these concerns I have outlined.

Sincerely,

Robert W. Maxwell

Robert W. Maxwell

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University of Massachusetts Dartmouth

SMAST

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Patricia A. Kurkul
Regional Administrator
Northeast Regional Office, NOAA/NMFS
One Blackburn Drive,
Gloucester,
MA 01930

4 April 2008

Dear Ms Kurkul:

I would like to address several questions in the "Atlantic Sea Scallop Amendment 15 Scoping Comments" published in the *Federal Register* on 5 March 2008. Specifically I believe some of our recent experimental research, funded under the Sea Scallop Research Set-Aside program, may be of use as follows:

5.) Measures to address EFH closed areas under the Scallop FMP if Phase II of the EFH Amendment is delayed

• *Do you agree that this action should consider making the EFH closed areas in the Scallop FMP consistent with the Groundfish FMP if the timeline for Phase II of the EFH Amendment is delayed?*

Our scientific analysis supports the action making the EFH closed areas consistent with A13 to the Groundfish FMP. We examined the limited, short-term, fishery for sea scallops conducted in areas of Georges Bank in 2000, that had been previously closed to all mobile fishing for five years. We used a video sampling technique to assess the benthic community structure within a before-after-control-impact design. One area we examined was the central portion of Closed Area I. In this area 60% of the exploitable scallops were harvested from the northern portion while the southern portion remained closed. Yet, we found that the abundance of most epibenthic organisms remained constant or varied only slightly from year to year and that sediment composition varied more than the benthic community structure. Changes in the number of taxonomic categories, and the density of individuals within each category, in the areas impacted by the fishery were similar to changes in the control areas that remained closed to fishing. We concluded that the limited fishery, which is similar to the pulse perturbations in the environment, may alter the epibenthic community less than the natural dynamic conditions of Georges Bank. This research was published in one of the top international scientific peer-reviewed journals in marine science the "*Marine Ecology Progress Series*" and I have included a reprint with this letter, the citation is:

Stokesbury, K.D.E., and B.P. Harris. 2006. Impact of a limited fishery for sea scallop, *Placopecten magellanicus*, on the epibenthic community of Georges Bank closed areas, Mar. Ecol. Prog. Ser. 307:85-100.

In our 2007 video survey of the sea scallop resource we observed 2667 mt (6 million lbs) of exploitable scallops in the northern open portion of Closed Area I and 12649 mt (28 million lbs) in the southern closed portion of Area I (summary tables, raw data, and spreadsheets used to calculate these estimates were provided in a series of emails dated 8/23, 8/24 and 8/30/2007 to Deirdre Boelke, Chair of the scallop PDT, and Dr. Hart, NMFS).

Therefore the scallops in the southern portion of Closed Area I could be harvested with little impact to the sea floor and provide a substantial benefit to the fishery.

I believe the above results also demonstrate the value of the 2% research set-aside (action 6 of the scoping document) for conducting cooperative research addressing specific issues of fisheries stock assessment and impact.

I realize that you are dealing with many difficult issues in fisheries management. I hope my laboratory, students, these data and our publications will be of service to you. Please do not hesitate to contact me if there is something we can analyze, describe or report that will assist you.

Sincerely,

Kevin Stokesbury
Chair Dept Fisheries Oceanography
SMAST-UMASSD

Vol. 307: 85–100, 2006 | MARINE ECOLOGY PROGRESS SERIES Mar Ecol Prog Ser | Published January 24

Impact of limited short-term sea scallop fishery on epibenthic community of Georges Bank closed areas

Kevin D. E. Stokesbury*, Bradley P. Harris

School for Marine Science and Technology, University of Massachusetts Dartmouth, 706 South Rodney French Boulevard, New Bedford, Massachusetts 02744-1221, USA

ABSTRACT: On Georges Bank, 2 areas that had been closed to sea scallop fishing since 1994 were opened for a limited harvest from August 2000 to February 2001. The effects of this limited short-term fishery on the epibenthic community were examined using a 'before/after, control/impact' environmental design conducted with video surveys. A centric systematic survey with 1379 stations placed on a 1.57 km grid, with 4 video quadrats collected at each station (3.235 m^2 per quadrat equaling 17 789 m^2 total sample area), was completed in 2 control and 2 impact areas before and after the fishery. The sea scallops *Placopecten magellanicus* and starfishes (primarily *Asterias vulgaris*) comprised more than 84 % of the fauna. Changes in the number of taxonomic categories and the density of individuals within each category in the areas impacted by the fishery were similar to changes in the control areas that remained closed to fishing. Further, sediment composition shifted between surveys more than epibenthic faunal composition, suggesting that this community is adapted to a dynamic environment. The limited short-term sea scallop fishery on Georges Bank appeared to alter the epibenthic community less than the natural dynamic environmental conditions.

KEY WORDS: Sea scallop · Video · Georges Bank · Fishing impact · Before/after, control/impact BACI · Closed areas

INTRODUCTION

The sea scallops *Placopecten magellanicus* support the second largest fishery in the NE United States and are managed as 2 stocks, Georges Bank and the Mid-Atlantic (Murawski et al. 2000, Stokesbury et al. 2004). To harvest sea scallops in these areas, fishing vessels (25 to 30 m long) usually deploy 2 New Bedford offshore dredges (Bourne 1964, Caddy 1989) (present study Fig. 1).

Scallop dredging may impact the benthic community by reducing densities and shifting spatial distribution of macrofaunal populations (Langton et al. 1987, Langton & Robinson 1990, Thrush et al. 1995, Kenchington 2000, Bradshaw et al. 2002), by removing colonial epifauna and reducing habitat complexity (Dayton et al. 1995, Auster et al. 1996, Collie et al. 1997, Collie & Escanero 2000, Hall-Spencer & Moore 2000), and by redistributing grain size of sediments and increasing silt in the water column (Caddy 1989, Mayer et al. 1991, Grant 2000, MacDonald 2000). Unfortunately, many studies do not assess disturbances caused by scallop dredging against a background of natural disturbance that occurs over time (Kaiser et al. 1996, Jennings & Kaiser 1998, Watling & Norse 1998, Auster & Langton 1999). This is difficult and expensive to do, and as a consequence dredge-impact studies are often hampered by the lack of proper environmental-impact assessment and appropriate monitoring (Thrush et al. 1995, Jennings & Kaiser 1998).

Because of proposed disturbances caused by scallop dredging and fish trawling, 3 areas on Georges Bank containing approximately 7000 km^2 of sea scallop grounds that had been fished since the 1800s were closed to mobile fishing gear in 1994 (Murawski et al. 2000) (see present Fig. 2). By 1999, densities of sea scallops within these areas had increased to the highest ever recorded, and continue to increase (Stokesbury 2002, Stokesbury et al. 2004). As a result, portions of these areas were opened for a single limited sea scallop fishery from 1999 to 2001.

*Email: kstokesbury@umassd.edu

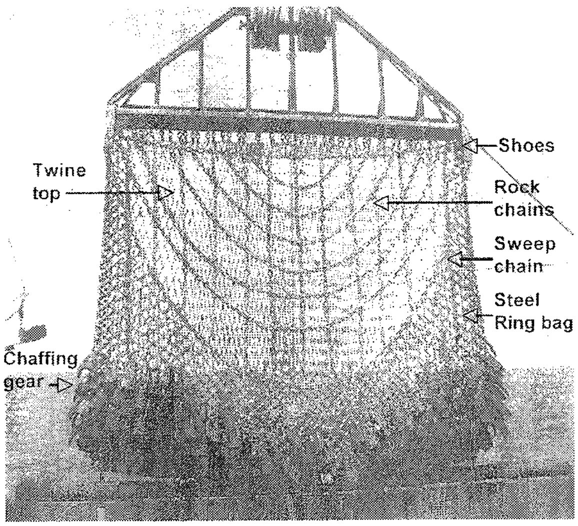

Fig. 1. New Bedford offshore sea scallop dredge used in this fishery, with weight of about 1870 kg, and width of 4.5 m. Dredge comprises series of vertical and horizontal sweep chains (that prevent large rocks from entering the bag) a 20.3 mm diamond mesh twine top, a 4.5 × 0.8 m bag knit of 89 mm steel rings and rubber chaffing gear

We examined the impact of the limited short-term sea scallop fishery on the epibenthic community of Georges Bank closed areas by conducting a large-scale before/after, control/impact (BACI) study (Green 1979, Stewart-Oaten et al. 1986, Krebs 1989, Underwood 1994). The epibenthic community is the group of organisms belonging to a number of different species that co-occur in a habitat and interact spatially and possibly trophically (Putman 1994). The null hypothesis was that changes in the number of taxonomic categories and the density of individuals within each category in the areas impacted by the fishery were similar to changes in the control areas that remained closed to fishing. We examined shifts in the epibenthic community by determining similarity indices, taxonomic category diversity, and the number of individuals within each category, within each area.

MATERIALS AND METHODS

The BACI study consisted of 2 experiments, each containing an impact area exposed to fishing and an undisturbed control area (Table 1, Fig. 2). The BACI design assumes that the control and impact areas have similar epibenthic communities and environmental conditions, and that these communities will change over time in the same fashion, except for any disturbances caused by scallop dredging in the impact areas.

In Expt I, the northern portion of Closed Area II (CAII) was used as the control area and the Nantucket Lightship Closed Area (NLCA) as the impact area (Fig. 2). The northern portion of CAII is the only location on Georges Bank that has been closed to all mobile fishing since 1994, and has similar scallop densities, substrate and current structure to the NLCA. The mean water depths were 52 m (SD = 9.5) and 66 m (SD = 9.1) in the control and impact areas, respectively. Both areas had mid-water tidal currents with maximum averages of about 60 cm s^{-1} (Brown & Moody 1987). Sand and granule/pebbles made up 74 and 89 % of the sediment

Table 1. Video surveys completed before and after the limited sea scallop fishery in 2 experiments, each with a control and impact area, on Georges Bank. CAII: Closed Area II (northern portion); NLCA: Nantucket Lightship Closed Area; CAIS: Closed Area I South; CAIN: Closed Area I North; (n): number of stations sampled in each survey

Location	Expt I		Expt II	
	Control area CAII	Impact area NLCA	Control area CAIS	Impact area CAIN
Before limited scallop fishery				
1st survey	28, 29 Sep 1999	12–19 Jul 1999	27 Jul–2 Sep 1999	27 Jul–2 Sep 1999
(n)	(125)	(174)	(48)	(105)
2nd survey		8–11 Aug 2000	15–17 Aug 2000	15–17 Aug 2000
(n)		(174)	(45)	(110)
Limited scallop fishery				
Opening date		15 Aug 2000		15 Oct 2000
No. of vessels		136		135
Harvest (t)		583.7		1506.8
Harvest (millions of scallops)		15.4		56.0
Closing date		14 Oct 2000		27 Feb 2001
After limited scallop fishery				
3rd survey		17–21 Oct 2000		
(n)		(174)		
4th survey	10–13 Jul 2001	15–17 Jul 2001	28 Jun–14 Jul 2001	28 Jun–14 Jul 2001
(n)	(125)	(174)	(46)	(111)

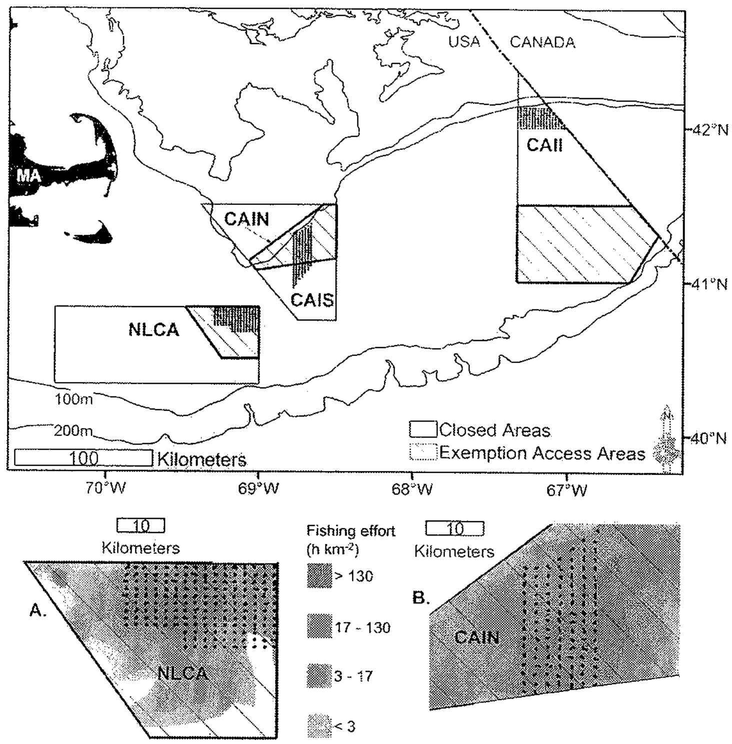

Fig. 2. Georges Bank, showing 1994 groundfish closed areas (NLCA: Nantucket Lightship Closed Area; CAIN, CAIS: Closed Area I, (north and south), respectively; CAII: Closed Area II), the sea scallop exemption fishery access areas (hatched) open for harvesting in 1999 to 2001, and the sea scallop video stations sampled for the before/after, control/impact (BACI) experiment (dots in A and B). (A,B) Enlargements of NLCA and CAIN, detailing fishing effort in impact areas. Shading represents fishing effort, whereby 3–17 and 17–130 h km^{-2} = 0.2 to 1.3 and 1.3 to 9.6 dredge passes over entire area, respectively (P. Rago unpubl. data, National Marine Fisheries Service, Woods Hole, MA)

composition in the control and impact areas, respectively. The scallop aggregations covered 235 and 282 km^2 of sea floor, with mean densities of 0.78 (SE = 0.092) and 0.64 (SE = 0.095) sea scallop m^{-2}, representing 183 and 180 million scallops (>60 mm shell height) in the control and impact areas, respectively (Stokesbury 2002). Although these areas are separated by about 200 km, they may be linked by transport of larval fishes and invertebrates due to the circulation patterns of Georges Bank (Tremblay et al. 1994).

Expt II was conducted in the central portion of Closed Area I (CAI), which was divided into the southern control area (CAIS) and the northern impact area (CAIN) (Fig. 2). The mean water depths were 61 m (SD = 4.2) and 70 m (SD = 9.7) in the control and impact areas, respectively. Both areas had mid-water tidal currents with maximum averages of about 45 cm s^{-1} (Brown & Moody 1987). Sand and granule/pebbles made up 86 and 99% of the sediment composition in the control and impact areas, respectively. The scallop aggregations covered 67 and 163 km^2 of sea floor with mean densities of 0.60 (SE = 0.181) and 0.30 (SE = 0.061) sea scallops m^{-2}, representing 70 and 69 million scallops (>60 mm shell height) in the control and impact areas, respectively (Stokesbury 2002).

Each area was surveyed at least once before and after the limited short-term sea scallop fishery (Table 1). All areas were surveyed in the summer of 1999. During the summer of 2000, just prior to the scallop harvest, the impact area of Expt I (NLCA) and both areas of Expt II were video surveyed. The impact area of Expt I (NLCA) was also video surveyed again 2 d after the fishery ended and the control and impact areas were surveyed a final time in July 2001. The control and impact areas of Expt II were video surveyed 4 mo after the fishery ended in June 2001.

A video survey pyramid deployed in a centric systematic sampling design with stations positioned on a 1.57 km grid, with 4 quadrats sampled at each station, was used to survey all areas. The precision of this survey design ranged from 5 to 15% for the normal and negative binomial distributions, respectively, based on the density of sea scallops in the Nantucket Lightship area in 1999 (Stokesbury 2002).

The sampling pyramid was deployed from scallop fishing vessels (Stokesbury 2002, Stokesbury et al. 2004) (Fig. 3). A camera was mounted vertically on the pyramid so that once the pyramid rested on the sea floor the camera height was 1575 mm, providing a 2.841 m^2 quadrat. All fishes and macroinverebrates were counted, including those only partially visible along the edge of the quadrat image. To correct for this edge effect, 56 mm (based on half the average shell height of the scallops observed) were added to each edge of the quadrat image, providing a quadrat size of 3.235 m^2 (Stokesbury 2002, Stokesbury et al. 2004).

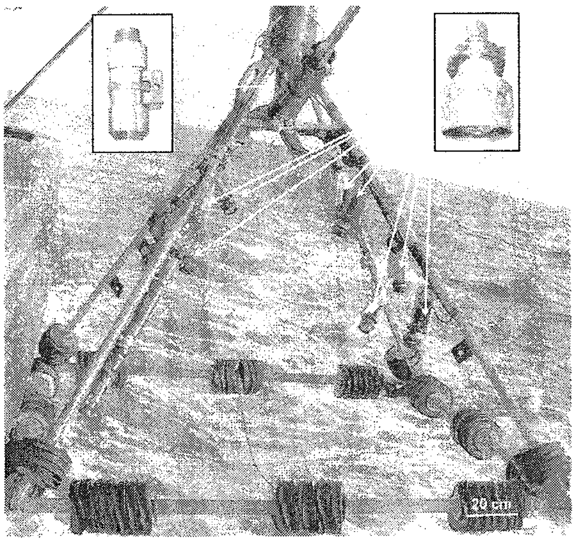

Fig. 3. School for Marine Science and Technology (SMAST) video sampling pyramid aboard the FV 'Huntress'. Pyramid has square base, 2.2 m per side, of 6 cm round iron, arms of 2.5 m × 4.5 cm round iron, and weighs approximately 450 kg. It is deployed with the large hydraulic winch used in the scallop fishing industry while a second tension sensitive hydraulic winch controls the electronic cable. Rubber rings (3 sets of 8 rings, each 20 cm diameter, 5 cm thickness, per side) are placed on the base of pyramid to prevent damage during deployment and provide gentle landing on the sea floor. Underwater camera (insert top left, Deepsea Power & Light® multi-Seacam) and up to nine 100 W lights (insert top right, Deepsea Power & Light® multi-Sealite) were attached to pyramid

Collecting 4 quadrats at each station increased the sample area to 12.94 m^2.

Fish may be attracted or repelled by light, and this may have affected the numbers we observed. However, as the sample pyramid approached the sea floor, the area illuminated by our lights expanded in all directions and this appeared to confuse many fishes. Most remained still, particularly those using concealment as a means of escaping predators, for example flounder and skates. Once the pyramid landed, if the fishes were within the quadrat area, they hesitated to swim over the cross bar of the pyramid's base, allowing clear identification (Fig. 4).

