Summary of Findings by the Center for Independent Experts Regarding Setting Excessive Share Limits for ITQ Fisheries

by John Walden

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Part I: Preface

by

John Walden

EXECUTIVE SUMMARY

The Center for Independent Experts (CIE) provided three individuals to evaluate a report (the Excessive Shares Report) commissioned by the National Marine Fisheries Service (NMFS) for setting an excessive share limit in catch share fisheries, and more specifically, the Surfclam and Ocean Quahog ITQ fishery. The CIE provides scientific expertise to conduct independent scientific peer reviews for NMFS based on specific Terms of Reference (TOR's) provided to the reviewers. Both the CIE and the NMFS Office of Science and Technology consider the purpose of the CIE review to be to examine the scientific merit of reports, and not to make policy recommendations. The three CIE reviewers chosen for this study were Dr. Ani Katchova, University of Kentucky, Dr. Ragnar Arnason, University of Iceland, and Dr. Rigeberto Lopez, University of Connecticut. Dr. James Wilen, University of California-Davis was the Mid-Atlantic Council Scientific and Statistical (SSC) Committee representative who chaired the meeting. The panel met June 21-23, 2011 in Falmouth and Woods Hole, MA to conduct a public review of the report, to accept public comment, and to question the consultants who prepared the report.

The CIE review of the excessive shares report presented unanticipated challenges. The topic of excessive shares in an ITQ fishery is relatively new in NMFS, and the economics needed to fully understand the issue are quite complex. Therefore, the discussion at the public meeting was highly technical and covered a great deal of territory. Additionally, the CIE reviewers were given a large amount of information during the meeting that they would need time to fully review outside of the meeting. Near the conclusion of the meeting it became apparent that the reviewers would have a difficult time reaching a consensus on a number of points before the meeting ended. The panelists agreed that they should end the meeting so they could individually review the material which was presented to them, and prepare their reports. The CIE reviewers also agreed that they would send a copy of their individual reports to the Chair, who would then prepare a summary report based on their individual reports. However, the following week it was learned that the CIE Directorate would not allow the CIE panelists' individual reports to be sent directly to the Chair which put the Chair in the position of being unable to produce a summary report.

In lieu of a formal summary report by the Chair, therefore, this Executive Summary simply lists the findings of the individual reports that were submitted by the CIE reviewers for each Term of Reference (TOR). Each CIE report is then included as a separate chapter in this document. This summary makes no value judgments on the findings of the CIE reviewers, and does not attempt to endorse or reject any of their findings.

Each CIE panel member presented their own findings and did not necessarily agree with one another on their responses to each individual term of reference. However, there were four areas that all three reviewers seemed to agree with in their individual reports. They were:

1. The method proposed by the Technical Group is based on the HHI, which means that evaluation of potential market power is consistent with what is done in other industries.

2. The Technical group appropriately modified the application of the HHI to consider competition from non-SCOQ clams as well as the aggregate share held by fringe holders. Within the framework given, the method proposed did not contain any errors. However, in order to apply the method, more data are needed along with a better understanding of the industry.

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3. More transparency is needed for quota prices. An auction mechanism would be one method that could be used to reveal quota prices.

4. The Technical Group should have paid more attention to the monopsony problem, which is the ability of processors to exert market power on the harvesting sector. This may be of greater concern than the monopoly problem.

TERMS OF REFERENCE (TOR):

1. Describe the Method or Process used by the NMFS Technical Group for determining the maximum possible allowable percentage share of quota ownership that will prevent an entity from obtaining Market power.

Note: There is no disagreement on this TOR as it merely asks the reviewers to provide a description of the methodology used by each reviewer.

Arneson:

Technical group applied the standard theory of competition and market power to the problem, using Horizontal Merger Guidelines.

Katchova:

Described six part process recommended for determining excessive share limit.

Lopez:

Described the seven part process used to determine an excessive share cap, and also described the corollary rule that there should be at least three firms.

"As with any excessive-share cap, the process requires information on ITQ ownership and control, substitutability of products, and definition of relevant markets or size of the market in order to compute the correct market shares."

"In the business literature, there is a widely accepted notion that a Rule of Three structure is optimal because three big and efficient companies (e.g., with more than 10% market share) act as a tripod to ensure that neither destructive competition nor collusion prevails (see Sheth, J.N. and S. Sisodia, *The Rule of Three: Surviving and Thriving in Competitive Markets*. New York: Free Press, 2002)

2. Evaluate the strengths and weaknesses of the proposed method developed by the NMFs Technical Group for determining maximum possible allowable percentage share of quota ownership. Review and comment on the data requirements necessary for applying the proposed methods.

Arnason:

Strengths:

1. It is based on the standard theory of monopolistic competition.
2. It is based on the Horizontal Merger Guidelines. This has the advantage of guaranteeing symmetrical treatment with other industries.
3. It is fairly clear and systematic
4. Within its own framework, it does not contain any serious errors.

Weaknesses:

1. Does not deal with the issues in sufficient depth.
2. Does not systematically cover all the key economic factors necessary for deciding a sensible counter-monopoly policy.
3. Puts too much emphasis on the HHI Index.
4. Contains no formal analysis of the fundamental factors affecting monopolistic behavior in the fisheries.
5. Does not consider the monopsony problem.

"In summary: to set the appropriate 'excessive size' limit in any given fishery a great amount of empirical information and investigation is needed"

Katchova:

Strengths:

1. Follows horizontal Merger guidelines.
2. Technical group appropriately modified the application of the HHI index to consider competition from non-SCOQ clams as well as the aggregate share held by fringe holders.
3. Additional "three firm" rule has support in the literature, but it is unclear if the rule should still be applied if there is a conflict between the two rules.

Weaknesses: (note that Dr. Katchova did not explicitly list weaknesses. This is my interpretation of her text).

1. In order to determine the boundaries of the relevant market, reliable data on prices and quantities are needed, which are not available. In the absence of reliable data, there needs to be an in-depth understanding of the industry, major players, and products.

2. Excessive Share cap will need to be updated over time.
3. HHI is applicable to homogenous products, and not differentiated products, and qualitative data needs to be available whether processors produce differentiated products.
4. Report did not explore monopsony problem, which may be just as important as monopoly power.
5. Reliable data on quota prices are needed.
6. Costs associated with implementation of an excessive share caps as well as monitoring and enforcement are likely to be substantial.

Lopez:

Strengths:

1. Used the Horizontal Merger Guidelines, and a HHI threshold of 2,500, which is deemed the "Gold Standard" for analyzing competition in the United States and abroad. It brings the problem into a class of more generalizable situations for which ready comparisons can be made across fisheries and non-fishery cases.
2. Inclusion of state fisheries, imports and fringe firms in calculation of the HHI. The larger the relevant market or degree of demand substitution from outside the fisheries area, the greater the allowable excessive-share cap.
3. Requiring three "efficient" processors under the suggested HHI will encourage economies of size as well as ensuring a minimum degree of competition in the geographic region of the fisheries, regardless of the size of the relevant market for processed fishery products.

Weaknesses:

1. Focus exclusively on monopoly power at the expense of monopsony power. A fishery is more likely to face monopsony power than monopoly power.
2. Lack of explicit consideration of harvesting and processing efficiency, which may give room to improve performance of the fishery, particularly if market power effects are weak. Cost reductions may reduce or even reverse a firm's incentive to elevate price in the monopoly case.
3. Numerator of Market Shares. The current definition of an excessive-share cap separates ownership and control and can yield a situation where a single processor processes 2/3 of the harvest but only officially controls 1/3 of the quota without owning any. In the standard literature, 2/3 purchase of the total volume would be of concern.
4. The relevant product and geographic markets are not defined, although market shares are computed as the ratio of the quota or cap shares divided by the relevant market.

Implementation of the Method Proposed by the Technical group requires at least the following data:

1. Quota ownership and control
2. Processing volumes and capacity.
3. Size of the relevant market.

3. Evaluate applicability of the proposed methods to the Surfclam/Ocean Quahog ITQ fishery. If there is disagreement with what the NMFS Technical Group recommended, clearly state that and your reason why.

Arnason:

1. Method is superficial; Does not go into sufficient depth.
2. It offers little data about the structure of the industry.
3. Ignores possible costs of monopolistic behavior, the benefits of returns to scale, and the cost of imposing and operating "excessive size" limits.
4. Ignores the monopsony problem.
5. Recommended Excessive Share Cap seems "ad-hoc".
6. Concludes that there is insufficient data to set any cap at this stage, so the prudent course of action is to refrain from doing so.

Katchova:

1. The NMFS have done the best possible analysis given the substantial problems related to data limitations and availability.
2. More transparency is needed for quota prices.
3. There is considerable uncertainty with regards to the size of the market (imports, fringe holders) and market share of participants.
4. The correct determination of post-transfer quota ownership and control is extremely important in the implementation, monitoring and enforcing of the excessive-share cap.
5. Viewed recommendations as general guidelines (perhaps even as lower bounds) for setting an excessive share cap.

Lopez:

1. The approach used by the Technical Group is generic and is applicable to just about any fisheries, provided accurate information is obtained on quota rights and control, boundaries and the relevant market, and efficiency effects of the scale of operation.
2. Although a 30-40% cap may be restrictive if the market is defined too narrowly or if efficiency effects of concentration are ignored, it is likely to be appropriate if there are buying power or monopsony concerns since, for the latter, the relevant market is geographically confined to the fishery in question.
3. Besides the monopsony and efficiency concerns pointed out, the main room for improvement is collecting accurate information about the fishery, the market, and performance indicators such as quota price.
4. The key number emerging from the report is a 40% excessive share cap, which automatically ensures independent harvest supply to sustain at least three processors in the market.
5. There is no constitutional basis to interpret "excessive" solely based on market power, or in this case, monopoly power.

6. In conclusion, an excessive share cap of 30-40 or the two-part cap counterpart might be rather conservative estimates, and that it might not be surprising that, considering efficiency impacts, an excessive share cap of 2/3 of TAC or eventually a natural monopoly or monopsony might be preferable.

4. Evaluate whether the approach outlined by the NMFS Technical Group is reasonable for setting excessive share limits in fisheries managed through catch shares? As part of this TOR, comment on any constraints that may hinder application of the methods proposed by the NMFS Technical Group.

Arnason:

1. The Approach Outlined is inadequate as a general framework for setting excessive share limits in fisheries in general.

Katchova:

1. The approach outlined by the NMFS technical group is generally applicable to other fisheries managed through catch shares.
2. Several factors are very important to take into consideration when applying these methods to other fisheries. These factors include: whether or not the TAC is binding, whether or not quota prices are transparent and are of significant value, the determination of relevant markets and substitutability with other products, whether ITQ are assigned to vessel owners or not, etc.

Lopez:

1. The approach used by the Technical Group is generic and is applicable to just about any fishery, provided accurate information is obtained on quota rights and control, boundaries of the relevant markets, and efficiency effects of scale of operation.
2. The main constraint remains access to the accurate information needed to appropriately implement the approach. As in any market, full and accurate information is needed for markets to work smoothly. Asymmetric information will generate advantages to those who have access to it and will make the regulator's job more imprecise and difficult.

5) *Provide any recommendations for further improvements.*

Arnason:

1. To be usable as guidance for setting excessive share limits in the SCOQ fishery and other ITQ fisheries, the procedures need to be complemented by the following:

    a. A careful general theoretical (discussion) of the factors that influence monopolistic behavior in ITQ fisheries in general
    b. A clear and well-developed prescription as to how to estimate and update the key relationships that are identified by the theoretical study.
    c. Additional steps having to do with the assessment of "deadweight loss" of monopolistic behavior, the possible loss of scale efficiencies that might result from "excessive share" limits and the costs of implementing and operating a

system of "excessive share" limits.

"To carry out these additions and improvements requires considerable amounts of high level expertise and will inevitably be quite time consuming and costly."

Katchova:

1. An open auction or other mechanism to reveal quota prices and make the market for quota transfers liquid and transparent needs to be established.
2. More information can be collected from industry participants regarding market shares, major buyers of processed output, prices paid and received for clam inputs and outputs. There needs to be a general description of all players from crew members to distributors.
3. Further studies need to be done on the cost efficiencies of operating as large processors.
4. Further studies are needed on the monopsonization of the input markets. Monopsonization of the input markets is a larger concern than monopolization of the output markets.
5. Other instruments for controlling market power beyond an excessive share cap should be considered.
6. Monitoring and Enforcement of the excessive share cap will need to be studied and implemented.