A monitor and VHS video recorder for the camera, a monitor for the captain controlling the vessel's hydraulic winches to deploy the pyramid, a laptop computer with Arcpad GIS® software integrated with a differential global positioning system and Wide Area Augmentation System (WAAS) receiver, and a laptop computer for data entry were assembled in the wheelhouse. The survey grid was plotted prior to each cruise in Arcpad GIS®; 2 scientists, the captain, mate and 1 deck-hand were able to survey about 100 stations every 24 h.

Video footage of the sea floor was recorded on VHS tapes. For each quadrat, the time, depth, latitude and longitude were recorded. After each survey the videotapes were reviewed in the laboratory and a still image of each quadrat was digitized and saved using Image Pro Plus® software (TIF file format) (Fig. 4). Within each quadrat, fishes and epifaunal macroinvertebrates were counted a second time for quality control and the substrate was identified (Stokesbury 2002, Stokesbury et al. 2004). When possible, fishes and macroinvertebrates, to a minimum size of about 40 mm, were identified to species, and animals were grouped into categories based on taxonomic order (Table 2). Grouping species into higher taxonomic categories increases the power of the statistical analysis, enhancing the detection of anthroprogenic change (Veale et al. 2000). Unidentified fishes were grouped as 'other fish.' Counts were standardized to individuals m^{-2}. For colonial organisms such as sponges, hydrozoans/bryozoans, and sand dollars, which tend to occur in large aggregations, individual counts were difficult or impossible. Therefore, if at least 1 organism of a category was observed, the quadrat was given a value of 1 for this category; however, this differed for the presence/absence data, as the quadrat did not comprise the total sample for each station.

Sediments were visually identified using texture, color, relief and structure in the video images, roughly following the Wentworth particle-grade scale, where sand = 0.0625 to 2.0 mm, gravel = 2.0 to 256.0 mm and boulders are >256.0 mm (Lincoln et al. 1992). Gravel was divided into 2 categories, granule/pebble = 2.0 to 64.0 mm and cobble = 64.0 to 256.0 mm (Lincoln et al. 1992). Shell debris was also identified, but was included with sand as these substrates were often observed together. Quadrats were categorized by the presence of the largest type of particle. Therefore, a quadrat identified as sand contained only sand, but a quadrat with 80 sand and 20% granule/pebbles was classified as granule/pebbles (Stokesbury 2002) (present Fig. 4).

Mean densities and standard errors of fishes and macroinvertebrates were calculated using equations for a 2-stage sampling design (Cochran 1977), whereby the mean of the total sample is

$$\bar{\bar{x}} = \sum_{i=1}^{n} \left(\frac{\bar{x}_i}{n}\right) \qquad (1)$$

where n = primary sample units (stations), $\bar{x}_i$ = sample mean per element (quadrat) in primary unit i (stations) and $\bar{\bar{x}}$ = the mean over the 2 stages.

The standard error of this mean is

$$\mathrm{SE}(\bar{\bar{x}}) = \sqrt{\frac{1}{n}(s^2)} \qquad (2)$$

where $s^2 = \sum^{n}(\bar{x}_i - \bar{\bar{x}})^2/(n-1)$ variance among primary unit (stations) means.

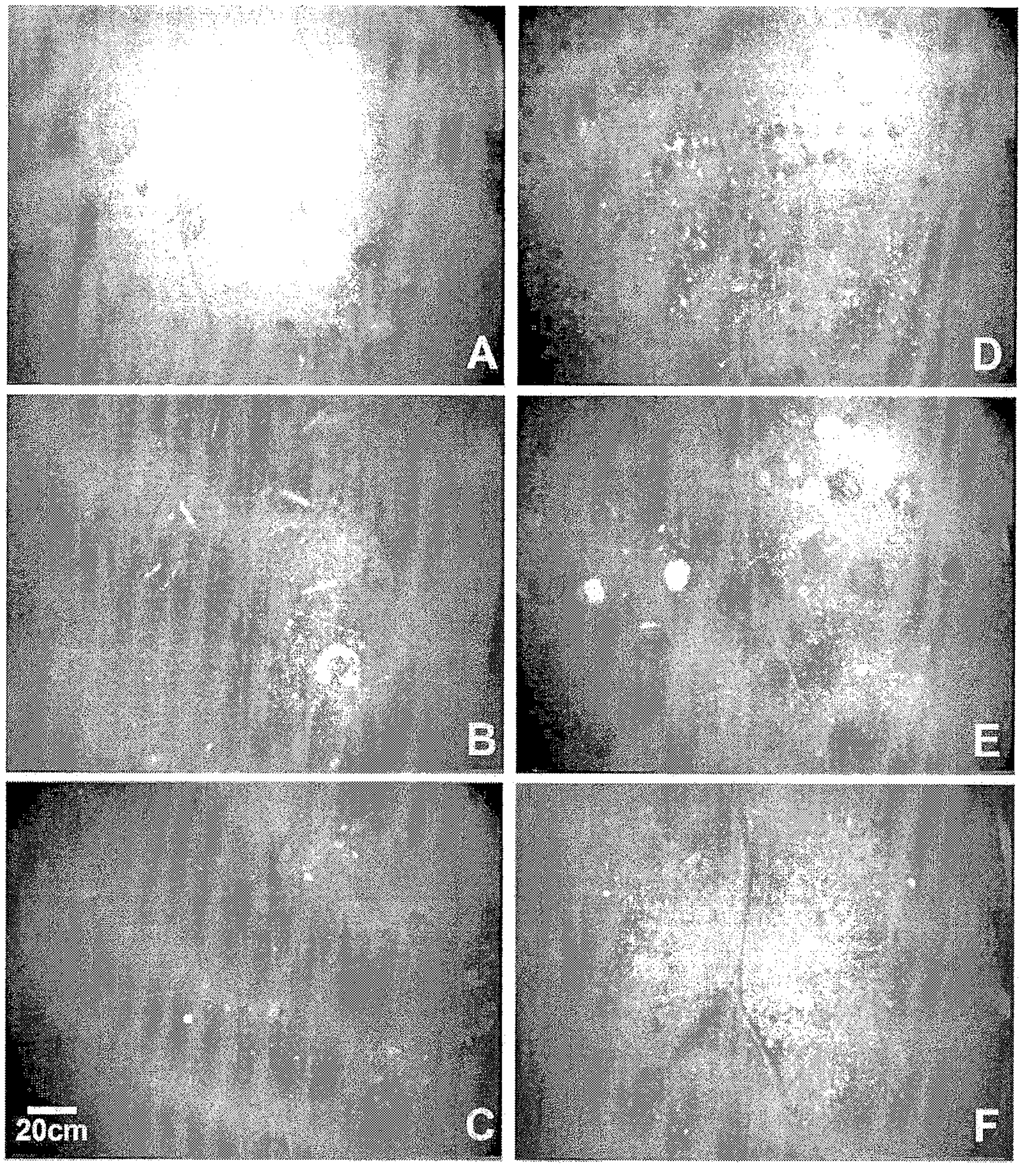

Fig. 4. Video 2.8 m^2 quadrat samples for BACI study. (A) Sand/shell debris, granule/pebble, cobble and boulder substrate with sponges (probably *Polymatia robusta*) and a longhorn sculpin *Myoxocephalus octodecemspinosus*. (B) Sand/shell debris and granule/pebble substrate with sea scallops *Placopecten magellanicus*, little skate *Raja erinacea*, summer flounder *Paralichthys dentatus*, and Atlantic cod *Gadus morhua*. (C) Sand/shell debris, granule/pebble and boulder substrate with attached bryozoans/hydrozoans. (D) Sand/shell debris substrate, with sand dollars *Echinarachnius parma*. (E) Sand/shell debris and granule/pebble substrate with sea scallops *P. magellanicus* and bryozoans/hydrozoans. (F) Sand/shell debris and granule/pebble substrate, with sea scallops *P. magellanicus*, bryozoans/hydrozoans and haddock *Melanogrammus aeglefinus*

As the sampling fractions were small (hundreds of scallops sampled compared to millions of scallops in the area) the finite population corrections were omitted, simplifying the estimation of the standard error (Cochran 1977). The 95% confidence intervals were calculated using $\bar{\bar{x}} \pm t_{\alpha}\mathrm{SE}(\bar{\bar{x}})$ (Cochran 1977).

The percent similarity index quantified the differences between benthic communities by comparing the number of taxonomic category present and their relative proportions between areas before and after fishing (Krebs 1989). Each category was standardized as a percentage of the total categories observed. The minimum value was selected for each category

Table 2. List of Georges Bank species grouped into taxonomic categories; these species have been identified from video recordings, collected from sea scallop tagging experiments, or provided by fishermen; specimens are preserved in authors' laboratory. Note. *Filograna implexa* is a tube worm but is grouped with bryozoans/hydrozoans as they all create branching plant-like structures on the sea floor. Common molluscan shells making up the substrate category 'shell debris' are also listed

Category	Scientific name	Common name
Scallop	*Placopecten magellanicus* (Gmelin, 1791)	Sea scallop
Starfishes	*Solaster endeca* (Linnaeus, 1771)	Purple sunstar
	Crossaster papposus (Linnaeus, 1767)	Spiny sunstar
	Leptasterias polaris (Müller & Troschel, 1842)	Polar sea star
	Asterias spp.	Sea stars
	Henricia spp.	Blood star
Sand dollars	*Echinarachnius parma* (Lamarck, 1816)	Sand dollar
Bryozoans/hydrozoans	*Flustra foliacea* (Linnaeus, 1758)	Bryozoans
	Callopora aurita (Hincks, 1877)	Bryozoans
	Electra monostachys (Busk, 1854)	Bryozoans
	Cribrilina punctata (Hassall, 1841)	Bryozoans
	Eucratea loricata (Linnaeus, 1758)	Bryozoans
	Tricellaria ternata (Ellis & Solander, 1786)	Bryozoans
	Eudendrium capillare Alder, 1856	Hydrozoans
	Sertularia cupressina Linnaeus, 1758	Sea cypress hydroid
	Sertularia argentea (Linnaeus, 1758)	Squirrel's tail hydroid
	Diphasia fallax (Johnston, 1847)	Hydrozoans
	Filograna implexa Berkeley, 1828	Lacy tube worm
Sponges	*Suberites ficus* (Johnston, 1842)	Fig sponge
	Haliclona oculata (Pallas, 1759)	Finger sponge
	Halichondria panicea (Pallas, 1766)	Crumb of bread sponge
	Cliona celata Grant, 1826	Boring sponge
	Polymastia robusta (Bowerbank, 1860)	Encrusting sponge
	Isodictya palmata (Lamarck, 1814)	Palmate sponge
	Microciona prolifera (Ellis & Solander, 1786)	Red beard sponge
Crabs	*Homarus americanus* H. Milne Edwards, 1837	American lobster
	Cancer irroratus Say, 1817	Atlantic rock crab
	Cancer borealis Stimpson, 1859	Jonah crab
Hermit crabs	Diogenidae	Left-handed hermit crabs
	Paguridae	Right-handed hermit crabs
	Parapaguridae	Deep water hermit crabs
Eel pout	*Zoarces americanus* (Bloch & Schneider, 1801)	Ocean pout
Flounder	*Paralichthys dentatus* (Linnaeus, 1766)	Summer flounder
	Paralichthys oblongus (Mitchill, 1815)	Fourspot flounder
	Scophthalmus aquosus (Mitchill, 1815)	Windowpane
	Pseudopleuronectes americanus (Walbaum, 1792)	Winter founder
	Limanda ferruginea (Storer, 1839)	Yellowtail flounder
	Glyptocephalus cynoglossus (Linnaeus, 1758)	Witch flounder
	Trinectes maculatus (Bloch & Schneider, 1801)	Hogchoaker
Haddock	*Melanogrammus aeglefinus* (Linnaeus, 1758)	Haddock
Hake	*Merluccius bilinearis* (Mitchill, 1814)	Silver hake
	Urophycis spp.	Red and white hake
Sculpins	*Myoxocephalus octodecemspinosus* (Mitchill, 1814)	Longhorn sculpin
	Prionotus carolinus (Linnaeus, 1771)	Northern sea robin
Skates	*Leucoraja erinacea* (Mitchill, 1825)	Little skate
	Leucoraja ocellata (Mitchill, 1815)	Winter skate
	Dipturus laevis (Mitchill, 1818)	Barndoor skate
Other fish	*Myxine glutinosa* Linnaeus, 1758	Atlantic hagfish
	Scyliorhinus retifer (Garman, 1881)	Chain dogfish
	Squalus acanthias Linnaeus, 1758	Spiny dogfish
	Anguilla rostrata (Lesueur, 1817)	American eel
	Conger oceanicus (Mitchill, 1818)	Conger eel
	Clupea harengus Linnaeus, 1758	Atlantic herring
	Brosme brosme (Ascanius, 1772)	Cusk
	Gadus morhua Linnaeus, 1758	Atlantic cod
	Lophius americanus Valenciennes, 1837	Goosefish
	Ammodytes dubius Reinhardt, 1837	Northern sand lance
	Scomber scombrus Linnaeus, 1758	Atlantic mackerel
	Sebastes fasciatus Storer, 1854	Acadian redfish
	Anarhichas lupus Linnaeus, 1758	Atlantic wolffish
Shell debris	*Buccinum undatum* Linnaeus, 1758	Waved whelk
	Euspira heros (Say, 1822)	Northern moonsnail
	Mercenaria mercenaria (Linnaeus, 1758)	Northern quahog
	Modiolus modiolus (Linnaeus, 1758)	Northern horse mussel
	Ensis directus Conrad, 1843	Atlantic jackknife
	Placopecten magellanicus (Gmelin, 1791)	Sea scallops

from the 2 samples and the values were summed so that 100% indicated identical samples. This quantitative similarity coefficient of community structure is robust to sample size and species diversity (Krebs 1989).

The counts of fishes and macroinvertebrates in each area were tested for normality and homogeneity of variance; as most of the data sets failed these tests, a log $(x + 1)$ transformation was applied before further analysis (Green 1979, Zar 1996). The optimal BACI design uses a 2-way analysis of variance (2-way ANOVA) where the interaction between site and time is used to statistically detect an impact. However, the 2-way ANOVA is only reliable if densities in the control and impact areas are equal. This is rarely the case in marine field studies, and the statistics involved to deal with inequality are complex and controversial (for example see Black & Miller [1991, 1994] and Rangeley [1994]). Several researchers have suggested using only graphs and tables to indicate environmental impacts, while others recommend statistical tests which are usually limited to Student's t-tests and 1-way ANOVAs (Green 1979, Stewart-Oaten et al. 1986, Underwood 1994). Although densities and substrates in our experimental areas were similar they were not equal, and this hampered the use of 2-way ANOVAs. Therefore, we graphed the observed densities to see if there were shifts that suggested impacts from fishing. We used 1-way ANOVAs to test the significance of shifts in mean individuals m^{-2} within each taxonomic category between surveys for each area. Shifts in sediment composition were compared using chi-squared tests.

Table 3. Percent similarity index for epibenthic community observed in Expt I on Georges Bank. Lines indicate survey years used to calculate the % similarity index

Categories	Control area		Impact area			
	Before	After	Before		After	
	1999	2001	1999	2000	2000	2001
Scallop	77.50	92.48	47.87	63.48	62.01	58.16
Starfishes	12.84	1.89	39.83	20.70	25.39	29.72
Sponges	5.44	1.72	3.62	1.05	1.38	1.69
Skates	1.06	0.86	2.31	5.09	3.01	2.19
Bryozoans/ hydrozoans	0.00	0.23	2.11	0.28	3.64	3.68
Sand dollars	0.81	0.57	1.66	2.09	2.32	1.16
Hake	0.24	0.00	1.05	1.32	0.25	0.95
Flounder	0.16	0.23	0.70	0.63	0.50	0.29
Sculpins	1.54	0.92	0.50	0.63	0.31	0.08
Other fish	0.00	0.11	0.20	2.86	0.19	1.12
Crabs	0.32	0.06	0.15	0.07	0.13	0.50
Haddock	0.00	0.17	0.00	1.46	0.25	0.08
Eel pout	0.08	0.11	0.00	0.35	0.31	0.25
Hermit crabs	0.00	0.63	0.00	0.00	0.31	0.12
% similarity			76.6			
				91.4		
					93.2	
% similarity	83.8		86.4			

power 0.050:0.995). Granule/pebble substrate increased from 55.2 to 67.5%, cobble decreased from 22.2 to 11.3%, and sand/shell debris and boulders remained the same (Fig. 7). The sediment composition percent similarity index was 87.4%.

RESULTS

Expt I

Before vs. after: control area
(September 1999 vs. July 2001)

We observed 10 categories of fishes and macroinvertebrates in the control area in 1999, and 13 in 2001 (Table 3). The sea scallop and starfishes comprised 90.3 and 94.4% of all individuals in 1999 and 2001, respectively. Mean densities of the sea scallop significantly increased from 0.59 to 0.99 individuals m^2, while those of starfishes decreased from 0.10 to 0.02 individuals m^2 (Figs. 5 & 6, Table 4). Bryozoans/hydrozoans, hermit crabs and sponges increased in density (Fig. 5 & 6, Table 4). The similarity index for all categories was 83.8% (Table 3).

The sediment composition differed significantly between 1999 and 2001 (χ^2 = 24.3, df = 3, p = <0.001, power 0.050:0.995). Granule/pebble substrate increased from 55.2 to 67.5%, cobble decreased from 22.2 to 11.3%, and sand/shell debris and boulders remained the same (Fig. 7). The sediment composition percent similarity index was 87.4%.

Before vs. after: impact area
(July 1999 vs. July 2001)

Approximately 8.5% of the sea scallops in the impact area were harvested between 15 August and 14 October 2000 (Table 1). In 1999, 11 categories of fishes and macroinvertebrates were observed in the impact area while 14 were observed in 2001 (Table 3). Sea scallops and starfishes represented 87.7 and 87.9% of all individuals in 1999 and 2001, respectively. Mean sea scallop density significantly increased from 0.42 to 0.63 individuals m^{-2} (Figs. 5 & 6, Table 4). Density of bryozoans/hydrozoans and other fishes significantly increased, while that of sculpins and sponges decreased (Figs. 5 & 6, Table 3). The similarity index for all categories was 86.4% (Table 3).

The sediment composition differed significantly (χ^2 = 100.9, df = 3, p = <0.001, power 0.050:1.000). Sand/shell debris increased from 51.9 to 74.4%, granule/pebble substrate decreased from 36.9 to 20.4%, cobble decreased from 8.1 to 1.0%, and boulders remained the same (Fig. 7). The sediment composition percent similarity index was 76.4%.

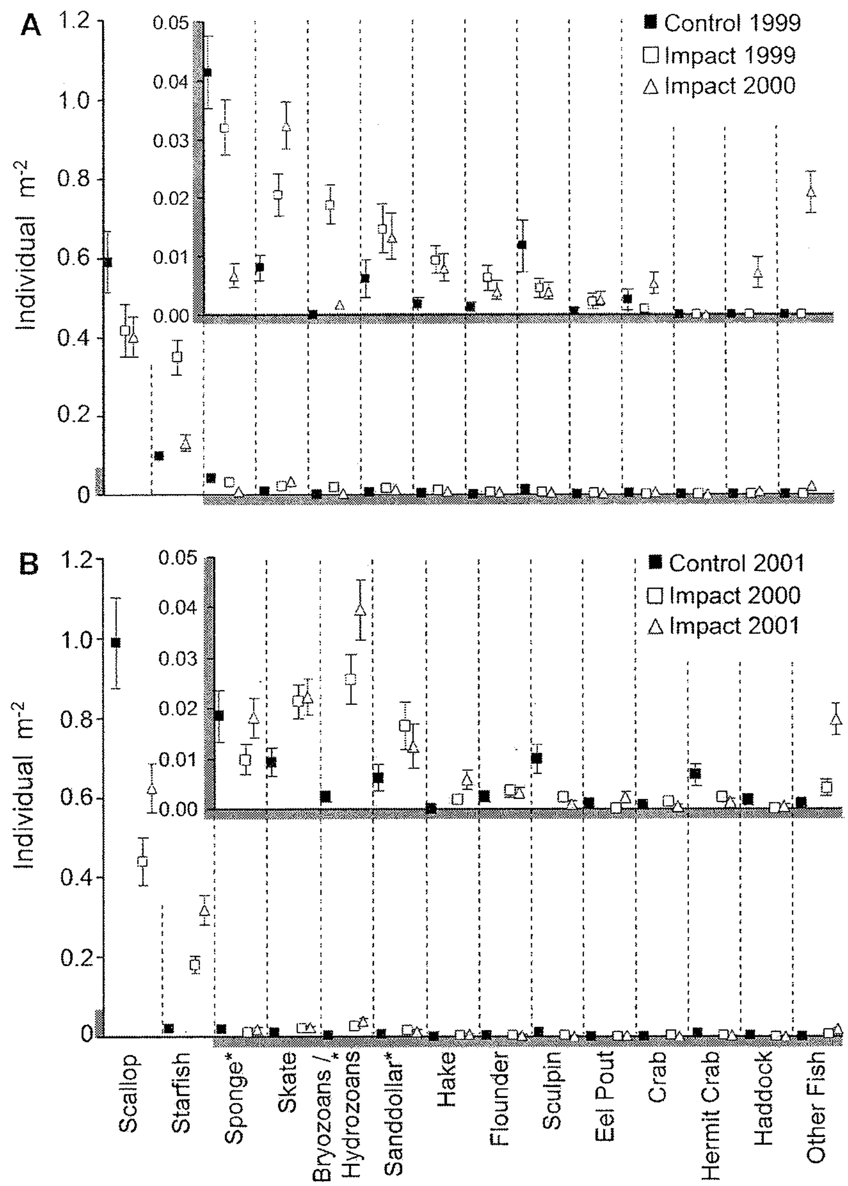

Fig. 5. Mean (±SE) individuals m^{-2} for taxonomic categories observed (A) before and (B) after sea scallop exemption fishery in Expt I on Georges Bank. Thicker portions of axes indicate portions of axes that have been enlarged in insets. *Significant difference at 0.05

Temporal variations

Because of prohibitively bad weather in late autumn 2000, we were unable to sample the control area; therefore we had to use the 2001 survey to fulfill the BACI design. Short-term fishing impacts may not have been detected. However, we were able to survey the impact area just prior to and just after the fishery, providing information on the short term shifts in faunal densities and sediment composition (Table 1).

Before vs. before: impact area (July 1999 vs. August 2000)

The number of fishes and macroinvertebrate categories increased from 11 to 13 from the 1999 to the 2000 surveys (Table 3), with the sea scallop and starfishes comprising 87.7 and 84.2% of all individuals, respectively. Numbers of starfishes, bryozoans/hydrozoans and sponges significantly decreased, while those of skates, haddock, 'other fish' and crabs signifi-

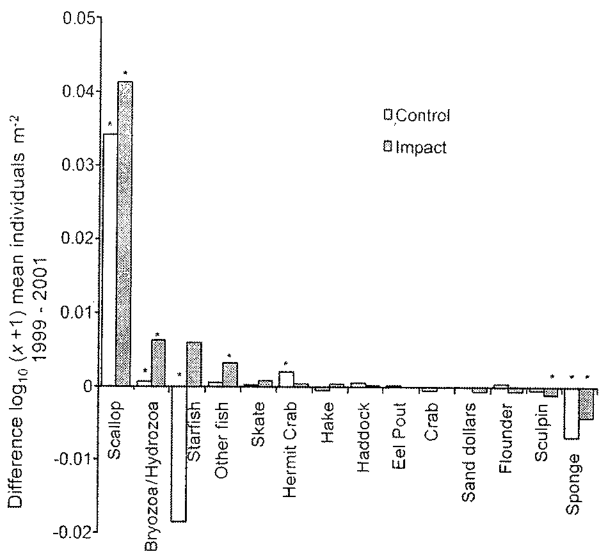

Fig. 6. Difference in mean densities for taxonomic categories observed in Expt I control (CAII) and in impact (NLCA) areas before (1999) and after (2001) the limited fishing event; data are log(x+1)-transformed. * Significant difference at p = 0.05

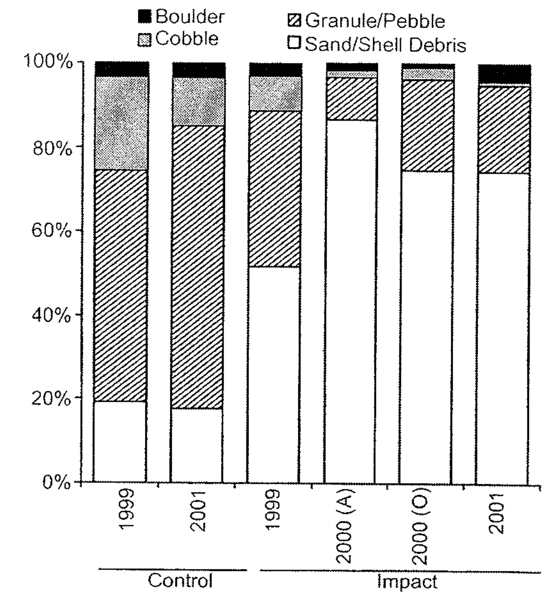

Fig. 7. Sediment composition in control and impact areas in Expt I observed from 1999 to 2001. Sand = 0.0625 to 2.0 mm, granule/pebble = 2.0 to 64.0 mm, cobble = 64.0 to 256.0 mm and boulders > 256.0 mm particle diameter. A: August; O: October

Table 4. Comparison of mean number of individuals m^{-2} within each taxonomic category in Expts I and II before (1999) and after (2001) fishery, using 1-way ANOVA; data are log(x+1)-transformed; all taxonomic categories were tested but only significant results are presented here. Power is beta, with alpha set at 0.05

Categories		df	SS	MS	F	p	Power
Expt I							
Control area (Sep 1999 vs. Jul 2001)							
Sea scallop	Between groups	1	0.074	0.074	6.637	0.011	0.659
	Residual		249	2.763	0.011		
Bryozoans/hydrozoans	Between groups	1	0.000	0.000	4.066	0.450	0.399
	Residual		249	0.002	0.000		
Starfishes	Between groups	1	0.021	0.021	34.180	<0.001	1.000
	Residual		249	0.156	0.001		
Hermit crabs	Between groups	1	0.000	0.000	9.891	0.002	0.862
	Residual		249	0.007	0.000		
Sponges	Between groups	1	0.003	0.003	8.256	0.004	0.778
	Residual		249	0.091	0.000		
Impact area (Jul 1999 vs. Jul 2001)							
Sea scallop	Between groups	1	0.149	0.149	21.162	<0.001	0.998
	Residual		346	2.430	0.007		
Bryozoans/hydrozoans	Between groups	1	0.003	0.003	9.577	0.002	0.849
	Residual		346	0.124	0.000		
Other fishes	Between groups	1	0.001	0.001	15.549	<0.001	0.980
	Residual		346	0.019	0.000		
Sculpins	Between groups	1	0.000	0.000	4.748	0.030	0.476
	Residual		346	0.007	0.000		
Sponges	Between groups	1	0.001	0.001	5.095	0.025	0.514
	Residual		346	0.101	0.000		
Expt II							
Impact area (Aug 2000 vs. Jun 2001)							
Sea scallop	Between groups	1	0.016	0.016	3.502	0.063	0.333
	Residual		219	0.982	0.005		
Bryozoans/hydrozoans	Between groups	1	0.000	0.000	6.115	0.014	0.613
	Residual		219	0.020	0.000		

cantly increased (Figs. 5 & 8, Table 5). The similarity index for all categories was 76.6%, the lowest value measured for any of the areas surveyed (Table 3).

The sediment composition differed significantly (χ^2 = 200.8, df = 3, p = <0.001, power 0.050:1.000). Sand/shell debris increased from 51.9 to 86.6%, while granule/pebble substrate decreased from 36.9 to 10.2% and cobble from 8.1 to 1.6% (Fig. 7). The sediment composition percent similarity index was 65.3%, the lowest value observed for any area.

Before vs. after: impact area (August 2000 vs. October 2000)

This area was surveyed immediately before and after the limited short-term fishery in August and October 2000 (Table 1). The number of categories increased from 13 to 14 (Table 3). The sea scallop and starfishes comprised 84.2 and 87.4% of all individuals in August and October, respectively. Mean density of the sea scallop were similar, 0.40 to 0.44 individuals m^{-2}

Table 5. Comparison of mean number of individuals m^{-2} indicating temporal variations within epibenthic communities of Expts I and II; data are log(x+1)-transformed. The 1-way ANOVAs were preformed on surveys chronologically; all taxonomic categories were tested but only significant results are presented here. Power is beta, with alpha set at 0.05

Categories		df	SS	MS	F	p	Power
Expt I							
Before vs. before: impact area (Jul 1999 vs. Aug 2000)							
Starfishes	Between groups	1	0.065	0.065	19.838	<0.001	0.996
	Residual		346	1.129	0.003		
Bryozoans/hydrozoans	Between groups	1	0.002	0.002	26.725	<0.001	1.000
	Residual		346	0.029	0.000		
Other fish	Between groups	1	0.002	0.002	26.402	<0.001	1.000
	Residual		346	0.027	0.000		
Sponges	Between groups	1	0.005	0.005	25.311	<0.001	1.000
	Residual		346	0.069	0.000		
Skates	Between groups	1	0.001	0.001	5.179	0.023	0.522
	Residual		346	0.071	0.000		
Crabs	Between groups	1	0.000	0.000	5.751	0.017	0.580
	Residual		346	0.009	0.000		
Haddock	Between groups	1	0.001	0.001	11.830	<0.001	0.926
	Residual		346	0.016	0.000		
Before vs. after: impact area (Aug 2000 vs. Oct 2000)							
Starfishes	Between groups	1	0.010	0.010	4.336	0.038	0.431
	Residual		346	0.822	0.002		
Bryozoans/hydrozoans	Between groups	1	0.005	0.005	24.060	<0.001	0.999
	Residual		346	0.065	0.000		
Other fish	Between groups	1	0.002	0.002	27.819	<0.001	1.000
	Residual		346	0.027	0.000		
Skates	Between groups	1	0.001	0.001	5.130	0.024	0.517
	Residual		346	0.066	0.000		
Hake	Between groups	1	0.000	0.000	7.674	0.006	0.740
	Residual		346	0.016	0.000		
Haddock	Between groups	1	0.000	0.000	6.491	0.011	0.648
	Residual		346	0.018	0.000		
Eel pout	Between groups	1	0.000	0.000	6.126	0.014	0.615
	Residual		346	0.003	0.000		
Crabs	Between groups	1	0.000	0.000	4.340	0.038	0.431
	Residual		346	0.009	0.000		
Hermit crabs	Between groups	1	0.000	0.000	3.877	0.050	0.378
	Residual		346	0.003	0.000		
After vs. after: impact area (Oct 2000 vs. Jul 2001)							
Scallop	Between groups	1	0.105	0.105	14.723	<0.001	0.943
	Residual		346	2.463	0.007		
Starfishes	Between groups	1	0.043	0.043	11.911	<0.001	0.928
	Residual		346	1.260	0.004		
Other fish	Between groups	1	0.001	0.001	16.797	<0.001	0.988
	Residual		346	0.019	0.000		
Hake	Between groups	1	0.001	0.001	9.957	0.002	0.865
	Residual		346	0.019	0.000		
Expt II							
Before vs. before: control area (Jul 1999 vs Aug 2000)							
Starfishes	Between groups	1	0.020	0.020	10.034	0.002	0.862
	Residual		90	0.176	0.002		
Bryozoans/hydrozoans	Between groups	1	0.001	0.001	4.614	0.034	0.456
	Residual		90	0.017	0.000		
Hake	Between groups	1	0.001	0.001	8.291	0.005	0.773
	Residual		90	0.014	0.000		
Before vs. before: impact area (Jul 1999 vs. Aug 2000)							
Other fish	Between groups	1	0.000	0.000	7.350	0.007	0.715
	Residual		199	0.010	0.000		
Hake	Between groups	1	0.002	0.002	16.881	<0.001	0.988
	Residual		199	0.026	0.000		

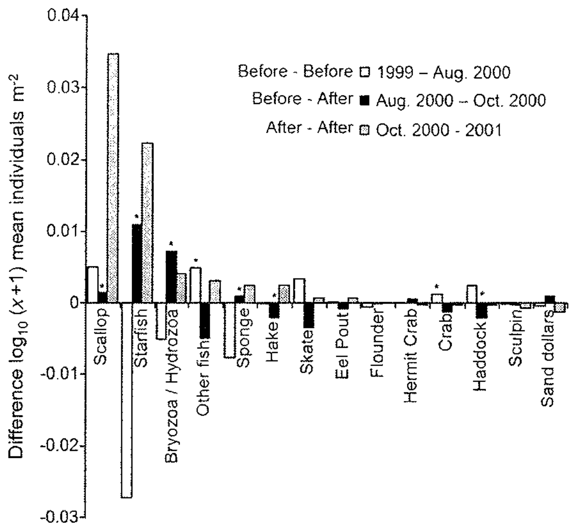

Fig. 8. Difference in mean densities for taxonomic categories observed in Expt I impact area (NLCA) from 1999 to 2000 (undisturbed), August 2000 to October 2000 (the fishing event occurred between these 2 surveys) and October 2000 and 2001 (undisturbed); data are $\log(x+1)$-transformed. *Significant difference at p = 0.05

(Figs. 5 & 8, Table 5). Density of starfishes, bryozoans/hydrozoans and hermit crabs significantly increased, while that of skates, hake, haddock, eel pout, 'other fish' and crabs decreased (Figs. 5 & 8, Table 5). The similarity index for all categories was high at 91.4% (Table 3).

The sediment composition differed significantly (χ^2 = 37.7, df = 3, p = <0.001, power 0.050:1.000). Sand/shell debris dominated the substrate but decreased from 86.6 to 74.6%, while the granule/pebble substrate doubled from 10.2 to 21.6% (Fig. 7). Cobble also doubled from 1.6 to 2.7%. The sediment composition percent similarity index was 87.4%.

After vs. after: impact area (October 2000 vs. July 2001)

In both October 2000 and 2001, 14 fish and macroinvertebrate categories were observed (Table 2). The sea scallop and starfishes comprised 87.4 and 87.9% of all individuals. Mean density of sea scallops increased from 0.44 to 0.63 individuals m^{-2} (Figs. 5 & 8, Table 5). Starfishes, hake and 'other fish' also significantly increased (Figs. 5 & 8, Table 5). The similarity index for all categories was the highest observed at 93.2% (Table 3).

The sediment composition differed significantly (χ^2 = 17.7, df = 3, p = <0.001, power 0.050:1.000). However, sand/shell debris and granule/pebble cover were similar between years (Fig. 7). Cobble decreased to 1.0% and boulder substrate increased to 4.2%. The sediment composition percent similarity index between years was very high at 97.0%.

Expt II

Before vs. after: control area (August 2000 and June 2001)

In the control area, 7 fish and macroinvertebrate categories were observed in both 2000 and 2001 (Table 6). The sea scallop and starfishes comprised 93.0 and 93.1% of all individuals in 2000 and 2001, respectively. The mean densities for each category were similar between 2000 and 2001 (Figs. 9 & 10, Table 4). The similarity index for all categories was very high at 96.9% (Table 6).

The sediment composition differed significantly (χ^2 = 16.5, df = 2, p = <0.001, power 0.050:0.972). Granule/pebble substrate doubled from 25.0 to 49.5%, cobble decreased from 10.9 to 1.6% and sand/shell debris decreased from 61.5 to 47.8% (Fig. 11). The sediment composition percent similarity index was 75.5%.