"The main challenge is with regards to the application of the proposed methods because of the lack of appropriate data on the size of the market, the major participants and market shares, relevant markets, substitutability of products, and transparency of quota ownership and prices." (Conclusion)

"Overall, the NMFS technical group's study is well executed and provided a good starting point in establishing an excessive-share cap in the Surfclam and Ocean Quahog Fishery." (Conclusion)

Lopez:

1. Focus more on the potential monopsony power effects rather than just the monopoly power, explicitly considering alternative vertical coordination arrangements.
2. Focus more on potential price effects rather than just the HHI, explicitly considering harvesting and processing efficiency effects.
3. Collecting information on the price of the quota, either through creating an auction mechanism to reveal prices or by soliciting this information explicitly from quota holders.

Part II: Peer Review Report

by

Ragnar Arnason

External Independent Peer Review by the Center for Independent Experts

Evaluation of excessive shares study in the Mid-Atlantic surfclam and ocean quahog ITQ fishery

Prepared by

Independent Reviewer: Ragnar Arnason

July 7 2011

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Acronyms

NFMS	National Marine Fisheries Service
MAFMC	Mid-Atlantic Fishery Management Council
SCOQ	Surfclam and ocean quahog
CIE	Center for Independent Experts
ITQ	Individual transferable quotas
TAC	Total allowable catch
SOW	Statement of Work*
TOR	Terms of reference
HH	Herfindahl-Hirchman index
HMG	Horizontal merger guidelines

Executive Summary

1. The surfclam and ocean quahog (SCOQ) fishery was subjected to ITQs (individual transferable quotas) in 1988. Since then industrial concentration in the fishery has increased substantially [Chapter 3, p. 7]

2. In competition theory, market power is defined as the ability of companies to profitably manipulate output (or input) prices. This activity, while profitable for the companies, usually corresponds to an overall economic loss for society. [Chapter 3, p. 8]

3. Increased concentration in ITQ fisheries is a matter of social concern. Accumulation of quota-share holdings may provide companies with market power and enable them to influence prices in input and output markets. [Chapter 1, p. 5]

4. The Magnuson-Stevens Act states that ITQ privilege programs should ensure that limited access privilege holders do not acquire an excessive share of the total limited access privileges in the program. The National Standard 4 of the Magnuson Act imposes a similar requirement. [Chapter 1, p. 5]

5. Measures of industrial concentration in the SCOQ fishery (the Herfindahl-Hirchman index) suggests that marketing power <u>may</u> exist in the fishery, particularly in its harvesting and processing sectors, but less so in quota holdings. [Chapter 3, pp.7-8]

6. These concentration measures are only indicative of the possibility of market power. They do not establish that it actually exists. In fact, the report by the NMFS Technical Group does not provide evidence of actual market power in the SCOQ fishery. [Chapter 3, pp. 8-9]

7. It should be noted that even when market power exists it may not be exercised for a number of reasons. In fact, the report by the NMFS Technical Group does not find any evidence of the actual exercise of market power in the SCOQ fishery [Chapter 3, p. 8]

8. Due to the inherent complexity of ITQ fisheries, the determination of market power is more complicated than in more standard industries. It follows that to determine "excessive shares" in the sense of generating market power requires deeper analysis and more complicated expressions [Chapter 3, pp. 8-10, Addendum 2.]

9. In an ITQ fishery the main tool for manipulating prices and, thus, exercising market power is to withhold quotas from fishing. Quotas may be held by fishers, fish processors, quota-holders which are neither and any combination of the three. Clearly the commercial interests of these types of players are not identical and, in some respects, they may be contrary. It follows that the distribution of quota holdings or quota control among these three types of players in the fishery is a major factor in the possible exercise of market power. [Chapter 3, pp. 9-10]

10. A limited theoretical analysis to account for some of the complex aspects of market power and monopolistic behavior in ITQ fisheries suggests that what constitutes excessive shares (in the sense of generating market power) is a function of a number of empirical variables in the fishery including various elasticities, the market price of quota, the output price of fish and other variables. In a comparatively simple framework this function may be expressed as:

$$\alpha_{crit} = \Lambda(E(p,H), E(w,H), E(s,H), s/p, \beta),$$

where α_{crit} is the critical share of the company before it becomes excessive. The first three terms of the function Λ denote the elasticities of output price, input price and

quota price with respect to harvest. *s* represents the market price of quota and *p* the price of landed catch. Finally, β is the ratio of costs to revenues for the company.

Obviously, to determine "excessive share" in a sensible manner requires an empirical estimate of all of the variables entering the function Λ. More realistic situations will undoubtedly involve more variables [Chapter 3, pp. 9-10 and Addendum 2]

11. The fundamental economic justification for controlling market power and, more generally, curtailing monopolistic behavior is to avoid the "deadweight loss of monopolies" which is the economic cost resulting from altering quantities to influence prices. [Chapter 3, p. 10 and Addendum 1]

12. However, in order to form a socially beneficial policy regarding market power, this cost must be balanced against (i) the possible gains in economic efficiency due to scale economies that may be captured by large companies and (ii) the cost of implementing and enforcing the regulations to curtail market power. [Chapter 3, p. 11]

13. Limitations of company share of quotas or relative size in general are a particularly blunt tool to curtail the exercise of market power. It may well be preferable to ignore company size but focus instead on methods to counteract monopolistic behavior more directly. [Chapter 3, p 11. and Addendum 1]

14. As a procedure to determine "excessive share" limits in the SCOQ fishery, the method proposed by the Technical Group is unsatisfactory. Among other things:

    (1) It does not go into sufficient depth in analyzing this particular industry and the role of ITQs in possible monopolistic behavior by the companies.

    (2) It offers little data about the structure of the industry and the operations of the key markets and virtually none on the relationships that determine what constitutes an "excessive share".

    (3) It totally ignores certain key aspects of the economic situation such as the cost of possible monopolistic behavior, the possible benefits of returns to scale and the cost of imposing and operating "excessive share" limits.

    As a result, the recommended "excessive share cap" for the SCOQ fishery has little if any foundation in either solid theory or empirical data. [Chapter 3, pp.13-14]

15. My conclusion is that the evidence provided in the Technical Group report is insufficient to set any particular share cap on the companies in this fishery. Given the possible costs of an erroneous cap, the prudent course of action seems to be to set no cap at the current time. [Chapter 3, p. 14]

16. It is further my conclusion that the approach outlined in the Technical Group Report, although a helpful step in the right direction, is inadequate as a general framework for setting excessive share limits in fisheries in general. [Chapter 3, p. 14]

17. Given the high economic value of fisheries already under ITQs in the US, the legal requirement to set excessive share limits and the potential economic costs of setting such shares inappropriately, it is urgent to develop a theoretically consistent and empirically robust procedure to assess what constitutes "excessive share". It is strongly recommended that concerted research and development work of this nature be initiated as soon as possible. [Chapter 3, p. 15]

1.   Background

On May 12, 2011, I agreed to serve, on behalf of the Center for Independent Experts (CIE), as an independent external reviewer of the "Evaluation of excessive shares study in the Mid-Atlantic surfclam and ocean quahog ITQ fishery" that had been prepared for the National Marine Fisheries Service (NMFS) and the Mid-Atlantic Fishery Management Council (MAFMC) by a Technical Group of Experts.

The surfclam and ocean quahog (SCOQ) fishery was subjected to an ITQ (individual transferable quota) system in 1988. Under the ITQ system, economic efficiency of the fishery seems to have improved substantially (Mitchell et al. 2011, MAFMC and NMFS 2010). Presumably related to this, industrial concentration in the fishery has increased, especially when measured by the number and size distribution of active companies and fishing vessels (Mitchell et al. 2011, MAFMC and NMFS 2010). Apparently there has also been some, although smaller, increase in the concentration in quota holdings but the extent of this is less clear (Mitchell et al. 2011, Social Sciences Branch 2009).

Increased concentration in ITQ fisheries is a matter of social concern. Accumulation of quota-share holdings may provide companies with market power and enable them to influence prices in input and output markets. The reauthorized Magnuson-Stevens Act (2006) states that ITQ privilege programs should ensure that limited access privilege holders do not acquire an excessive share of the total limited access privileges in the program. The National Standard 4 of the Magnuson Act requires that fishing privilege allocations be carried out so that "no particular individual, corporation, or other entity acquires an excessive share of such privileges" (SOW, appendix 2). It is, however, not clear what constitutes an "excessive share" in this context.

To deal with the issue of "excessive share", a Technical Group of Experts (referred to in the TOR as the NMFS Technical Group) was created. This technical Group, whose membership was provided by the consultancy company Compass Lexecon, submitted a report titled "Recommendations for Excessive-Share Limits in the Surfclam and Ocean Quahog Fisheries" (Mitchell et al. 2011). This report (i) outlines a procedure for determining an "excessive share" in any fishery and (ii) suggests an excess share limit for the SCOQ fishery.

Given this context, I was specifically requested to address the following issues:

1.   Describe the method or process used by the NMFS Technical Group for determining the maximum possible allowable percentage share of quota ownership that will prevent an entity from obtaining market power.

2.   Evaluate the strengths and weaknesses of the proposed method developed by the NMFS Technical group for determining maximum possible allowable percentage share of quota ownership. Review and comment on the data requirements necessary for applying the proposed methods.

3.   Evaluate application of the proposed methods to the Surfclam/Ocean Quahog ITQ fishery. If there is disagreement with what the NMFS Technical Group recommended, clearly state that and your reason why.

4.   Evaluate whether the approach outlined by the NMFS Technical group is reasonable for setting excessive share limits in fisheries managed through catch shares? As part of

this TOR, comment on any constraints that may hinder application of the methods proposed by the NMFS Technical group.

5. Provide any recommendations for further improvement

Further details of my obligations under this contract are set out in the Statement of Work a copy of which is found in Appendix 2 of this report.

My work on this review was primarily carried out during the period June 15 to July 7 2011. The first part of the period was used to collect background information and study the material on this issue provided by the CIE. A Panel Review meeting took place in Falmouth and Woods Hole on June 21-23. The period after that was used to assess the information and findings at this meeting to undertake further analysis of the issues and to prepare this report.

2. Description of Reviewer's role in Review Activities

The review work was for the most part carried out during the period June 15 to July 7, 2011. It is primarily based on (i) two reports supplied to me by the CIE (Mitchell et al. 2011 and MAFMC and NMFS 2010, see bibliography), (ii) a number of background articles and reports that I located (see bibliography),(iii) the background presentation given by the MAFMC representative (vice chairman Lee Anderson)and the presentation given by Technical Group representatives (S. Peterson and G. Mitchell) at the Peer Review Meeting on June 21-23 and questions and discussions during that meeting, (iv) further information about the SCOQ fishery provided by the staff at the Northeast Fisheries Science Center (especially J. Walden) and (v) my own general knowledge on the subject. Much of the written material used in this review is listed in the bibliography.

During the Peer Review Meeting June 21-23, I had the opportunity to ask questions for clarification and discuss the various aspects of the report by the Technical Group and the competitive situation in general. During that meeting I received honest and clear answers to all my questions. The general discussion was also, in my opinion, extremely informative and useful to all participants.

During the Peer Review Meeting I inevitably became privy to views and comments made by my fellow reviewers. This report, however, contains exclusively my own assessments and evaluations.

In further detail my review activities proceeded as follows:

- June 15-20. Collect and study background material including the documentation supplied by the CIE.
- June 20-June 24. Travel to and attend the panel meeting at NEFSC in Woods Hole.
- June 25-July 7. Study of material, further analysis and the preparation of my draft review report.

3. Summary of findings

The Surf Clam and Ocean Quahog (SCOQ) fishery off the Atlantic coast of the US has a considerable history going back to at least to the 1960s (FAO 2011). This is not a particularly large fishery. In recent years the harvest in federal waters has been just over 6 million bushels (MAFMC and NMFS 2010) with an approximate landed value of between $50 and 60 million.[1] Landings have been quite stable over time and so, apparently, have unit prices of landings.