Before vs. after: impact area (2000 and 2001)

In the impact area, 8 fish and macroinvertebrate categories were observed in 2000 and 2001 (Table 6). The sea scallop and starfishes comprised 90.0 and 86.0% of all individuals in 2000 and 2001, respectively. Most of the 56 million sea scallops harvested during the fishery from 15 October 2000 to 27 February 2001 came from the impact study area and sea scallop densities declined from 0.35 to 0.22 individuals m^{-2}, although the

Table 6. Percent similarity index for epibenthic community observed in Expt II on Georges Bank. Lines indicate survey years used to calculate % similarity index

Categories	Control			Impact		
	Before		After	Before		After
	1999	2000	2001	1999	2000	2001
Scallop	76.64	71.84	73.93	55.65	67.81	59.46
Starfish	9.63	21.20	19.21	29.17	22.19	26.58
Skate	5.74	3.16	2.23	4.97	3.70	3.63
Hake	4.30	0.63	0.51	5.51	1.23	1.91
Sand dollars	1.84	0.79	1.72	2.55	3.15	3.63
Sponge	1.64	0.32	0.17	0.81	1.10	0.38
Bryozoans/ hydrozoans	0.20	2.06	2.23	0.67	0.41	3.44
Flounder	0.00	0.00	0.00	0.67	0.41	0.96
% similarity	86.5			86.8		
			96.9			90.9

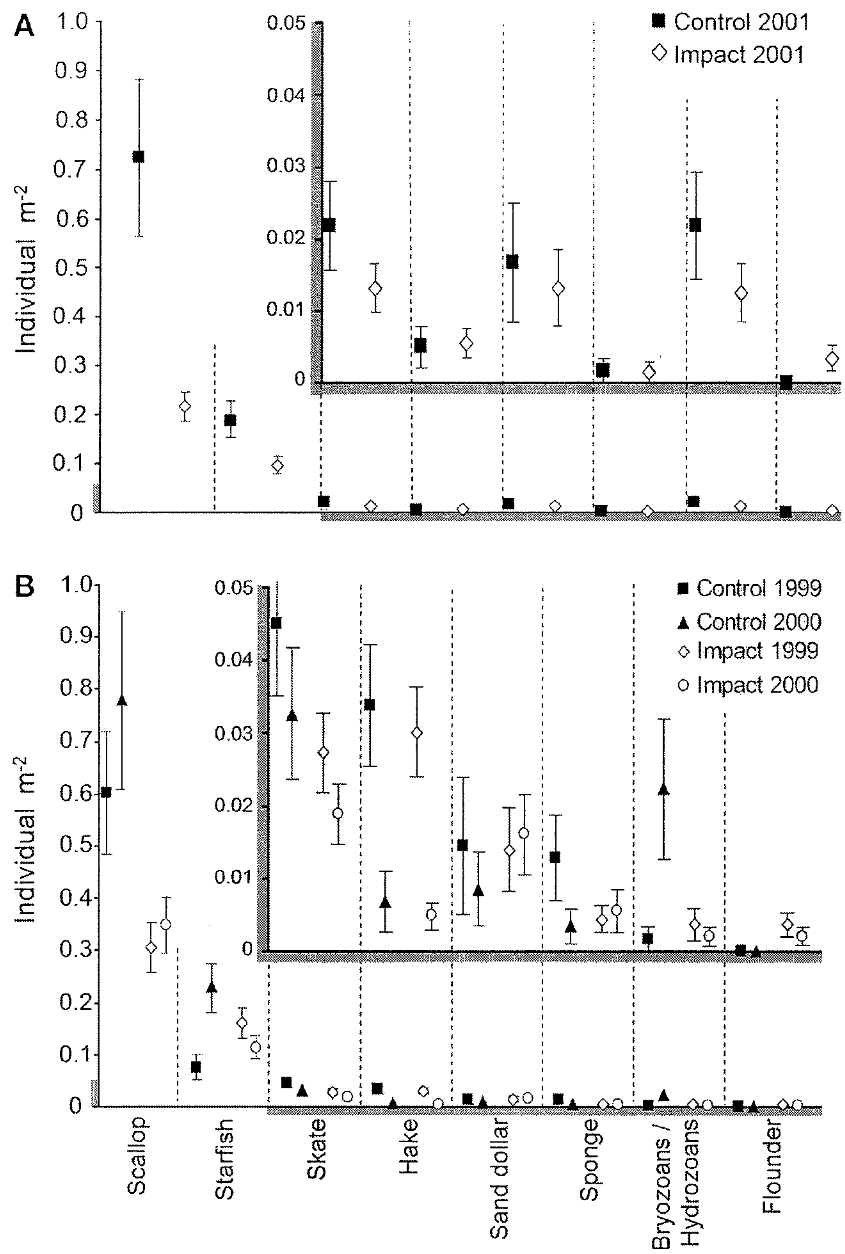

Fig. 9. Means (±SE) individuals m^{-2} for taxonomic categories observed (A) before and (B) after sea scallop exemption fishery in Expt II on Georges Bank. Thicker portions of axes indicate portions that have been enlarged in insets

difference in densities was not quite significant, since p = 0.06 rather than 0.05 (Table 4). Byrozoans/hydrozoans significantly increased and all other categories remained the same (Figs. 9 & 10, Table 4). The similarity index for all categories was very high at 90.9% (Table 6).

The sediment composition was similar between the 2 surveys ($\chi^2 = 2.30$, df = 2, p = 0.316, power 0.050:0.243). Sand/shell debris dominated at 88.6 and 79.3% for 2000 and 2001, respectively. The sediment composition percent similarity index was 87.5% (Fig. 11).

Temporal variations

The same stations in both areas were observed in 1999, enabling us to compare temporal shifts in taxonomic categories and sediments with no fishing disturbance.

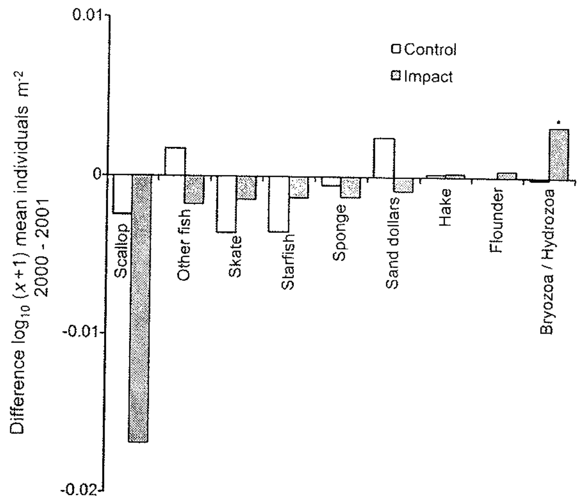

Fig. 10. Difference in mean densities for taxonomic categories observed in Expt II, control (CAIS) and impact (CAIN) areas, before and after limited fishing event; data are $\log(x+1)$-transformed; * Significant difference at $p = 0.05$

Before vs. before: control area
(July 1999 vs. August 2000)

In the control area, 7 fish and macroinvertebrate categories were observed in 1999 and 2000 (Table 6). The sea scallop and starfishes comprised 86.3 and 93.0% of all individuals. Density of bryozoans/hydrozoans and starfishes significantly increased, while that of hake significantly decreased (Figs. 9 & 12, Table 5). The other categories remained similar (Figs. 9 & 12, Table 5). The similarity index for all categories was 86.5% (Table 6).

The sediment composition differed significantly ($\chi^2 = 11.7$, df = 2, p = 0.003, power 0.050:0.886). Granule/pebble substrate decreased from 40.6 to 25.0%, while sand/shell debris increased from 45.0 to 61.5% (Fig. 11). The sediment composition percent similarity index was 80.9%.

Before vs. before: impact area
(July 1999 vs. August 2000)

In the impact area, 8 fish and macroinvertebrate categories were observed in both 1999 and 2000 (Table 6). 'Other fish' significantly increased in numbers, while hake significantly decreased and all other categories remained the same (Figs. 9 & 12, Table 5). The similarity index for all categories was very high at 86.8%.

The sediment composition differed significantly ($\chi^2 = 20.5$, df = 2, p = <0.001, power 0.050:0.993). Sand/shell debris was the dominant substrate at 82.5 and 88.6%, while granule/pebble decreased from 15.7 to 6.9% for 1999 and 2001, respectively (Fig. 11). The sediment composition percent similarity index was 91.2%.

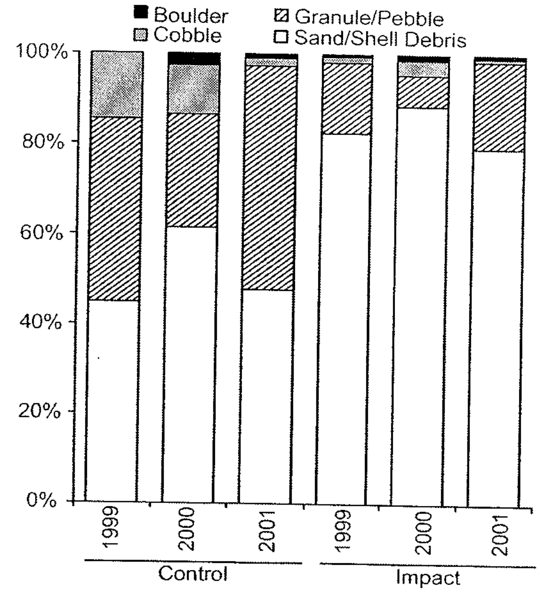

Fig. 11. Sediment composition in control and impact areas in Expt II observed from 1999 to 2001. Sand = 0.0625 to 2.0 mm, granule/pebble = 2.0 to 64.0 mm, cobble = 64.0 to 256.0 mm and boulders > 256.0 mm particle diameter

DISCUSSION

Changes in the number of fish and macroinvertebrate categories and the density of individuals within each category in the areas impacted by the limited short-term sea scallop fishery were similar to changes in the control areas that remained closed to fishing. Further, sediment composition shifted between surveys more than epibenthic faunal composition.

In the control and impact areas of Expt I the number of taxonomic categories increased from before to after the limited fishery. The sea scallop and starfishes comprised over 87% of all fish and macroinvertebrate categories. The numbers of individuals within many of the categories did not change significantly. Sea scallops and bryozoans/hydrozoans increased in both areas. Only sponges increased in the control area and decreased in the impact area. The similarity index suggested that shifts in the numbers of categories and the density of each category were similar. However, the sediment composition in both the control and impact areas shifted significantly. The largest shift in both sediment composition and taxonomic category occurred in the impact area between 1999 and 2000 before the limited fishery.

In the control and impact areas of Expt II the number of taxonomic categories remained the same before and after the limited fishery. The numbers of individuals within categories were similar, except for bryozoans/hydrozoans, which increased significantly in the

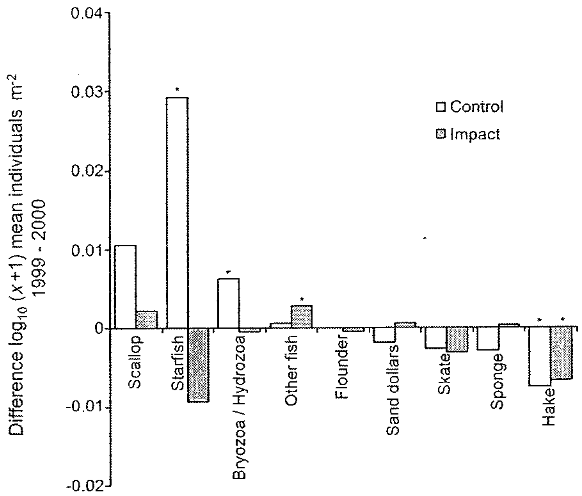

Fig. 12. Difference in mean densities for taxonomic categories observed in Expt II, control (CAIS) and impact (CAIN) areas, from 1999 to 2000 (undisturbed); data are $\log(x+1)$-transformed; *Significant difference at $p = 0.05$

impact area. The similarity index for all categories suggested a greater variation in the impact area than in the control area, but both indices indicated a high degree of similarity before and after the limited fishery. The sediment composition shifted significantly in the control area but not in the impact area.

As the sediment composition varied more than the benthic community structure, it appears that the epibenthic community associated with sea scallop aggregations is adapted to living in a dynamic environment. Sea scallops are strongly associated with sand/granule/pebble substrate, which in turn is associated with areas of high tidal energy (Thouzeau et al. 1991, Stokesbury 2002). Tidally induced bottom currents and storm events can be strong in all our study locations, reaching speeds above 30 cm s^{-1} (Brown & Moody 1987, Butman 1987a,b, Butman & Beardsley 1987). Animals such as sea scallops have adapted to this unstable environment, for example, juveniles can attach to pebbles or larger particles using byssal threads, allowing them to remain stationary. The adult sea scallop's ability to swim, form depressions in sand/granule/pebble substrates and orient itself to avoid sediments entering the pallial gap reduces the effects of these currents, allowing it to persist in dynamic areas (Baird 1954, Caddy 1968, Dadswell & Weihs 1990, Cheng & Demont 1996, Stokesbury & Himmelman 1996, Stokesbury 2002, Stokesbury et al. 2004). Further, the sea scallop shell appears to be the most stable surface in sand/granule/pebble sediments and provides a structure to which sessile epifauna attach; for example, 49 species were identified on scallop shells in the Bay of Fundy (Kenchington 2000).

Sediment communities are continually exposed to natural disturbance at various scales (Hall 1994, Jennings & Kaiser 1998). Veale et al. (2000) found that natural disturbances in sediment communities were sufficient to maintain low fishing-effort areas at an intermediate level of total disturbance, so that species diversity decreased only with increasing fishing effort. Sand habitats on Georges Bank exposed to natural disturbances may recover from fishing gear impact in a relatively short period of time: less than 1 yr (Lindholm et al. 2004).

The first controlled experiments (BACI) to assess the impact of scallop dredging on a commercial spatial scale were performed in Australia using a 'Peninsula' dredge (fitted with scraper and cutter bars that did not extend below the level of the skids) (Currie & Parry 1996, 1999). In the 1996 study, a 20 to 30% decrease in the abundance of most species was detected after fishing, but the impact was undetectable 6 mo later after recruitment for most species. In the 1999 study conducted on soft substrates, changes in the benthic community were small and damage to bycatch species was slight.

Our findings differ from several studies that suggest that sea scallop harvesting severely impacted the sea floor. Some studies examined the environmental impacts of the New Bedford scallop dredge by comparing heavily fished areas to areas that were never fished (Collie et al. 1997, Collie & Escanero 2000). These studies may have compared different benthic communities, as the sea scallop is strongly associated with sand/granule/pebble substrates, and is the dominant macroinvertebrate in these substrates on Georges Bank but was rare at the control sites in the studies of Collie et al. (1997) and Collie & Escanero (2000), as indicated by the low fishing effort. Several studies examined the impact of the dredge on the sea floor immediately after the dredge had passed (Caddy 1968, 1971, 1973). However, it is very difficult to expand the effects of a single pass of a dredge to the entire fishery as the fishery is not spatially or temporally uniform and covers a range of environmental conditions.

Many fishing impact studies have used smaller sample sizes and examined disturbances on a smaller spatial scale than our study. Collie & Escanero (2000) used a total sample area of 17.3 m^2 (64, 0.27 m^2 still photographs) to survey 5 sites, comparing fished, unfished, shallow and deep habitats (250 km^2 total survey area) on Georges Bank. Lindholm et al. (2004) used a total sample area of 12.5 m^2 (32, 0.39 m^2 still photographs) to determine the abundance of common microhabitats inside and outside CA II on Georges Bank in 1999; the sea scallop was only rarely detected in the closed area with their sampling design, although it is the dominant macroinvertebrate (Stokesbury et al. 2004) in this area, suggesting their analyses focused on a fine scale. Our sample size and number (12.9 m^2 per station, 1379 stations, 17 789 m^2 total sample area, 1118 km^2 survey area) had a higher sampling frequency based on a target precision of 5 to 15%, and provided a high statistical power for the most abundant macroinvertebrates. However, the statistical power declined for the less common species, a problem in many marine environmental studies (Dayton et al. 1995, Jennings & Kaiser 1998).

Many studies examining the effects of scallop harvesting on the marine habitat have been conducted in Europe and Australia, where toothed dredges are used to collect the slightly buried scallops (Chapman et al. 1977, Kaiser et al. 1996, Jennings & Kaiser 1998, Hill et al. 1999, Hall-Spencer & Moore 2000, Veale et al. 2000, 2001, Jenkins et al. 2001, Bradshaw et al. 2002). The New Bedford offshore sea scallop dredge rides on 2 shoes and skims over the sea floor, flipping the sea scallops with the sweep chains into the chained bag, and may have less impact on the sea floor than a toothed dredge (Bourne 1964, Caddy 1989).

Previous studies have relied primarily on fishermen's log books to determine fishing effort and, in most cases, this was difficult to quantify (Collie et al. 1997, Collie & Escanero 2000, Veale et al. 2000). The requirement that scallop fishing vessels in the United States possess a 'Vessel Monitoring System' which transmits the vessel's geographic position every 30 min has provided highly accurate fishing effort data (Rago et al. 2000). These data allowed us to verify, with a level of confidence previously unattainable, that our control areas were undisturbed and that we had captured the impact of the fishery in our impact areas.

The epibenthic community of the closed areas of Georges Bank did not appear to be detrimentally effected by the limited sea scallop fishery in 2000. Shifts in taxonomic categories and individuals within categories within the areas where the fishery was executed were similar to those in the unfished control areas. Further, the sea floor sediment composition shifted more than the epibenthic community it supported. Therefore, our study suggests that a limited short-term sea scallop fishery alters the epibenthic community less than the natural dynamic environmental conditions of Georges Bank.

Acknowledgements. We thank B. J. Rothschild for his support and guidance. We thank the owners, captains, and crews who sailed with us on the FVs 'Alpha and Omega II', 'Edgartown', 'Friendship', 'Frontier', 'Huntress', 'Liberty', 'Mary Anne' and 'Tradition'. P. Christopher (NMFS) and L. Gavlin (USCG) provided the letters of authorization and insured smooth transitions between fishing and surveying for the vessels. P. Rago (NEFSC, NMFS) kindly allowed the use of the VMS data. M. Stokesbury, M. C. Marino II, J. I. Nogueira and 5 anonymous reviewers provided many helpful comments on the manuscript. Aid was provided by SMAST, the Massachusetts Division of Marine Fisheries, the National Marine Fisheries Service's sea scallop research set-aside program (NOAA awards: NA16FM1031, NA06FM1001, NA16FM2416, and NA04NMF4720332) and the sea scallop fishery and supporting industries. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any other agencies.

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Editorial responsibility: Otto Kinne (Editor-in-Chief), Oldendorf/Luhe, Germany

Submitted: August 2, 2004; Accepted: July 17, 2005
Proofs received from author(s): December 13, 2005

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April 4, 2008

VIA ELECTRONIC MAIL

Patricia A. Kurkul, Regional Administrator
National Marine Fisheries Service
One Blackburn Drive
Gloucester, MA 01930-2298
Scallop.Fifteen@noaa.gov

Re: Atlantic Sea Scallop Amendment 15 Scoping Comments

Dear Regional Administrator Kurkul:

We submit this letter on behalf of the Fisheries Survival Fund ("FSF"), representing the bulk of the full-time, Limited Access scallop fleet, in response to the invitation for comments on scoping on Scallop Amendment 15. We arrange these comments under the topic headings chosen by the Council in its scoping document.