From the 1970s until 1988, this fishery was regulated by a number of technical measures including restrictions on vessel entry, fishing effort, seasons and fishing gear (Adelaja et al. 1998, MAFMC and NMFS 2010). These policies led to an increasingly over-capitalized and inefficient fishery (Marvin, 1992; Adelaja et al. 1998). Following amendment 8 to the Fishery Management Plan for this fishery set by the MAFMC in 1988, the SCOQ fishery was subjected to an ITQ system leading to a substantially improved economic efficiency (MAFMC and NFMS 2010).

Concentration

Since the adoption of the ITQ system in 1988, there has been substantially increased concentration in the fishery with respect to the number of active fishing vessels and the number of processing companies. There also seems to have been certain concentration in quota ownership although, apparently, to a lesser degree (Social Science Branch 2009, Mitchell et al. 2011).

The current level of concentration in the industry is to a certain extent measured by the so-called Herfindahl-Hirchmann (HH) index (Hirchman 1945, Herfindahl 1950).[2] According to the Technical Group Report (Mitchell et al 2011), the number of processing plants has been reduced from 44 in 1979 to 12 in 2011. In terms of purchases the HH-index for surfclams grew from 2068 in 2003 to 3134 in 2008 and that for ocean quahogs from 3431 to 4369 (Mitchell et al. 2011). Similar statistics for the development of concentration in quota-holdings and harvesting are not available. However, in 2009, the combined (both species) HH-index for quota holdings was 993 and for the harvesting activity 2890 (Mitchell et al. 2011).

These values of the HH index may be compared to the thresholds defined in the US government Horizontal Merger Guidelines (anonymous 2010) according to which industries with an HH index below 1500 are considered unconcentrated and those with an HH index value above 2500 highly concentrated.

Market power

In competition theory, market power refers to the ability of companies to profitably manipulate output (or input) prices. More formally, market power may be defined to exist

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[1] This estimate assumes a landings price of $12 for a bushel of surfclams and $6 for a bushel of ocean quahog.
[2] The HH-index is just one of many possible single-number-measures of concentration. As all single-number-measures of complicated phenomena, this measure suffers from severe limitations one of which is the lack of uniqueness, i.e. the same index number generally corresponds to many different combinations of company sizes and number. It is worth noting that as pointed out by Hirchman (1964), his initial definition and use of this index preceded that of Herfindahl by five years.

when a firm (or a group of firms, acting jointly) are able to raise output price above the competitive level without losing sufficient sales to make the price increase unprofitable (Landes and Posner 1981, Tirole 1989). Given this definition, some degree of market concentration is obviously necessary to provide market power to one or more companies. It is, however, not by any means sufficient. To see this, one only has to note that a single company (therefore having an HH-index of 10000) operating in a market with perfectly elastic supply and demand curves has no market power.

According to the concentration thresholds set by the Horizontal Merger Guidelines mentioned above, there are indications of market power in the harvesting and processing activity but much less so for quota holdings. It should be stressed, however, that due to the imperfectness of the HH-index and the gap between HH-concentration measures and market power, these are only indications of possible market power. The HH-index measures obtained by no means establish that there actually exists market power in these sectors of the SCOQ fishing industry. By the same token, the low HH-index measure of quota holdings can not be taken to show that there is no market power in this sector of the SCOQ fishery. Indeed, there are indications that the real control of quotas may well be more concentrated than the formal ownership.

Exercise of market power

It is important to realize that the existence of market power (in the sense defined above) does not imply that it will be exercised. There can be several reasons for this including the following:

(1) The company having market power does not realize this and acts as if it had none.
(2) The company simply prefers to accept normal (rather than monopoly) profits possibly for reasons of maintaining its reputation or because of perceived social responsibility.
(3) The company is deterred by the illegality of and possible sanctions for exercising market power.
(4) The exercise of market power requires co-ordination with other companies which is too difficult (or costly) to arrange and maintain.

It follows that even if it can be shown that market power exists, it has not been established that this power is actually being exercised.

Market power in an ITQ fishery

Due to the complexity of ITQ fisheries (caused by the quota constraint, quota trading and the inherently dynamic nature of the fishery and quota holdings), the determination of market power in an ITQ fishery is much more involved than for standard (textbook) industries. It follows that the relevant relationships must be carefully analyzed and examined in order to determine the existence of market power. Certain aspects of possibly major importance are listed below:

(1) In an ITQ fishery, to the effect that monopolistic behavior depends on constraining quantity, market power resides largely with quota holders. Quota use determines catches and subsequent outputs in the production chain. All other quantities entering

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the production chain depend functionally (via production functions) on the volume of catches with, generally, relatively little scope for substitutions.

(2)   The ITQ system alters opportunities for monopolistic behavior in fisheries in two somewhat opposite ways:

    (i)   The imposition of an upper level quantity constraint (the TAC) reduces the scope for quantity adjustments in the fishery (and downstream activities). In fact, the TAC may easily be less than the monopoly point for the companies.

    (ii)   The system erects certain barriers to entry into the fishery — newcomers need to buy quotas to become active in the fishery. This barrier is similar or the situation in the retail business where the competitors control the available sites for setting up business.

(3)   It follows from the previous two points that in an ITQ fishery the main instrument for exercising market power is to withhold quotas from being fished. This does not mean of course that there are no opportunities for other types of monopolistic activity. The point is simply that in an ITQ fishery, this is the most important quantity for monopolistic manipulation and, moreover, the one that is made available to the companies by the establishment of the ITQ system.