1. Habitat Closures

- The Council should address the habitat closure in Closed Area I that limits the size of the access area there as soon as possible, whether such a step is taken in the EFH Omnibus Amendment or Scallop Amendment 15. The Council voted to harmonize the scallop and groundfish EFH closed areas about five years ago, and it was not the substance of the Council's analysis, but the process that was followed (not an amendment), that prevented the Council's recommendation from going into effect.
- Currently, the limiting factor – the reason why scallop open area DAS are being reduced by about one-third in 2009 – on the scallop fishery is habitat closures. A full twenty-one percent of the resource is located within Georges Bank habitat closures, including the part of Closed Area I at issue. This unnecessarily wastes

the scallop resource and prevents the fishery from achieving optimum yield, both now and over the long-term.

- Opening the very top portion of Closed Area II should also be considered. It has been designated as a potential scallop access area, and is not closed for habitat reasons.

2. Annual Catch Limits & Accountability Measures

- The scallop Limited Access fishery, the General Category ITQ fishery, and the incidental scallop fishery should be included in the ACL (or, more accurately, each should have their own sub-ACLs) under the scallop fishery management plan. The Northern Gulf of Maine area should have an ACL or TAC of some sort, but that area is outside the resource area for the scallop fishery principally managed by the Council. Accordingly as is the case (and as the Council recommended) in Amendment 11, NGOM landings should not count against the principal resource-wide TAC.
- The Council should not modify Amendment 11's allocation between the Limited Access and General Category IFQ fisheries. No basis exists to amend this recently-determined allocation.
- There should not be any additional precautionary buffers built in between the fishery's overall TAC and the annual catch limit. Indeed, there is already more than enough precaution in the scallop management. Currently, the target F rate is 0.20, which is considerably lower than the maximum allowable rate of 0.29, and even below Amendment 10's definition of optimum yield as 80% of MSY, or 0.23. In fact, the target F should be increased.
- The flexibility and precaution that is already built in to scallop management, such as a target F that is lower than it needs to be, should be considered its own form of accountability measure, if such a discrepancy between the target F rate and the overall TAC is allowed to persist.
- The Limited Access fishery should have its own sub-ACL and accountability measures that are separate from the General Category fishery.
- Further, the Scallop PDT, Scallop Committee, and Scallop FMP should develop and implement any accountability measures that deal with scallop catches of other species. Such measures should be consistent with scallop management to the extent at all possible.
- For instance, to the extent that the scallop fishery receives (as it does now) a yellowtail flounder allocation for some or all of its fishery, the Scallop FMP planning process should decide how the yellowtail allocation is distributed across the fishery and what makes sense, from a scallop yield perspective, if accountability for an overage is ever needed.

- Maintaining the scallop fishery accountability function in the scallop management process is more efficient from a management perspective. It would also allow the scallop fishery experts to design any needed accountability measures that have the least adverse consequences to scallop management goals.
- The scallop fishery should be provided a reasonable ACL for every fish stock for which it is determined that a bycatch ACL is required to prosecute the scallop fishery throughout its range and at a level of landings (for scallops) that are consistent with the Scallop FMP. In that regard, it is important to recognize the great strides the scallop fishery has made, and is continuing to make, to reduce bycatch.

3. "Capacity Reduction" in the Scallop Fishery

- FSF participants have a range of views, pro and con, on whether the scallop fishery requires capacity reduction measures at this time.
- If the Council does choose to act in this area, however, it should not do anything that undoes the underlying control and allocation mechanisms (open area DAS and access areas) in the limited access fishery.
- As we understand it, FSF's participants do not support consideration in Amendment 15 of a quota-based system, such as is being used for the General Category. Development of an ITQ alternative at this point would raise the possibility of the kinds of allocation issues the groundfish fishery is facing now -- as well as the strife that occurred in the scallop fishery in the early 1990's when ITQs were last formally considered.

4. Overfishing Definition

- This same Overfishing Definition was considered and rejected -- repeatedly -- during the deliberations for Amendment 10. Nothing has changed in the fishery or the rotational management scheme to warrant another round of discussion on this issue.
- In addition, the proponents of the new overfishing definition argue it is necessary to prevent localized overfishing. However, current management is already preventing localized overfishing from occurring, via access areas and the levels at which open area DAS are being set. That fact, combined with the overly cautious target fishing rate being used, make any change to the overfishing definition unnecessary.
- In addition, it is absolutely the wrong time to go complicating scallop management with regional open area TACs, for instance, under the new proposed overfishing definition. Such a step is a logical consequence of the proposed OFD.

Please consider the complications if each new open area component were to have two or three scallop sub-ACLs, along with sub-ACLs for bycatch species. The watch-word for this rebuilt fishery should be flexibility.

5. Fishing Year

- The FSF is absolutely opposed to any movement of the beginning of the fishing year. As an industry, FSF participants have developed their business plans around the consistent start of the fishing year.
- Changing the fishing year is even more troublesome in light of the ill-advised terms and conditions of the most recent turtle biological opinion. A term and condition of the biological opinion is to cut at least in half the amount of scallop effort in the Mid-Atlantic during the summer months (starting in May or June). If the scallop fishery is forced to massively reduce its effort in the Mid-Atlantic during the summer months because of new turtle regulations, and the fishing year starts in May or June, significant amounts of open area and access area effort would end up being used in the fall and winter when yields are poorer, the summertime peak scallop market has passed, and heavy weather makes fishing more dangerous.

6. General Category Amendment 11 "Tweaks"

- These should not upset the balance struck in Amendment 11. For instance, there is no reason to install area-by-area ITQ shares for the Limited Access vessels that qualify for a General Category ITQ allocation.

* * *

We appreciate the opportunity to submit these scoping comments. FSF and its participants will be present at the scoping hearings to present additional thoughts and answer any questions.

Sincerely,

David E. Frulla
Shaun M. Gehan
Andrew E. Minkiewicz

Counsel for the Fisheries Survival Fund

DEF:sah

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April 4, 2008

VIA ELECTRONIC MAIL

Patricia A. Kurkul, Regional Administrator
National Marine Fisheries Service
One Blackburn Drive
Gloucester, MA 01930-2298
Scallop.Fifteen@noaa.gov

Re: Atlantic Sea Scallop Amendment 15 Scoping Comments

Dear Regional Administrator Kurkul:

I submit this letter on behalf of the Fisheries Survival Fund ("FSF"), representing the bulk of the full-time, Limited Access scallop fleet, in response to the invitation for comments on scoping on Scallop Amendment 15. I will only be commenting on the issue of improvements to the scallop RSA program.

The scallop RSA program has been a huge success for accomplishing many of the research tasks that are mission requirements of the NMFS. This of course benefits the scallop industry directly and the public at large. There are however many improvements that need to be made to make the program more effective. Much needed research has not been accomplished due to regulatory obstacles, a deficient review process for proposals, and issues of timeliness. There are actions that can be taken within the FMP process that can overcome these problems. It is critical that time be spent on addressing these issues during the development of this Amendment so that we can more effectively conduct the research needed to address the issues of stock assessment, bycatch, and habitat through the RSA program. This should be a priority and not relegated to the back burner.

Thank you for this opportunity to comment and I look forward to working with the Council and NMFS on this issue on behalf of the FSF.

Sincerely,

Ronald Smolowitz

Capt. Bill

3-18-08 (23)

Dear Mr Kurkul,

For the past twenty years I have been Captain of a Scalloper. I am in favor of stacking two permits on one vessel. The previous six years I have been Captain of two vessels with one crew. It would be advantages for me and my crew to stay on the same vessel for the entire fishing year.

APR - 2 2008

(24)

March 30, 2008

Patricia Kurkul, RA
NMFS
Northeast Region
Once Blackburn Drive
Gloucester, MA 01930

Dear Ms. Kurkul,

For the past 20 years I have been captain of commercial scallop boats owned by Ramond Starvish. I am in favor of stacking two permits on one vessel.

For the previous six years, I have been Captain of two vessels with one crew. It would be advantages for me and my crew to stay on one vessel for the entire fishing year. I also believe that if vessels were allowed to stack permits that some of the smaller and less sea worthy vessels would be eliminated.

Thank You.

William H. Hulbig

William H. Hulbig

APR - 2 2008

Appendix II

Amendment 15 to the Sea Scallop FMP

Quantifying the Tradeoff Between Precaution and Yield in the U.S. Sea Scallop Fishery

Quantifying the Tradeoff Between Precaution and Yield in the U.S. Sea Scallop Fishery

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July 31, 2009

Abstract

Fishery reference points in the U.S. sea scallop fishery are set using yield per recruit analysis. Because of uncertainties in the parameters used in this analysis, the estimated reference points are uncertain. For this reason, it is often argued that target fishing mortality rates should be less than the calculated reference points in order to reduce the risk of overfishing. However, precautionary management also can reduce yield by fishing at suboptimal rates. Here, I use Monte-Carlo simulations to quantify the tradeoff between overfishing risk and loss in yield per recruit. At fishing mortalities near F_{MAX}, the fishing mortality where maximum yield per recruit is obtained, reducing fishing mortality obtains a substantial reduction in the risk of overfishing at little cost of lost yield per recruit. At lower fishing mortality rates, however, the marginal benefit in terms of reduced fishing mortality risk from further reductions in fishing mortality becomes less, and the cost in reduced yield per recruit becomes greater. If implementation uncertainty is added to the analysis, the risk of overfishing as well the loss of yield per recruit is increased, except at F_{MAX}.

Introduction

Fishery reference points are uncertain because the models that generate them depend on parameters that are themselves uncertain. For this reason, it has long been recommended that reference points be set on a precautionary basis, so as to minimize the risk of overfishing. This approach has been codified into U.S. law in 1996 and 2006 by revisions to the Magnuson-Stevens fishery act. However, reducing fishing mortality below F_{MSY} will, by definition, reduce the expected yields that can be obtained from the fishery. While precaution gives benefits in that it reduces the risk of overfishing and its concomitant impacts on the marine ecosystem, it also has a cost in that it reduces expected yield. The purpose of this paper is to explore these tradeoffs in setting reference points for the U.S. sea scallop, *Placopecten magellanicus*, fishery.

Because stock-recruit relationships for sea scallops are not well defined (and are presumably saturated at current and future biomass levels), reference points for sea scallops have been set using yield per recruit analysis, using F_{MAX} as a proxy for F_{MSY}. The most recent sea scallop stock assessment (NEFSC 2007) estimated $F_{\text{MAX}} = 0.24$ on Georges Bank, $F_{\text{MAX}} = 0.36$ in the Mid-Atlantic, and $F_{\text{MAX}} = 0.29$ for the fishery overall.

Uncertainties in yield per recruit analysis can be assessed by estimating a probability distribution for each of the input parameters and then repeatedly drawing parameters at random from these distributions and performing yield per recruit analysis using these choices (Restrepo and Fox 1988). By repeating this procedure a large number of times, the probability distribution of F_{MAX} and the expected yield per recruit at a given fishing mortality can be estimated. From this, the probability of overfishing at a fishing mortality F as well as the loss in yield per recruit incurred by fishing at F rather than F_{MAX} can be calculated.

Besides the uncertainties in the reference points, there is implementation error in that the fishing mortality target intended by managers may not be realized precisely, and the actual fishing mortality may be greater or less than that intended by management. The effect of such errors will also be discussed here.

Methods

Monte-Carlo yield per recruit analysis

A description of basic length-based yield per recruit model used in this analysis can be found in Hart (2003). The yield per recruit calculations depend on a number of parameters which each carry a level of uncertainty:

(1) Von Bertalanffy growth parameters K and L_∞

(2) Shell height/meat weight parameters a and b

(3) Natural mortality rate M

(4) Fishery selectivity parameters α and β

(5) The cull size of the catch and the fraction of discards that survive

(6) The level of incidental fishing mortality, i.e., non-catch mortality caused by fishing.

Each of these parameters were assigned a probability distribution reflecting their level of uncertainty, as discussed below. For each iteration, choices for each of these parameters were drawn from their distributions, and then a yield per recruit analysis was performed. This was repeated for $n = 10000$ iterations for both regions (Georges Bank and Mid-Atlantic) and the results collected. Of particular interest were the expected yield per recruit at a given fishing mortality F and the probability that overfishing would be occurring if fishing mortality was F. The expected yield per recruit was calculated simply as the average of the yield per recruit of each run. The probability of overfishing was estimated as the number of runs for which $F_{\text{MAX}} < F$ divided by the total number of runs.

The estimates of three sets of these parameters (K and L_∞, a and b, and α and β) are confounded, as reflected by a strong correlation between the estimates. For example, a growth curve with a given K and L_∞ resembles one with a slightly smaller K and larger L_∞, implying a negative correlation between the estimates of the two parameters. In these cases, each parameter pair was simulated as correlated normals. In other cases, gamma distributions were used.

The analyses were done separately in each area (Georges Bank and Mid-Atlantic). Expected yields were combined assuming that each area is equally productive. This is approximately correct over the last 25 years, though Georges Bank was more productive over a longer time period, and the Mid-Atlantic more productive in recent years. Calculating the probability of overfishing of the combined resource requires additional assumptions regarding the correlation of parameters in the two regions. It would seem likely that a positive correlation exists, e.g., if the natural mortality estimate of 0.1 was underestimated in one region, it is likely that it is also in the other. For that reason, it is assumed here that the corresponding parameters in the two regions are correlated with a correlation of 1. If this correlation is smaller, the variability between the regions would partially cancel, and the probability of overfishing would be somewhat less than calculated here.

Probability distributions for the simulated parameters

The mean, standard error and correlation (when applicable) for each of the simulated parameters is given in Table 1. These estimates were taken from the latest sea scallop stock assessment (NEFSC 2007) or from the literature. When standard errors were not available, they were estimated using reasonable judgement. Details on each of these parameters is given below.

Growth parameters K and L_∞. These parameters were estimated using a linear mixed-effects model based on the reading of sea scallop rings from shells collected during the 2001-2006 NEFSC sea scallop surveys (NEFSC 2007). These estimates were recently revised by using a slightly refined model and one additional year of data (Hart and Chute 2009). In order to conform to the NEFSC (2007) reference points, the growth parameters estimated there were used, rather than the updated ones. The difference between these is in any case minimal.

As discussed above, K and L_∞ were simulated as negatively correlated normals, with their mean, variance and covariance as estimated in NEFSC (2007). The standard errors of K and L_∞ are very small due to the large amount of data available. The true uncertainty may be greater than this "statistical uncertainty" because of model uncertainties. For example, von Bertalanffy growth appears to well approximate sea scallop growth, but is probably not exactly correct. Such uncertainties are not reflected in the standard errors of the parameters. However, simulations indicate that the mixed-effects model is robust to a number of uncertainties, and likely estimates the mean growth parameters to within 1% of its true value (Hart and Chute 2009).

Shell height/meat weight relationships. Meat weight W at shell height H is calculated using a formula of the form:

$$W = \exp(a + b\ln(H)) \tag{1}$$

The parameters a and b were estimated during the last sea scallop benchmark assessment (NEFSC 2007) using a generalized mixed-effects model (GLMM) based on data collected during the 2001-2006 NEFSC annual sea scallop surveys. This analysis was used to obtain estimates of means, variances, and covariances of the parameters (Table 1). Similar to the growth parameters, the estimates of a and b are somewhat confounded, so that they have a strong negative correlation. This means that the predicted meat weight at a given shell height carries less uncertainty than it would appear from the variances of the individual parameters.

Meat weights vary seasonally, with the greatest meat weights during the late spring and early summer. Meat weights drop considerably after the later summer/early fall spawn and stay low until the spring. These patterns were documented in NEFSC (2007) using observer data. Observers weigh scallop meats in aggregate, so that it is not possible to distinguish which of the shell height/meat weight parameters change seasonally. However, general allometric principles suggest that most of the variation is in the intercept a rather than the slope (or power) parameter b. Haynes (1966) constructed a number of monthly shell height/meat weight relationships, and did not find any significant trend in the slopes. Thus, it was assumed in NEFSC (2007) that all the seasonal variation in meat weights was due to variability in a. If this is the case, seasonality would not affect the F_{MAX} reference point. For this reason, seasonal variability was not considered a source of uncertainty for this analysis.

Natural mortality M. Like most stocks, natural mortality is one of the most uncertain parameters. However, dead "clapper" scallops (dead scallop shells still attached at the hinge) are an indicator of recent natural mortality, due to such causes as disease, high temperatures and sea star predation. The clappers separate some time after death because of hinge degeneration. At equilibrium, the rate of clappers being produced, ML, where L is the number of live scallops, must equal the rate of loss of clappers C/S, where S is the mean clapper separation time and C is the number of clappers. Solving this for M gives:

$$M = \frac{1}{S}\frac{C}{L} \tag{2}$$

so that natural mortality is proportional to the ratio of clappers to live scallops.

Merrill and Posgay (1964) used this idea to estimate natural mortality. They estimated the clapper ratio $C/L = 0.0662$, and the mean separation time $S = 33$ weeks $= 33/52$ years, to estimate an annual natural mortality rate of $(52/33) * 0.0662 = 0.104 \approx 0.1$. Probably the greatest uncertainty in this calculation is the mean separation time S. For example, Dickie (1955) estimated S to be 100 days (14.3 weeks). I assumed S was distributed as a gamma random variable, with mean 33 weeks and standard deviation 15 weeks. The resulting distribution of M has the desirable characteristic of being skewed to the right. This makes sense since, for example, a natural mortality of $M = 0.2$ is possible, but an $M = 0$, or even close to zero, is not. Note that because S appears in the denominator of (2), the mean value of M is not equal to applying equation (2) with the mean value of S, so that the original calculation of Merrill and Posgay (1964) was biased.

Fishery selectivity. Fishery selectivity s was estimated using an ascending logistic curve of the form:

$$s = \frac{1}{1 + \exp(\alpha - \beta H)} \tag{3}$$

where H is shell height. The mean, variances, and correlation of the α and β parameters were estimated based on CASA model runs from the last sea scallop assessment during the most recent time period. Note that fishery selectivity reflects targeting as well as gear selectivity.

Discard mortality. Sea scallops likely tolerate discarding fairly well, provided they are returned to the water relatively promptly and they are not damaged by the capture process or their time on deck. Further uncertainty occurs in the summertime in the Mid-Atlantic, where summer SST exceeds the thermal tolerance of sea scallops. Discard mortality was estimated at 20% in the last assessment, but there is little confidence in this number. Here, discard mortality was simulated as a gamma distribution, with a mean of 0.2 and a standard deviation of 0.15.

Incidental fishing mortality. Incidental fishing mortality occurs when scallops are killed but not captured by the gear. Let F_L be the landed fishing mortality rate and F_I be the rate of incidental fishing mortality. F_I should be proportional to F_L, say $F_I = iF_L$. Based on the studies of Caddy (1973) and Serchuk and Murawski (1989), i was estimated as 0.15 on Georges Bank and 0.04 in the Mid-Atlantic by NEFSC(2007). Because of the considerable uncertainty in these numbers, i was simulated here with a gamma distribution with these means and coefficients of variation of 0.75.

Incorporating management uncertainty

The actual fishing mortality realized may be different than the target fishing mortality set by managers. Thus, for a fixed target fishing mortality F_{TARGET}, the actual fishing mortality F_a is a random variable with density function $p(F)$. Denote by $Y(F)$ the expected yield per recruit obtained by fishing at F, and $Y_t(F)$ the expected yield per recruit obtained by setting the target fishing mortality at F. Note that these will be different, even if the process of setting the management targets is unbiased because yield per recruit curves are non-linear. The expected yield per recruit obtained from setting the target at F_{TARGET} is:

$$Y_t(F_{\text{TARGET}}) = \int_0^\infty p(F)Y(F)\,dF. \tag{4}$$

For these analyses, I assumed that the density function $p(F)$ is normal (in principle, this needs to be truncated at 0, but in practice there is negligible probability that $F < 0$) with mean F_{TARGET} and standard deviation σ. The integral was estimated by discretization with a step size of 0.01.

It remains to estimate the standard deviation σ. The CASA stock assessment model generally estimates fishing mortalities with errors of between 0.01 to 0.02. However, these are estimates of past fishing mortalities, obtained when all the information is available. Managers set effort and/or quota levels based on forecasts that must contain more uncertainty than stock assessment estimates of prior years. The SAMS projection model used for forecasts in the scallop fishery typically gives uncertainty in fishing mortalities of about $\sigma = 0.04$ for short-term forecasts, based on bootstraps of initial conditions and stochastic recruitment variability. This estimate does not include "model error" such as uncertainties in model parameters or changes in fishing practices. If this type of error is of similar magnitude and independent from the stochastic error already quantified by the SAMS model, the total implementation error is about $0.04\sqrt{2} \approx 0.06$. The analysis was conducted both with $\sigma = 0.04$ as a lower bound and $\sigma = 0.06$.

Results and Discussion

The tradeoffs between probability of overfishing and losses in expected yield are shown in Table 2 and Figure 1. Maximal expected yield per recruit are obtained at somewhat higher (by about 0.07) fishing mortalities than calculated in the last sea scallop assessment (NEFSC 2007). There are two reasons for this. First, even though the Merrill and Posgay (1964) estimates were used as the expected value of the clapper ratio and separation time for the clappers, the mean natural mortality was about 0.13, rather than the 0.1 estimated by Merrill and Posgay (1964), due to the uncertainty in the denominator of equation (2). Secondly, the yield per recruit curve is asymmetric, with a greater slope (in absolute magnitude) to the left of F_{MAX} than to the right. As a result, expected yield per recruit will be optimized by fishing at a level slightly greater than the point estimate of F_{MAX}.

Reducing fishing mortality near F_{MAX} produces considerable benefits (in terms of reduced risk of overfishing) at only a small cost (reduced expected yield per recruit). However, as fishing mortality is further reduced, benefits are reduced and costs increase. Basic cost/benefit theory states that the point of optimal cost/benefit will occur where the marginal benefit equals the marginal cost. The difficulty in applying this theory is that costs and benefits are in incommensurate quantities, so that the value of a decreased risk of overfishing compared to a loss in expected yield is subjective. Thus, some judgement is required to decide the appropriate balance. The scallop PDT suggested that the ABC fishing mortality should be set where the risk of overfishing is 0.25, or where the loss of yield per recruit is 1% less than optimal, whichever is less. According to Table 2, this would result in an ABC fishing mortality target of 0.28. While this value is reasonable, arguments can be made for just about any target between 0.2 and 0.3.

Performing similar analyses, but using target fishing mortality instead of actual fishing mortality, indicates that at lower fishing mortalities, implementation error increases both the risk of overfishing and the loss of yield per recruit due to precaution (Tables 3 and 4; Figures 2 and 3).

It is also of interest when setting the target is to calculate the probability of exceeding the ABC fishing mortality, since this triggers "accountability measures." Because implementation error is assumed to be normally distributed, this can be calculated simply from a table of (inverse) normal probabilities (Table 5).

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Table 1. Mean, standard error, and distributions of parameters used in the yield per recruit analysis.

(a) Georges Bank

Parameter	Purpose	Mean	S.E.	Corr.	Distribution
K	Growth	0.375	0.002	-0.6	Corr. Normal
L_∞	Growth	146.5	0.3	-0.6	Corr. Normal
a	SH/MW	-10.70	0.27	-0.998	Corr. Normal
b	SH/MW	2.942	0.055	-0.998	Corr. Normal
S	Nat. mort.	33/52 y	15/52 y		Gamma
α	Selectivity	25.24	8.69	0.998	Corr. Normal
β	Selectivity	0.23	0.08	0.998	Corr. Normal
F_D	Disc. mort.	0.2	0.15		Gamma
i	Incid. mort.	0.15	0.11		Gamma

(b) Mid-Atlantic

Parameter	Purpose	Mean	S.E.	Corr.	Distribution
K	Growth	0.495	0.004	-0.6	Corr. Normal
L_∞	Growth	131.6	0.4	-0.6	Corr. Normal
a	SH/MW	-12.01	0.15	-0.997	Corr. Normal
b	SH/MW	3.22	0.05	-0.997	Corr. Normal
S	Nat. mort.	33/52 y	15/52 y		Gamma
α	Selectivity	21.67	2.77	0.998	Corr. Normal
β	Selectivity	0.214	0.03	0.998	Corr. Normal
F_D	Disc. mort.	0.2	0.15		Gamma
i	Incid. mort.	0.04	0.03		Gamma

Table 2. Probability of overfishing (POF) and loss of yield per recruit (percetage loss compared to maximal) for sea scallops in Georges Bank, the Mid-Atlantic, and overall.

Georges Bank			Mid-Atlantic			Overall		
F	POF	%Loss	F	POF	%Loss	F	POF	%Loss
0.10	0	23	0.20	0.003	7.7	0.15	0	12.33
0.11	0	19.7	0.21	0.007	6.8	0.16	0	10.62
0.12	0	16.7	0.22	0.012	5.9	0.17	0.003	9.13
0.13	0	14.2	0.23	0.021	5.1	0.18	0.005	7.81
0.14	0	12.1	0.24	0.033	4.4	0.19	0.01	6.66
0.15	0.001	10.2	0.25	0.050	3.8	0.20	0.02	5.65
0.16	0.004	8.6	0.26	0.066	3.2	0.21	0.038	4.77
0.17	0.011	7.2	0.27	0.084	2.7	0.22	0.058	4
0.18	0.022	5.9	0.28	0.108	2.3	0.23	0.083	3.32
0.19	0.04	4.9	0.29	0.132	1.9	0.24	0.108	2.74
0.20	0.06	4	0.30	0.159	1.6	0.25	0.13	2.23
0.21	0.087	3.2	0.31	0.186	1.3	0.26	0.158	1.79
0.22	0.119	2.6	0.32	0.215	1.0	0.27	0.189	1.41
0.23	0.154	2	0.33	0.244	0.8	0.28	0.225	1.09
0.24	0.191	1.5	0.34	0.277	0.6	0.29	0.254	0.82
0.25	0.226	1.2	0.35	0.304	0.5	0.30	0.29	0.6
0.26	0.263	0.8	0.36	0.333	0.3	0.31	0.333	0.41
0.27	0.303	0.6	0.37	0.363	0.2	0.32	0.355	0.27
0.28	0.341	0.4	0.38	0.388	0.1	0.33	0.385	0.16
0.29	0.381	0.2	0.39	0.416	0.1	0.34	0.418	0.08
0.30	0.418	0.1	0.40	0.443	0.0	0.35	0.448	0.03
0.31	0.449	0	0.41	0.467	0.0	0.36	0.483	0
0.32	0.484	0	0.42	0.490	0.0	0.37	0.51	0
0.33	0.515	0	0.43	0.512	0.0	0.38	0.535	0.02
0.34	0.54	0	0.44	0.535	0.0	0.39	0.555	0.06
0.35	0.568	0.1	0.45	0.557	0.0	0.40	0.578	0.11

Table 3. Probability of overfishing (POF) and loss of yield per recruit (percetage loss compared to maximal) for sea scallops in Georges Bank, the Mid-Atlantic, and overall, with respect to target fishing mortality rates, assuming $\sigma = 0.04$ implementation uncertainty.

Georges Bank			Mid-Atlantic			Overall		
F_{TARGET}	POF	%Loss	F_{TARGET}	POF	%Loss	F_{TARGET}	POF	%Loss
0.10	0.001	27.7	0.20	0.015	8.7	0.15	0.016	14.06
0.11	0.002	23.6	0.21	0.022	7.6	0.16	0.022	12.12
0.12	0.004	20.0	0.22	0.030	6.6	0.17	0.029	10.43
0.13	0.007	17.0	0.23	0.040	5.8	0.18	0.038	8.96
0.14	0.012	14.4	0.24	0.052	5.0	0.19	0.049	7.66
0.15	0.018	12.2	0.25	0.067	4.3	0.20	0.062	6.51
0.16	0.027	10.3	0.26	0.083	3.7	0.21	0.076	5.50
0.17	0.038	8.7	0.27	0.102	3.2	0.22	0.093	4.63
0.18	0.053	7.3	0.28	0.122	2.7	0.23	0.111	3.86
0.19	0.070	6.1	0.29	0.145	2.3	0.24	0.131	3.20
0.20	0.091	5.0	0.30	0.169	1.9	0.25	0.153	2.62
0.21	0.114	4.1	0.31	0.194	1.6	0.26	0.177	2.12
0.22	0.141	3.4	0.32	0.220	1.3	0.27	0.201	1.69
0.23	0.170	2.7	0.33	0.247	1.1	0.28	0.227	1.33
0.24	0.201	2.2	0.34	0.275	0.9	0.29	0.254	1.02
0.25	0.234	1.7	0.35	0.302	0.7	0.30	0.281	0.76
0.26	0.268	1.3	0.36	0.330	0.5	0.31	0.309	0.55
0.27	0.303	1.0	0.37	0.357	0.4	0.32	0.337	0.37
0.28	0.337	0.8	0.38	0.384	0.3	0.33	0.364	0.24
0.29	0.372	0.6	0.39	0.410	0.2	0.34	0.392	0.14
0.30	0.406	0.4	0.40	0.435	0.2	0.35	0.419	0.06
0.31	0.439	0.3	0.41	0.460	0.1	0.36	0.445	0.02
0.32	0.471	0.3	0.42	0.484	0.1	0.37	0.470	0.00
0.33	0.501	0.2	0.43	0.507	0.1	0.38	0.495	0.00
0.34	0.530	0.2	0.44	0.529	0.0	0.39	0.518	0.03
0.35	0.558	0.3	0.45	0.551	0.0	0.40	0.541	0.07

Table 4. Probability of overfishing (POF) and loss of yield per recruit (percetage loss compared to maximal) for sea scallops in Georges Bank, the Mid-Atlantic, and overall, with respect to target fishing mortality rates, assuming $\sigma = 0.06$ implementation uncertainty.

Georges Bank			Mid-Atlantic			Overall		
F_{TARGET}	POF	%Loss	F_{TARGET}	POF	%Loss	F_{TARGET}	POF	%Loss
0.1	0.006	27.5	0.2	0.033	9.4	0.15	0.016	16.22
0.11	0.009	25.2	0.21	0.042	8.2	0.16	0.022	13.71
0.12	0.014	22.9	0.22	0.053	7.2	0.17	0.029	11.77
0.13	0.019	20.5	0.23	0.064	6.3	0.18	0.038	10.09
0.14	0.026	19.4	0.24	0.078	5.4	0.19	0.049	8.63
0.15	0.034	16.7	0.25	0.093	4.7	0.2	0.062	7.36
0.16	0.044	14.1	0.26	0.110	4.1	0.21	0.076	6.25
0.17	0.057	11.9	0.27	0.129	3.5	0.22	0.093	5.28
0.18	0.071	10.1	0.28	0.149	3.0	0.23	0.111	4.42
0.19	0.088	8.5	0.29	0.170	2.5	0.24	0.131	3.67
0.2	0.107	7.1	0.3	0.192	2.2	0.25	0.153	3.03
0.21	0.128	5.9	0.31	0.216	1.8	0.26	0.177	2.47
0.22	0.151	4.9	0.32	0.240	1.5	0.27	0.201	1.99
0.23	0.176	4.1	0.33	0.265	1.3	0.28	0.227	1.58
0.24	0.202	3.3	0.34	0.290	1.0	0.29	0.254	1.23
0.25	0.231	2.7	0.35	0.316	0.9	0.3	0.281	0.93
0.26	0.260	2.2	0.36	0.341	0.7	0.31	0.309	0.68
0.27	0.291	1.8	0.37	0.367	0.6	0.32	0.337	0.48
0.28	0.321	1.4	0.38	0.392	0.4	0.33	0.365	0.32
0.29	0.353	1.2	0.39	0.417	0.3	0.34	0.392	0.20
0.3	0.384	0.9	0.4	0.441	0.3	0.35	0.419	0.11
0.31	0.415	0.8	0.41	0.465	0.2	0.36	0.445	0.05
0.32	0.445	0.6	0.42	0.489	0.2	0.37	0.470	0.01
0.33	0.475	0.5	0.43	0.511	0.1	0.38	0.495	0.00
0.34	0.504	0.4	0.44	0.533	0.1	0.39	0.519	0.01
0.35	0.532	0.4	0.45	0.554	0.1	0.4	0.541	0.04

Table 5. Risk of exceeding the ABC and hence encountering accountability measures at various reductions in target fishing mortalities below the ABC fishing mortality.

Reduction in F	$P(F > F_{\text{ABC}})$ $\sigma = 0.04$	$P(F > F_{\text{ABC}})$ $\sigma = 0.06$
0.01	0.401	0.434
0.02	0.309	0.369
0.03	0.227	0.309
0.04	0.159	0.252
0.05	0.106	0.202
0.06	0.067	0.159
0.07	0.040	0.122
0.08	0.023	0.091
0.09	0.012	0.067
0.10	0.006	0.048
0.11	0.003	0.033
0.12	0.001	0.023

Figure legends

Figure 1. The probability of overfishing (solid) and loss in yield per recruit (dashed) for (a) Georges Bank, (b) Mid-Atlantic and (c) overall, as a function of true fishing mortality.

Figure 2. Figure 1. The probability of overfishing (solid) and loss in yield per recruit (dashed) for (a) Georges Bank, (b) Mid-Atlantic and (c) overall, as a function of target fishing mortality with implementation error $\sigma = 0.04$.

Figure 3. The probability of overfishing (solid) and loss in yield per recruit (dashed) for (a) Georges Bank, (b) Mid-Atlantic and (c) overall, as a function of target fishing mortality with implementation error $\sigma = 0.06$.