(4)   As in any other situation of possible monopolistic behavior, the structure of the industry is of major importance. In the SCOQ fishery, the main players appear to be (i) quota holders, (ii) fishing companies and (iii) processing companies. Further, processors and wholesale distributers may also play a role but that is ignored here. Some companies may be involved as one or more of these basic players. The combination possibilities are summarized in the following figure

Figure 1
Main fishery players and their possible configuration
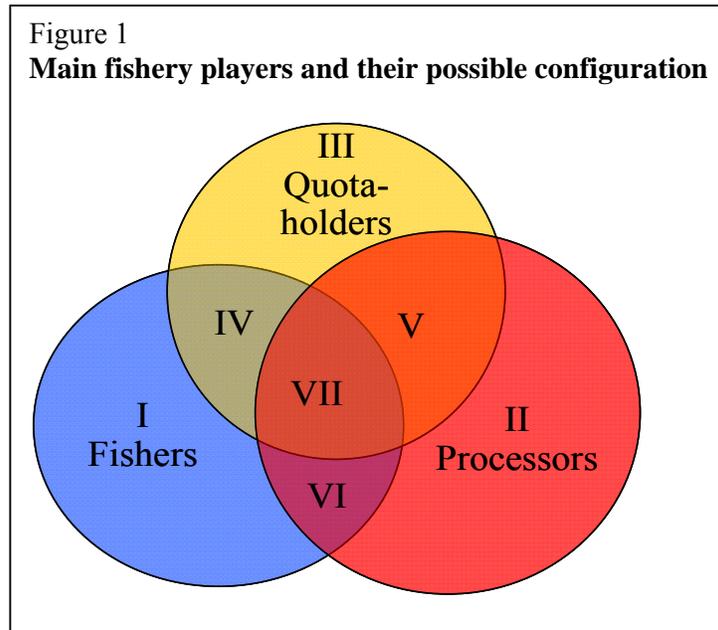
As shown in the figure, there can be various types of companies in this industry. These include (i) pure quota-holders, (ii) pure fishermen and (iii) pure processors. But there can also be any combination of these three. All in all there are seven possible

configurations of companies. From the data supplied (MAFMC and NMFS 2010 and Mitchell et al. 2011) as well as other information (see Appendix 1), it appears that most or all of the possible configurations actually exist in the fishery.

It can be shown that the possible monopolistic profit maximizing behavior differs in general from one configuration of companies to the other.[3] It immediately follows that the appropriate policy response depends on the type of company in question and, consequently, on the overall configuration of companies in the industry.

A limited attempt to account for some of these aspects of an ITQ fishery in the analysis of market power points is presented in an Addendum 2 to this report. This analysis, limited as it is, suggests that in an ITQ fishery market power and monopolistic behavior on that basis is quite complex. A basic condition for the existence of market power derived in Addendum 2 is:

(1) $$\alpha(i) > \cfrac{1}{1 + E(s,H) + \left(\beta(i) \cdot E(w,H) - E(p,H)\right) \cdot \dfrac{p}{s}}$$

This expression gives the relative size of company i (share of fishery or quotas) denoted by $\alpha(i)$, that is necessary for market power. This may be referred to as the critical size. On the right-hand side of the inequality; p/s is the output price to quota price ratio, $\beta(i)$ is the cost to revenue ratio of the company and $E(s,H)$, $E(w,H)$, $E(p,H)$ are the respective elasticities of quota price, input prices and output price with respect to total harvest volume. Needless to say, this expression accounts for market power in the output market, input market (monopsony) and the market for quotas.

From expression (1), we immediately derive a set of important conclusions of general validity:

(1)   The determination of the critical company size (before market power is gained) is a complicated matter involving a number of variables.

(2)   It immediately follows that an extensive empirical investigation is needed before the appropriate size limit is determined.

(3)   A limited analysis considering e.g. only the market power in the output market and the elasticity of price w.r.t. harvests is inadequate in the sense that it can easily lead to erroneous conclusions. (Note for instance that the $E(s,H)$ works in an opposite way to the other elasticities) .

(4)   For seemingly reasonable values of the variables on the right-hand-side of (1), the critical relative size of a company (before market power is gained) appears to be quite substantial. This is discussed at some length in Addendum 2.[4]

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[3]   This is touched upon but not really explored in Addendum 2.
[4]   In Addendum 2, based on reasonable guestimates of the values of the arguments in (1), was calculated to be about 83%.

Controlling market power

The fundamental economic justification for controlling market power and, generally, curtailing monopolistic behavior is to avoid the economic "deadweight loss of monopolies" (Varian 1984, Tirole 1989. See Addendum 1). However, it must be realized that there may be costs involved. The most obvious ones are:

(1)   Losses in the efficiency of the economic activity in question
(2)   Costs of imposing and enforcing the controls on market power.

Clearly, for sensible policy, these costs have to be balanced against the potential gains from reducing the "deadweight loss" of monopolistic behavior.

There are many ways to control or counteract market power (Tirole 1989). The method under consideration in this study is to set an upper limit on the share of quotas, the so-called "excessive share" limit that may be held (or controlled) by any one entity. This corresponds to a limitation on company size.

It should be noted that the "excessive size" limit is an extremely imprecise tool. It may for instance hit companies that have not exercised market power or it may be bypassed by co-ordination between companies. A superior method, although much more complicated to implement, is not to restrict company size but to counteract monopolistic behavior directly (see Addendum 1 to this report).

It is important to realize that relatively large companies are often the result of economic returns to scale. In other words, relatively large companies are simply economically more efficient than smaller companies. This often applies in fisheries, especially comparatively small ones as the SCOQ fishery. It follows that limiting the size of companies in such fisheries may forgo the social gains that can be had by reaping the economic benefits of returns to scale. This is discussed in Addendum 1 to this report, where it is shown that the loss in efficiency due to a size limit on companies can easily outweigh the gains from reduced market power.

Imposing and enforcing constraints on monopolistic behavior is inevitably costly. In some cases this cost can be very high. Additional costs are borne by companies which, inevitably try to find ways to adjust to and even circumvent any binding restrictions. These costs must also be set against the potential gains of less monopolistic behavior.

Responses to the specific items in the TOR

1.   *Describe the method or process used by the NMFS Technical Group for determining the maximum possible allowable percentage share of quota ownership that will prevent an entity from obtaining market power*

The technical group (Mitchell et al. 2011) applies the standard theory of competition and market power to the problem. The method is in accordance with the procedure suggested in the US government *Horizontal Merger Guidelines* (anonymous 2010). This is to a certain, but limited, extent complemented by an interpretation of some aspects attributed to the ITQ system in the SCOQ fishery.

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In essence the method applied to the SCOQ fishery specifically is as follows:

(1) The HH-index is applied to measure concentration in the various sectors of the industry. The Technical Group finds a rather low concentration of quota ownership, but high concentration of quota use (harvesting) and in processing.

(2) The HH-index outcomes are compared with the thresholds in the *Horizontal Merger Guidelines* (anonymous 2010) apparently suggesting that sectors exceeding these thresholds warrant particular consideration.

(3) Certain factors that limit market power (e.g. elasticities) are identified and their values speculated about. On this basis, apparently, the Technical Group is particularly concerned about output markets (monopoly) but pays comparatively little attention to input markets (monoposony).

(4) The industry structure, market attributes and possible monopolistic behavior under the ITQ system are discussed in fairly general terms without formal analysis or much empirical data.

(5) On this basis, conclusions are drawn about the need for imposing excessive share limits in terms of quota holdings in the fishery

(6) Finally, on this basis of the above, "reasonable" excessive size limits in the SCOQ fishery are proposed without, however, providing good arguments for the proposals.

In addition to this, the Technical Group specifies a more general approach to setting excessive share limits in ITQ fisheries in general. This approach and its data and research requirements are summarized in Table ES-1. The procedure proposed is in broad terms in accordance with the one described for the SCOQ fishery above. It is in many respects a sensible and useful one.

2. *Evaluate the strengths and weaknesses of the proposed method developed by the NMFS Technical group for determining maximum possible allowable percentage share of quota ownership. Review and comment on the data requirements necessary for applying the proposed methods.*

 B. Strengths
 The approach described in the Technical Group Report (Mitchell et al. 2011) has certain important strengths:
 (1) It is based on the standard theory of monopolistic competition.
 (2) It is based on Horizontal Merger Guidelines (HMG), This has the advantage of guaranteeing symmetrical treatment with other industries.
 (3) It is fairly clear and systematic.
 (4) Within its own framework, it does not contain any serious errors as far as I could see.

B. Weaknesses

The approach proposed, however, also suffers from significant weaknesses.

(1) It is fairly superficial in the sense that it does not deal with the issues in sufficient depth. This applies in particular to the analysis of the ITQ system and its role in the creation and exercise of market power.

(2) It does not systematically cover all the key economic factors necessary for deciding a sensible counter-monopoly policy. In particular, it does not discuss (i) the deadweight loss of monopoly, (ii) the loss of economic efficiency that may result from counter-monopoly policies and (iii) the cost of imposing, enforcing and adjusting to such policies.

(3) It puts too much emphasis on the HH-index. This, as already discussed, suffers from severe limitations. It is also more appropriate to markets for homogenous goods which may be the case for quotas but is certainly not the case in the SCOQ product market and hardly in the market for landings.

(4) It contains no formal analysis of the fundamental factors affecting monopolistic behavior in the fisheries operating under ITQs. Addendum 2 to this report demonstrates that such an analysis in crucial.

(5) It hardly considers the monopsony problem (distributors vs. processors, processors vs. fishers) which may be of major importance in many fisheries including the SCOQ one.

C. Data requirements.

The needs for data to determine sensible "excessive share" limits are inadequately specified in the Technical Group Report. This, presumably, is primarily because the analysis needed to specify these data is missing in the report. The analysis in Addendum 2 suggests some of the data that are needed. These include (i) various price elasticities with respect to total harvest (output price, input prices and quota prices), (ii) the ratio of costs to revenues and (iii) the quota price to output price ratio. A more complete analysis would undoubtedly add more variables. To calculate the elasticities basically requires the estimation of demand and supply curves, which is equivalent to estimates of the production (or profit) functions at the various levels of the industry. In addition to this, data on the industry structure, level of quota holdings in each segment, possible company co-operation and collusion need to be obtained and investigated. Since all of these relationships and variables may alter over time, these data, moreover, need to be continuously updated. In summary: to set the appropriate "excessive size" limit in any given fishery a great amount of empirical information and investigation is needed.

3. *Evaluate application of the proposed methods to the Surfclam/Ocean Quahog ITQ fishery. If there is disagreement with what the NMFS Technical Group recommended, clearly state that and your reason why.*

As already stated above, as a method to determine "excessive share" limits in the SCOQ fishery, the method proposed by the Technical Group suffers from serious weaknesses.

(1) It is quite superficial; it does not go into sufficient depth in analyzing this particular industry and the role of ITQs in any possible monopolistic behavior by the companies.

(2) It offers little data about the structure of the industry and market operation and virtually none about the crucial relationships including the key elasticities.

(3) It totally ignores important aspects of the situation such as the possible cost of monopolistic behavior, the benefits of returns to scale and the cost of imposing and operating "excessive size" limits.

(4) It for the most part ignores the monopsony problem.

(5) Its recommendation for an "excessive size" limit in this fishery seems rather 'ad hoc' and apparently not based on a solid theoretical or empirical foundation even within their rather limited frame of analysis.

I disagree with the Technical Group's recommendation about an excessive share cap in the SCOQ fishery. My disagreement is not that the proposed cap is necessarily wrong or that the two part cap is inappropriate. My disagreement is that I don't see any reasonable basis in the report or in the other data about this fishery that I have collected (see Appendix 1) to set this cap. If anything my own investigations, partly presented in Addendum 2 and the first part of this report, suggest that to the extent that a cap should be set, it should be substantially higher.

My basic conclusion is that there are insufficient data to set any cap at this stage and, therefore, especially given the possible costs involved, the prudent course of action is to refrain from doing so.

4. *Evaluate whether the approach outlined by the NMFS Technical group is reasonable for setting excessive share limits in fisheries managed through catch shares? As part of this TOR, comment on any constraints that may hinder application of the methods proposed by the NMFS Technical group.*

As already discussed above, the approach outlined in the *Technical Group* Report suffers from serious weaknesses of depth and omission. In particular:

(1) It lacks analysis of the role and effect of ITQs in monopolistic behavior. One consequence is that it does not identify the key relationships and variables that need to be empirically estimated. Another is that it does not explicitly relate the critical share to the empirical facts of the fishery situation.

(2) It omits dealing with key elements of the monopoly situation including (i) the deadweight loss of monopolistic behavior, (ii) the potential efficiency gains from exploiting returns to scale and (iii) the cost of implementing and operating "excessive share" limits.

Therefore, in my opinion, the approach as outlined in the Technical Group Report is inadequate as a general framework for setting excessive share limits in fisheries in general.