Figure 1
(a) (b) (c)

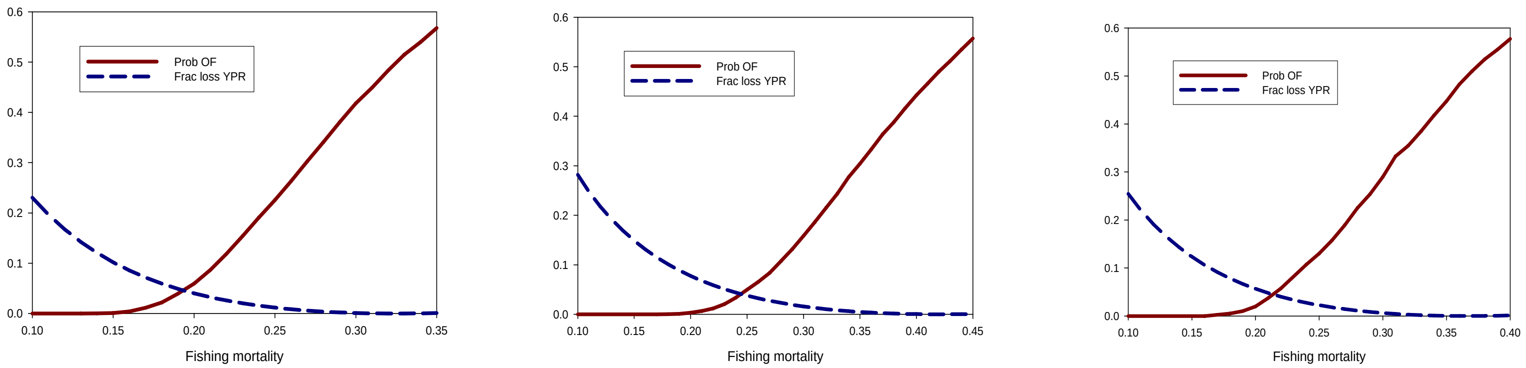


Figure 2
(a) (b) (c)

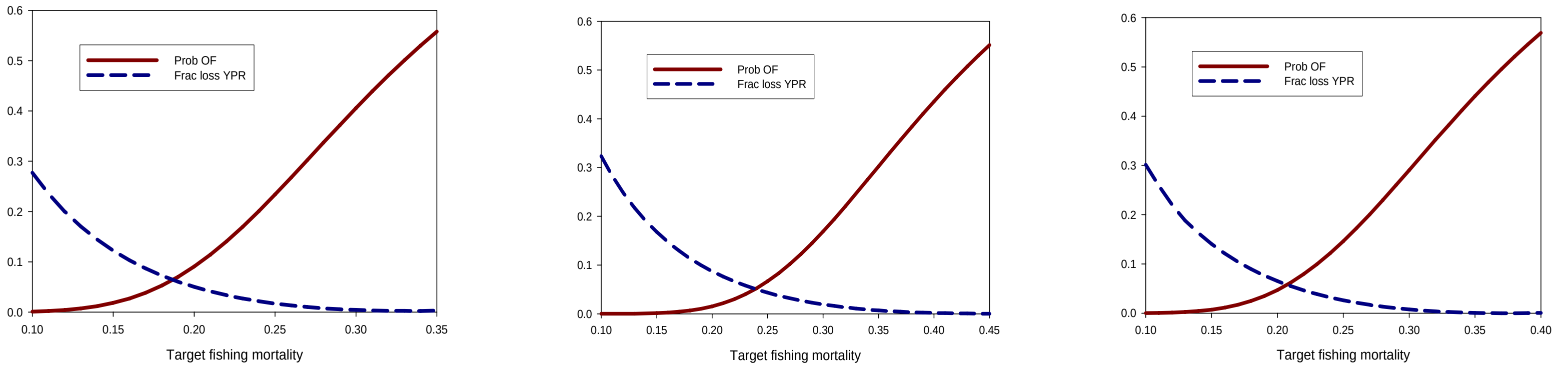
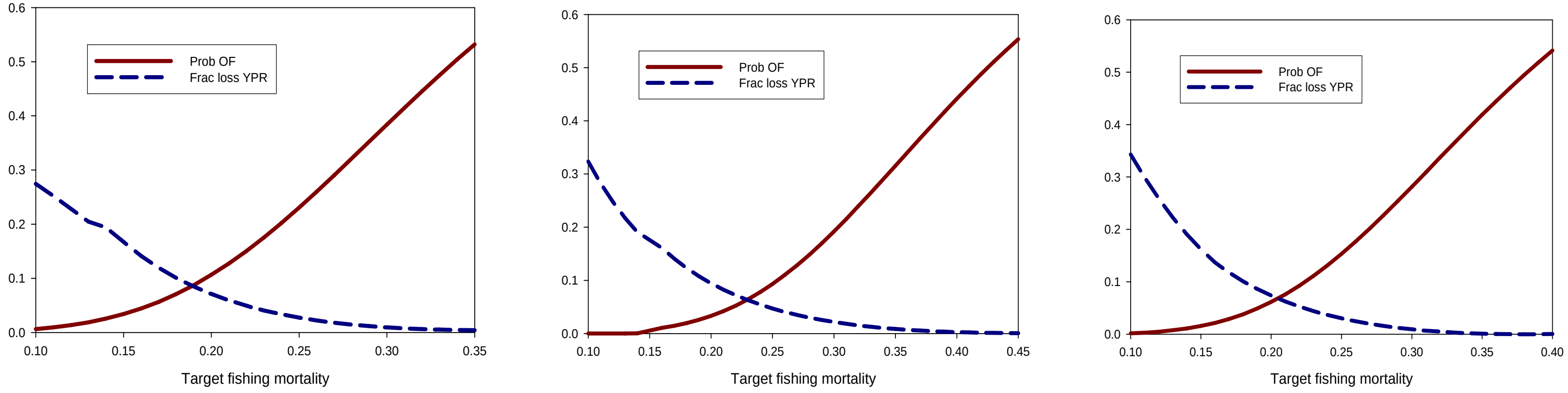


Figure 3

(a) (b) (c)



Prob OF
Frac loss YPR
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
Target fishing mortality

Appendix III

Amendment 15 to the Sea Scallop FMP

Economic Model

1.1 APPENDIX III – ECONOMIC MODEL

1.1.1 ESTIMATION OF PRICES, COSTS, PROFITS AND NATIONAL BENEFITS

The economic model includes an ex-vessel price equation, a cost function and a set of equations describing the consumer and producer surpluses. The ex-vessel price equation is used in the simulation of the ex-vessel prices, revenues, and consumer surplus along with the landings and average meat count from biological projections. The cost function is used for projecting harvest costs and thereby for estimating the producer benefits as measured by the producer surplus. The set of equations also includes the definition of the consumer surplus, producer surplus, profits to vessels, and total economic benefits.

1.1.2 Estimation of annual ex-vessel prices

Fish prices constitute one of the important channels through which fishery management actions affect fishing revenues, vessel profits, consumer surplus, and net economic benefits for the nation. The degree of change in ex-vessel price in response to a change in variables affected by management, i.e., scallop landings and meat count, is estimated by a price model, which also takes into account other important determinants of price, such as disposable income of consumers and price of imports.

Given that there could be many variables that could affect the price of scallops, it is important to identify the objectives in price model selection for the purposes of cost-benefit analyses. These objectives (in addition to developing a price model with sound statistical properties) are as follows:

- To develop a price model that uses inputs of the biological model and available data. Since the biological model projects annual (rather than monthly) landings, the corresponding price model should be estimated in terms of annual values.
- To select a price model that will predict prices within a reasonable range without depending on too many assumptions about the exogenous variables. For example, the import price of scallops from Japan could impact domestic prices differently than the price of Chinese imports, but making this separation in a price model would require prediction about the future import prices from these countries. This in turn would complicate the model and increase the uncertainty regarding the future estimates of domestic scallop prices.

In the past SAFE reports and Scallop Amendment and Frameworks, the average ex-vessel price for scallops was estimated from an annual price model as a function of total landings, average meat count of scallops landed, disposable income of consumers, and average import prices. Collection of price data by market category of scallops since 1998, however, made it possible to improve the price model by taking into account the changes in the size composition of scallops. The composition of scallops changed significantly in the last ten years toward larger sizes as a result of effort-reduction measures, area closures, and an increase in ring sizes implemented by the Sea Scallop FMP. The share of U10's increased to 27% in 2007 from 7% in 2000 and the share of count 11-20 scallops increased from 18% in 2000 to over 50% in 2007 (Table 52).

The scallop price by market category is affected by the relative abundance or supply of that size category relative to total scallop landings. Until the 2005 fishing year, U10 scallops had a significant price premium, but as their supply in landings increased, the difference in the annual average price of U10's and other size categories declined and in 2006, average price of U10s actually was lower than the price for other size categories (Table 53). The price model developed originally for Framework 18 captured these changes by estimating the prices by major meat count categories and including the relative share of each category in total supply of scallops as an explanatory variable.

Table 1. Composition of scallop landings by market category

Year	U10	11 to 20	21 to 30	Over 30
1999	19%	13%	29%	39%
2000	8%	21%	49%	22%
2001	4%	27%	56%	13%
2002	5%	16%	73%	5%
2003	7%	25%	65%	3%
2004	8%	45%	46%	2%
2005	14%	62%	22%	2%
2006	24%	55%	20%	1%
2007	26%	56%	14%	4%
2008	24%	55%	19%	1%

Table 2. Average annual price of scallops by market category (2008 prices)

Year	U10	11 to 20	21 to 30	Over 30
2000	7.8	7.9	7.3	6.4
2001	8.7	6.8	5.9	6.1
2002	7.2	4.7	4.4	4.7
2003	6.7	4.8	4.5	5.1
2004	5.7	4.8	4.8	5.3
2005	6.8	5.8	5.5	5.7
2006	8.8	8.6	8.5	8.3
2007	6.6	7.3	7.6	7.6
2008	7.2	6.9	6.8	6.2

In addition to the changes in size composition and landings of scallops, other determinants of ex-vessel price include level of imports, import price of scallops, disposable income of seafood consumers, and the demand for U.S. scallops by other countries. The main substitutes of sea scallops are the imports from Canada, which are almost identical to the domestic product, and imports from other countries, which are generally smaller in size and less expensive than the domestic scallops. An exception is the Japanese imports, which have a price close to the Canadian imports and could be a close substitute for the domestic scallops as well.

The ex-vessel price model estimated below includes the price, rather than the quantity of imports as an explanatory variable, based on the assumption that the prices of imports are, in general, determined exogenously to the changes in domestic supply. This is equivalent to assuming that the U.S. market conditions have little impact on the import prices. An alternative model would estimate the price of imports according to world supply and demand for scallops, separating the impacts of Canadian and Japanese imports from other imports since U.S. and Canadian markets for scallops, being in proximity, are highly connected and Japanese scallops tend to be larger and closer in quality to the domestic scallops. The usefulness of such a simultaneous equation model is limited for our present purposes, however, since it would be almost impossible to predict how the landings, market demand, and other factors such as fishing costs or regulations in Canada or Japan and in other exporting countries to the U.S. would change in future years.

Since the average import price is equivalent to a weighted average of import prices from all countries weighted by their respective quantities, the import price variable takes into account the change in composition of imports from Canadian scallops to less expensive smaller scallops imported from other countries. This specification also prevents the problem of multi-colinearity among the explanatory variables, i.e., prices of imports from individual countries and domestic landings. In terms of prediction of future ex-vessel prices, this model only requires assignment of a value for the average price of imports, without assuming anything about the composition of imports, or the prices and the level of imports from individual countries. The economic impact analyses of the fishery management actions usually evaluate the impact on ex-vessel prices by holding the average price of imports constant. The sensitivity of the results affected by declining or increasing import prices could also be examined, however, using the price model presented in this section.

The price model presented below estimates annual average scallop ex-vessel price by market category (PEXMRKT) as a function of

- Meat count (MCOUNT)
- Average price of all scallop imports (PIMPORT)
- Per capita personal disposable income (PCDPI)
- Total annual landings of scallop minus exports (SCLAND-SCEXP)
- Percent share of landings by market category in total landings (PCTLAND)
- A dummy variable as a proxy for price premium for Under 10 count scallops (DU10).

Because the data on scallop landings and revenue by meat count categories were mainly collected since 1998 through the dealers' database, this analysis included the 1999-2008 period. All the price variables were corrected for inflation and expressed in 2008 prices by deflating current levels by the consumer price index (CPI) for food. The ex-vessel prices are estimated in semi-log form to restrict the estimated price to positive values only as follows:

Log (PEXMRKT) = f(MCOUNT, PIMPORT, PCDPI, SCLAND-SCEXP, PCTLAND, DU10)

The coefficients of this model are shown in Table 54. Adjusted R2 indicates that changes in meat count, composition of landings by size of scallops, domestic landings net of exports, average price of all imports, disposable income, and price premium on under 10 count scallops and 2005 dummy variable explain 82 percent of the variation in ex-vessel prices by market category. In contrast to the price model estimates for the earlier years, the coefficient for the landings net of exports was not statistically significant for the period 1999-2008 for the range of landings observed in this period probably because annual variation in landings in recent years were relatively small and the change in the composition of landings toward larger scallops had a larger impact on prices.

In addition, values of the all the explanatory variables are held at the recent levels. For example, disposable income per capita and import prices are assumed to stay constant at the 2008 level. This is because it is not possible to predict accurately the changes in the future values of the explanatory variables and also because our goal is determine the response in prices to the change in landings and the composition in terms of market category given other things held constant. Therefore, future prices could be higher (lower) than predicted depending on the values of the explanatory variables.

Table 3. Regression results for price model

Regression Statistics	
R Square	0.85
Adjusted R Square	0.82
Observations	40

Table 4. Coefficients of the Price Model

Variables	Coefficients	Standard Error	t Stat
INTERCEPT	-1.18096	0.49743	-2.37
MCOUNT	-0.00414	0.00185	-2.23
PIMPORT	0.21944	0.05449	4.03
PCDPI	0.06606	0.01124	5.87
SCLAND-SCEXP	-0.00131	0.00458	-0.29
DU10	0.05008	0.05106	0.98
PCTLAND	-0.23569	0.08327	-2.83

These numerical results should be interpreted with caution, however, since the analysis covers only 10 years of annual data from a period during which the scallop fishery underwent major changes in management policy including area closures, controlled access, and rotational area management.

1.1.3 Estimation of trip costs

1.1.4 Trip Costs

Data for variable costs, i.e., trip expenses include food, fuel, oil, ice, water and supplies. The trip costs per day-at-sea (ffiwospda) is postulated to be a function of vessel crew size (CREW), vessel size in gross tons (GRT), fuel prices (FUELP), and dummy variables for trawl (TRW) and small dredge (DFT) vessels. This cost equation was assumed to take a double-logarithm form and estimated with data obtained from observer database. The empirical equation presented in Table 56 estimated more than 70% of the variation in trip costs and has proper statistical properties. Table 57 shows the estimated model for the fuel costs with similar statistical properties.

Table 5. Estimation of total trip costs per DAS used

The MODEL Procedure

Nonlinear GMM Summary of Residual Errors

Equation	DF Model	DF Error	SSE	MSE	R-Square	Adj R-Sq	Durbin Watson
lnffiwospda	6	206	24.9349	0.1210	0.7159	0.7090	1.8100

Nonlinear GMM Parameter Estimates

Parameter	Estimate	Approx Std Err	t Value	Approx Pr > |t|
intc	3.991271	0.3129	12.76	<.0001
grtco	0.286919	0.0499	5.75	<.0001
crewco	0.632637	0.1411	4.48	<.0001
dftco	-0.27828	0.0794	-3.51	0.0006
trwco	-0.39799	0.1559	-2.55	0.0114
fuelpco	0.84357	0.0846	9.97	<.0001

Table 6. Estimation of fuel costs per DAS used

The MODEL Procedure

Nonlinear GMM Summary of Residual Errors

Equation	DF Model	DF Error	SSE	MSE	R-Square	Adj R-Sq	Durbin Watson
lnfuelcpda	6	205	25.7857	0.1258	0.7235	0.7168	1.9435

Nonlinear GMM Parameter Estimates

Parameter	Estimate	Approx Std Err	t Value	Approx Pr > |t|
intc	3.605563	0.3133	11.51	<.0001
grtco	0.32617	0.0504	6.47	<.0001
dftco	-0.33534	0.0865	-3.88	0.0001
trwco	-0.18154	0.0955	-1.90	0.0588
crewco	0.389788	0.1383	2.82	0.0053
fuelpco	1.248935	0.0834	14.98	<.0001

Table 7. Comparison of actual and estimated values for trip costs

		Year			
		2005	2006	2007	2008
Estimated trip costs per DAS		1483.39	1445.47	1603.01	1896.45
Actual trip costs per DAS		1306.36	1672.22	1684.29	2094.69
% Difference		15.46	-8.16	-2.48	-1.94
DAS per trip		11.29	9.36	11.00	10.50
LPUE	Mean	2143.67	1365.38	1229.04	1158.69
Actual fuel costs per DAS		939.45	1265.24	1284.92	1703.74
Estimated fuel costs per DAS		1034.55	1022.35	1182.27	1545.78
% Difference		14.42	-12.15	-5.31	-0.61
Fuel price (06)		2.08	2.16	2.33	3.15
GRT	Mean	163.14	146.91	167.64	124.00
HP	Mean	857.00	897.55	1025.07	507.25
LEN	Mean	82.41	80.64	86.01	76.13
Built	Mean	1981.00	1989.18	1982.50	1976.25
% Fuel		0.72	0.75	0.77	0.81
% Fuel Predicted cpred		0.70	0.70	0.74	0.81
N		7.00	11.00	14.00	4.00

1.1.5 Estimation of fixed costs

The fixed costs include those expenses that are not usually related to the level of fishing activity or output. These are insurance, maintenance, license, repairs, office expenses, vessel improvement, professional fees, dues, and utility, interest, communication costs, association fees and dock expenses. The data on these items are obtained from the 2006-07 Cost Survey data. The data included 196 observations and the fixed costs are estimated by using the 97 observations for vessels with dredge and trawl gear. Because the data on communications costs and association fees were missing for most observations, these costs were not included in the estimation but their average values for the scallop vessels were added on to fixed costs.

The following model is based on stepwise regression and estimates fixed costs as a function of length, year built, horse power and a dummy variable for boats that have multispecies permit.

Table 8. Estimation of fixed costs

The MODEL Procedure

Nonlinear GMM Summary of Residual Errors

Equation	DF Model	DF Error	SSE	MSE	Root MSE	R-Square	Adj R-Sq	Durbin Watson
lnfc	5	92	25.7672	0.2801	0.5292	0.5253	0.5047	2.3358

Nonlinear GMM Parameter Estimates

Parameter	Estimate	Approx Std Err	t Value	Approx Pr > |t|
intc	-261.633	85.2438	-3.07	0.0028
lenco	1.335278	0.2650	5.04	<.0001
bltco	35.10611	11.2451	3.12	0.0024
d10co	-0.30008	0.1252	-2.40	0.0186
hpco	0.236827	0.1588	1.49	0.1392

Table 9. Basic fixed costs (do not include improvement costs, includes other costs including fuel and maintenance –double entries)

[illegible]

Table 3. Basic fixed costs (do not include other costs and improvement costs)

Table 10. Actual and predicted value of fixed costs for FT dredges: Annual average per vessel; Costs are in 2006 inflation adjusted prices.

DATA		2006	2007
N		25.00	12.00
Fixed costs/vessel		238480.88	236607.88
Predicted fixed cost		244971.88	203595.90
LENGTH	Mean	81.40	76.61
HP	Mean	867.24	577.08
GRT	Mean	154.00	131.50
Hull+Liability Insurance		62121.44	54461.83
Repairs and Maint.		47054.52	72271.92
Improvement Costs		71940.50	66275.00
Other Costs		103194.16	82481.69

Table 11. Average association fee and communication costs by vessel size

	Average annual association fee	Average annual Communication Costs
All Vessels	1610	3446
Large (>=80 feet)	1895	3939
Medium (<80 feet)	1459	3185

1.1.6 Profits and crew incomes

As it is well known, the net income and profits could be calculated in various ways depending on the accounting conventions applied to gross receipts and costs. The gross profit estimates used in the economic analyses in the FSEIS simply show the difference of gross revenue over variable (including the crew shares) and fixed expenses rather than corresponding to a specific accounting procedure. It is in some ways similar to the net income estimated from cash-flow statements since depreciation charges are not subtracted from income because they are not out-of-pocket expenses.

Gross profits per vessel are estimated as the boat share (after paying crew shares) minus the fixed expenses such as maintenance, repairs and insurance (hull and liability). Based on the input from the scallop industry members and Dan Georgianna on the lay system, the profits and crew incomes are estimated as follows:

- The association fees, communication costs and a captain bonus of 5% are deducted from the gross stock to obtain the net stock.
- Boat share is assumed to be 48% and the crew share is assumed to be 52% of the net stocks.
- Profits are estimated by deducting fixed costs from the boat share.
- Net crew income is estimated by deducting the trip costs from the crew shares.

1.1.7 Changes in Revenues, Costs, profits and crew incomes

Table 12. Costs, revenues, crew income and profits (all the values are in 2006 inflation adjusted prices)

Data	1999	2007
Scallop landings per vessel(pound)	103,954	167,831
Scallop revenue per vessel	695,934	1,074,625
Fixed costs per vessel	228,815	246,567
Total trip costs per vessel	86,285	155,056
Shared costs: Communications cost+ Association fees+captain's bonus	40,284	59,148
DAS used per vessel	105	95
Trip costs per DAS	822	1,640
Length	84	82
GRT	161	155
Horse Power	857	837
LPUE	1,149	1,817
Fuel price	0.96	2.30
Ex-vessel price/pound	6.69	6.40
Fuel cost per DA	406	1168
Fuel cost/Trip cost	0.50	0.71
Number of vessels	168	234

Note: For fcgrp<=0.50 23 obs in 1999 and 9 in 2007 are eliminated.

Table 13. Percentage share of costs, profits and crew income in gross stock

Year	Data	Scenario A Out of boat share	Scenario B Out of Gross stock
1999 (Crew share=55% of gross stock)	Net Crew income	296,478	274,322
	Profits	44,071	66,227
	% of Gross Stock (Scallop revenue)		
	Trip costs	13%	13%
	Shared costs	6%	6%
	Fixed costs	34%	34%
	Profits	5%	9%
	Net Crew income	42%	39%
	Total	100%	100%
2007 (Crew share=52% of gross stock)	Net Crew income	403,748	372,992
	Profits	210,104	240,862
	Trip costs	15%	15%
	Shared costs	6%	6%
	Fixed costs	24%	24%
	Profits	19%	22%
	Net Crew income	37%	34%
	Total	100%	100%

1.1.8 Consumer surplus

Consumer surplus measures the area below the demand curve and above the equilibrium price. For simplicity, consumer surplus is estimated here by approximating the demand curve between the intercept and the estimated price with a linear line as follows:

CS= (PINT*SCLAN-EXPR*SCLAN)/2

$$PVCS = \sum_{t=2000}^{t=2008} (CS_t / (1+r)^t)$$

Where: r=Discount rate.

CS_t= Consumer surplus at year “t” in 1996 dollars.

PVCS= Present value of the consumer surplus in 1996 dollars.

EXPR= Ex-vessel price corresponding to landings for each policy option.
PINT=Price intercept i.e., estimated price when domestic landings are zero.
SCLAN= Sea scallop landings for each policy option.

Although this method may overestimate consumer surplus slightly, it does not affect the ranking of alternatives in terms of highest consumer benefits or net economic benefits.

1.1.9 Producer surplus

The producer surplus (PS) is defined as the area above the supply curve and the below the price line of the corresponding firm and industry (Just, Hueth & Schmitz (JHS)-1982).

The supply curve in the short-run coincides with the short-run MC above the minimum average variable cost (for a competitive industry). This area between price and the supply curve can then be approximated by various methods depending on the shapes of the MC and AVC cost curves. The economic analysis presented in this section used the most straightforward approximation and estimated PS as the excess of total revenue (TR) over the total variable costs (TVC). It was assumed that the number of vessels and the fixed inputs would stay constant over the time period of analysis. In other words, the fixed costs were not deducted from the producer surplus since the producer surplus is equal to profits plus the rent to the fixed inputs. Here fixed costs include various costs associated with a vessel such as depreciation, interest, insurance, half of the repairs (other half was included in the variable costs), office expenses and so on. It is assumed that these costs will not change from one scenario to another.

PS=EXPR*SCLAN- ΣOPC

ΣOPC = Sum of operating costs for the fleet.

$$PVPS = \sum_{t=2000}^{t=2008} (PS_t / (1+r)^t)$$

Where: r=Discount rate.

- PS_t= Producer surplus at year "t" in 1996 dollars.
- PVPS= Present value of the producer surplus in 1996 dollars.
- SCALN= Sea scallop landings for each policy option.
- EXPR= Price of scallops at the ex-vessel level corresponding to landings for each policy option in 1996 dollars.

Producer Surplus also equals to sum of rent to vessels and rent to labor. Therefore, rent to vessels can be estimated as:

RENTVES=PS – CREWSH

Rentves= Quasi rent to vessels
Crewsh= Crew Shares

1.1.10 Total economic benefits

Total economic benefits (TOTBEN) is estimated as a sum of producer and consumer surpluses and its value net of status quo is employed to measure the impact of the management alternatives on the national economy.

TOTBEN=PS+CS

Present value of the total benefits= PVTOTBEN= PVPS+PVCS

1.1.11 Savings in Trip Costs from leasing DAS: An example

The fishing power and mortality adjustments are expected to prevent a vessel from increasing scallop landings by leasing open area DAS from a larger more efficient vessel. Thus, the scallop revenues that could be obtained from fishing with the leased days are estimated to be equal to the revenues that the lessor could derive from fishing these days. The same argument is valid for leasing the access area trips since the lessee will not be allowed to land any amount larger than the allocated scallop pounds and/or possession limit. Therefore, leasing could increase total profits from the leased days only if the open area days or access area trips could be fished at lower costs on some vessels relative to others and some fixed costs could be reduced. In general, if the leasing vessel can fish the leased pounds (from DAS or access area trip lease) at a lower cost than the lessor, than the difference between revenue and the costs could allow the lessee compensate the lessor and still make a profit. Lessor could gain by earning the same net revenue from the pounds she transferred than fishing those days on her own boat. Even earning a smaller amount of net revenue from the leased DAS or access area trips could benefit the lessor if the value of the leisure time was taken into account.

The relative variable (trip) costs of fishing will depend on the relative LPUE's, the costs of the trading vessels and the adjustment factors. Table 66 shows that even though the larger vessels could catch more scallops per day, average trip costs per pound of scallops do not vary significantly among the HP-length groups because the smaller vessels have lower trip costs per day-at-sea. For example, a vessel in group hp-length group 12 has almost the same trip costs per pound of scallops with a larger vessel in group 82. As a result, fishing the same amount of scallops (in pounds) on a larger vessel compared to a smaller vessel are not expected to lead to large savings in trip costs in most of the cases, narrowing down the returns from leasing DAS on account of trip costs. As discussed in Section ?, however, the production model results indicated that LPUE could increase by 5% when having access to more open area DAS increases the flexibility for the vessel to adjust the trip length optimally according to the resource and market conditions. This could reduce the trip costs per pound of scallops of the lessee as shown in Table 66. For example, if a vessel in group "82" leased open area days from a vessel in group "12', the trip costs per pound of scallops will decline from $0.96 per pound (for group '12' vessel) to $0.89 per pound of scallops (for the leasing vessel in group "82' after trading). Still, these savings are small especially considering that a vessel in group "82" could only use 33 days when it leases 51 days from a vessel in group "12" because of fishing power and mortality adjustments.

Table 14. Full-time Dredge Vessel Characteristics

HP	Length	HP-Length Group	Number of vessels	HP	GRT	Length
<500	50-70	11	5	392	59	61
<500	>70	12	9	431	122	77
500-599	50-70	21	5	523	79	64
500-599	>70	22	25	530	132	77
600-719	50-70	31	4	618	99	66
600-719	>70	32	37	641	146	81
720-863	50-70	41	4	763	119	65
720-863	>70	42	74	814	166	83
864-1036	50-70	51	1	950	111	64
864-1036	>70	52	30	959	167	86
1037-1243	>70	62	38	1,121	183	89
1244-1492	>70	72	12	1,299	178	90
>=1493	>70	82	11	1,545	186	99

Table 15. Scallop landings and trip costs (assuming open area DAS=51)

Fishing power group	Average HP	Average Length	Estimated LPUE (4)	Scallop Pounds landed (5)	Average Trip costs per DAS (6)	Trip costs per pound (7)	Trip costs per pound with increase in LPUE (8)
11	392	61	1,241	63,278	1,186	0.96	0.87
12	431	77	1,296	66,091	1,508	1.16	1.06
21	523	64	1,327	67,688	1,345	1.01	0.92
22	530	77	1,354	69,077	1,598	1.18	1.07
31	618	65	1,376	70,153	1,395	1.01	0.92
32	641	81	1,417	72,290	1,592	1.12	1.02
41	763	66	1,440	73,444	1,601	1.11	1.01
42	814	83	1,494	76,200	1,669	1.12	1.02
52	958	85	1,550	79,045	1,665	1.07	0.98
62	1121	89	1,610	82,100	1,736	1.08	0.98
72	1299	90	1,662	84,773	1,702	1.02	0.93
82	1545	99	1,739	88,694	1,702	0.98	0.89

The total savings in trip costs will depend on the relative fishing power of the trading vessels and the total pounds the lessee can land with the leased days after fishing power and mortality adjustments. Table 67 shows the scallop pounds that can be landed by the leased days and compares the trip costs of the lessor and the lessee, which is assumed to be a vessel in the largest fishing power group (82) in this example. Column 2 shows the days that can be used for fishing by the lessee after leasing, and column 3 shows the estimated scallop landings. For example, if the days are leased from a vessel in group “12”, the lessee can use only 35 days for fishing after the fishing power and mortality adjustments. Total scallop pounds from fishing 35 days are estimated to be 66,091 pounds (Column 3, Table 67), which is equal to the pounds that could be landed by an average vessel in group “12” using 51 days (Table 66, column 5). Column 4 of the Table shows the trip costs for the lessor and column 5 for the lessee of landing 66,091 pounds of scallops. The difference in these total trip costs shows the total gains from trading. Table 67 shows that largest savings in trip costs ($19,944) could be obtained if the lessee (group 82) leased days from a vessel in group 22 in this example. In general, leasing days would lower trip costs in the majority of cases if the overall LPUE increases due to the increased flexibility with access to a larger allocation of open area days. When a larger vessel leases days from a smaller vessel, the trip costs per pound of scallops will also be lower because the larger vessels in general have a higher LPUE. On the other hand, smaller vessels have lower costs per day-at-sea which limits the gains from trip cost savings.

Table 16. Das-used, landings and trip cost savings after a vessel in group 82 leases 51 open area days from other groups.

Lessor	Lessee=Group 82					
	DAS-used after leasing (2)	Scallop landings (3)	Total Trip costs of the lessor (4)	Total Trip costs of the lessee (5)	Savings in trip costs (6)	Trip cost savings per DAS (for an allocation of 51)
11	33	63,278	60,485	56,366	4,119	81
12	35	66,091	76,909	58,872	18,037	354
21	35	67,688	68,595	60,294	8,301	163
22	36	69,077	81,475	61,531	19,944	391
31	37	70,153	71,150	62,490	8,659	170
32	38	72,290	81,173	64,394	16,779	329
41	38	73,444	81,664	65,421	16,243	318
42	40	76,200	85,129	67,876	17,253	338
52	41	79,045	84,911	70,410	14,501	284
62	43	82,100	88,550	73,132	15,419	302
72	44	84,773	86,825	75,513	11,312	222
82	46	88,694	86,819	79,005	7,814	153

If smaller vessels lease days-at-sea from larger vessels, however, there will be no fishing power adjustment to compensate for the lower LPUE. In addition, a 9% mortality adjustment may also be applied. This means that scallop landings and revenues will decline if a small vessel leases days from a larger vessel. For example, if a vessel in group "11" leases 51 open area days from a vessel in group '"82", its landings will still remain at 63,278 pounds, and its revenues from leased days will be $442,946 assuming that the price is $7.00 per pound of scallops. An average vessel in group "82" is estimated to land 88,894 pounds using 51 days-at-sea and earn $620,855 (Table 68). Therefore, the revenue of the smaller vessel will be $177,909 (in Group 11) less than the revenue that the lessor (in Group 82) could obtain from its allocation. As a result, it is unlikely that leasing days from a larger vessel will be profitable for the smaller vessel in group "11" unless the savings in trip and fixed costs outweigh the difference in revenues.

In order to assess the gains from leasing, the increase in boat share and profits should be taken into account, however. The boat shares from leased days are shown in Table 69 and the differences in the boat shares of the lessee and the lessor are shown in Table 70. Boat shares are estimated as 48% of the gross revenue and in case of leased days, savings in trip costs are added to the boat share. This assumption implies that there will be a change in the crew lay system and the trip costs savings will be captured by the owner and net boat shares estimated in Table 69 will be if part of the savings from the trip costs accrued to the crew members. The results show that as long as a vessel leases DAS from a vessel that is either in the same or in a lower HP-length group, the boat share of fishing the open area DAS allocation (51 days in this case) on the leasing vessel will exceed the boat share of the lessor. This surplus will provide opportunity for the lessee to compensate lessor for the amount it could earn by fishing the pounds on her/his own boat and still earn a profit. This analysis does not include any savings in the fixed costs for the lessor or an increase in the fixed costs for the lessee, however. Reduction in fixed costs as a result of the decline in fishing activity could make leasing of DAS more profitable for vessels even if DAS is leased from a larger vessel.

Table 17. The scallop revenue from leased days (51 open area days) compared to the revenue the lessor can obtain from its allocation of 51 open area days

Fish Power group	Lessor 's revenue at 51 days	Lesse's revenue from leasing 51 days											
		11	12	21	22	31	32	41	42	52	62	72	82
11	442,946	442,946	442,946	442,946	442,946	442,946	442,946	442,946	442,946	442,946	442,946	442,946	442,946
12	462,640	442,946	462,640	462,640	462,640	462,640	462,640	462,640	462,640	462,640	462,640	462,640	462,640
21	473,814	442,946	462,640	473,814	473,814	473,814	473,814	473,814	473,814	473,814	473,814	473,814	473,814
22	483,536	442,946	462,640	473,814	483,536	483,536	483,536	483,536	483,536	483,536	483,536	483,536	483,536
31	491,074	442,946	462,640	473,814	483,536	491,074	491,074	491,074	491,074	491,074	491,074	491,074	491,074
32	506,031	442,946	462,640	473,814	483,536	491,074	506,031	506,031	506,031	506,031	506,031	506,031	506,031
41	514,107	442,946	462,640	473,814	483,536	491,074	506,031	514,107	514,107	514,107	514,107	514,107	514,107
42	533,398	442,946	462,640	473,814	483,536	491,074	506,031	514,107	533,398	533,398	533,398	533,398	533,398
52	553,314	442,946	462,640	473,814	483,536	491,074	506,031	514,107	533,398	553,314	553,314	553,314	553,314
62	574,698	442,946	462,640	473,814	483,536	491,074	506,031	514,107	533,398	553,314	574,698	574,698	574,698
72	593,410	442,946	462,640	473,814	483,536	491,074	506,031	514,107	533,398	553,314	574,698	593,410	593,410
82	620,855	442,946	462,640	473,814	483,536	491,074	506,031	514,107	533,398	553,314	574,698	593,410	620,855

Table 18. Boat shares from leased days (51 open area days) compared to lessor's boat share by fishing its allocation of 51 open area days

Fish Power group	Lessor 's boat share at 51 days	Lesse's boat share from leasing 51 days (including savings in trip costs from increase in LP									
		11	12	21	22	31	32	41	42	52	62
11	212,614	218,058	218,058	218,058	218,058	218,058	218,058	218,058	218,058	218,058	218,058
12	222,067	219,241	228,989	228,989	228,989	228,989	228,989	228,989	228,989	228,989	228,989
21	227,431	218,386	228,095	233,604	233,604	233,604	233,604	233,604	233,604	233,604	233,604
22	232,097	219,331	229,083	234,616	239,430	239,430	239,430	239,430	239,430	239,430	239,430
31	235,716	218,390	228,100	233,609	238,403	242,119	242,119	242,119	242,119	242,119	242,119
32	242,895	219,009	228,746	234,271	239,078	242,805	250,201	250,201	250,201	250,201	250,201
41	246,771	218,957	228,692	234,216	239,021	242,748	250,141	254,133	254,133	254,133	254,133
42	256,031	218,977	228,712	234,236	239,043	242,769	250,164	254,156	263,692	263,692	263,692
52	265,591	218,732	228,457	233,975	238,776	242,498	249,884	253,872	263,398	273,233	273,233
62	275,855	218,757	228,483	234,001	238,803	242,526	249,912	253,900	263,428	273,264	283,825
72	284,837	218,447	228,159	233,670	238,465	242,182	249,559	253,541	263,055	272,877	283,423
82	298,010	218,189	227,889	233,394	238,183	241,896	249,264	253,241	262,744	272,555	283,088

Table 19. Difference of the boat shares from leased days (51 open area days) compared to lessor's boat share by fishing its allocation of 51 open area days

	Lessor										
Lessee	11	12	21	22	31	32	41	42	52	62	72
11	5,444	(4,009)	(9,373)	(14,039)	(17,658)	(24,837)	(28,713)	(37,973)	(47,533)	(57,797)	(66,779)
12	6,627	6,922	1,558	(3,109)	(6,727)	(13,906)	(17,782)	(27,042)	(36,602)	(46,866)	(55,848)
21	5,771	6,028	6,174	1,507	(2,112)	(9,291)	(13,167)	(22,427)	(31,987)	(42,251)	(51,233)
22	6,717	7,016	7,185	7,333	3,714	(3,465)	(7,341)	(16,601)	(26,161)	(36,425)	(45,407)
31	5,776	6,033	6,178	6,305	6,403	(776)	(4,652)	(13,912)	(23,472)	(33,736)	(42,718)
32	6,395	6,679	6,840	6,981	7,090	7,306	3,429	(5,830)	(15,390)	(25,654)	(34,636)
41	6,343	6,625	6,785	6,924	7,032	7,246	7,362	(1,898)	(11,458)	(21,722)	(30,704)
42	6,362	6,645	6,806	6,945	7,054	7,269	7,385	7,662	(1,898)	(12,163)	(21,144)
52	6,118	6,390	6,544	6,678	6,782	6,989	7,101	7,367	7,642	(2,622)	(11,604)
62	6,142	6,416	6,571	6,705	6,810	7,017	7,129	7,397	7,673	7,970	(1,012)
72	5,833	6,092	6,239	6,367	6,467	6,664	6,770	7,024	7,286	7,568	7,814
82	5,575	5,822	5,963	6,085	6,180	6,369	6,470	6,713	6,964	7,233	7,468

1.1.12 REFERENCES

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