5.   *Provide recommendations for further improvement*s

The procedure in the Technical Group Report as outlined e.g. in Table ES-1 and discussed in further detail in chapter VI of the report is, in my opinion, quite helpful. However, to be usable as guidance for setting excessive share limits in the SCOQ fishery and other ITQ fisheries it needs to be complemented by the following.

(i)   A careful general theoretical of the factors that influence monopolistic behavior in ITQ fisheries in general.

(ii)   A clear and well-developed prescription as to how to estimate and update the key relationships that are indentified by the theoretical study.

(iii) Additional steps having to do with the assessment of the "deadweight loss" of monopolistic behavior, the possible loss of scale efficiencies that might results from "excessive share" limits and the costs of implementing and operating a system of "excessive share" limits.

To carry out these additions and improvements requires considerable amounts of high level expertise and will inevitably be quite time-consuming and costly. However, given the number and economic value of fisheries already and potentially under ITQs in the US, the legal requirement to set excessive share limits, and the potential economic costs of setting such shares inappropriately, making this investment seems like a sensible way to proceed.

4.   Conclusions and recommendations

What constitutes an excessive share in an ITQ fishery is a complicated issue. Because of the complications of ITQs and the dynamic nature of fisheries and ITQ-holdings, it is probably substantially more complicated than problems of limited competition in general.

The report submitted by the NMFS Technical Group (Mitchell et al. 2011) represent, a useful step toward understanding these issues. However, it is just one a step. It is, in my opinion, too lacking in the depth of its analysis and too narrow in scope to be acceptable to set sensible "excessive share" limits in both the SCOQ fishery and ITQ fisheries in general. More detailed reasons for this conclusion are provided in the main text of this report, especially chapter 3 and its addenda.

It is recommended that the work begun by the Technical Group Report be continued by further investigation into the conditions for monopolistic behavior in ITQ fisheries and the socially appropriate methods to deal with the problem. As in the Technical Group Report, this work should aim at developing theoretically consistent and empirically feasible procedures for judging the appropriate excessive share limits in ITQ fisheries in general.

Addendum 1
Monopolistic behavior: Basic theory

A general profit function for a company may be written as:

$$\pi(q, p(q)),$$

where q represents the production quantity and $p(q)$ the input and output prices faced by this company. These may in general depend on the quantity produced by the company with the first derivative of p being negative (more generally non-positive) for output prices and positive (more generally non-negative) for input prices. The profit function itself should be dome shaped in its first argument and monotonically increasing in output prices and decreasing in input prices.

For illustrative purposes, it is useful to write this profit function more explicitly as:

$$\pi(q, p(q)) = v(q) \cdot q - C(q, w(q)),$$

where v refers to output and w to input prices and $C(.,.)$ is the company's cost function.

In this context, market power exists if the company is large enough relative to the market detect a change in market prices if it alters the quantity, q, or, alternatively, if it can alter the price without the quantity dropping to zero.[5]

The socially optimal output level takes prices as exogenous and is defined by the condition:

$$\pi_1(q, p(q)) = 0,$$

where π_1 denotes the first derivative of the profit function w.r.t. the first argument. Let us refer to the socially optimal output level by q^*.

Firms with market power can affect prices by altering output and therefore do not generally take prices as exogenous. Their profit maximizing production level consequently is defined by:

$$\pi_1(q, p(q)) + \pi_2(q, p(q)) \cdot p_q = 0.$$

For both input and output prices the 2nd term would be negative provided $p_q \neq 0$.[6] It follows from the usual shape of the profit function that the monopoly production level, q_{mon}, say, is less than the socially optimal one, i.e., $q_{mon} \leq q^*$.

The monopoly situation is often illustrated as in Figure 1. In this figure, the monopolist is faced with a downward sloping demand curve, so he perceives $p_q < 0$. Therefore, rather than setting the quantity at the socially optimal level, q_{opt}, where the marginal profits

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[5]   In more technical language, the requirement for the existence of market power is that the elasticity of the output demand function and the input supply functions, as seen by the firm, be less than infinite.

[6]   Note that $p_q = 0$ corresponds to perfectly elastic demand and supply functions.

are zero and the market price will be p_{opt}, he maximizes his profits by setting the quantity at q_{mon}, corresponding to a higher price p_{opt}. So, under the monopoly, the quantity is less and the market clearing price is higher than for the socially optimal behavior.
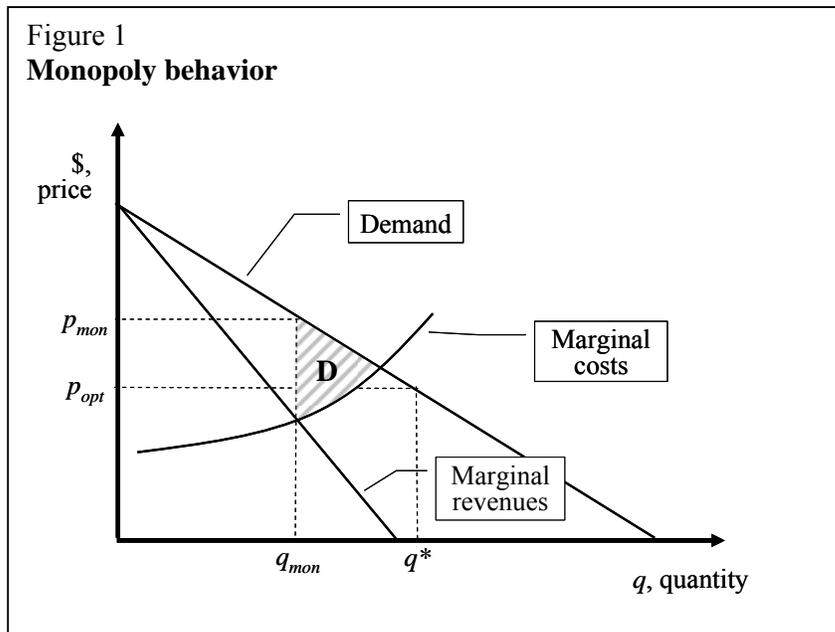
Monopolistic behavior results in a social loss, a limited measure of which is often referred to as the deadweight loss of monopoly (Varian 1984). [7] This loss is illustrated as the striped area in Figure 1.

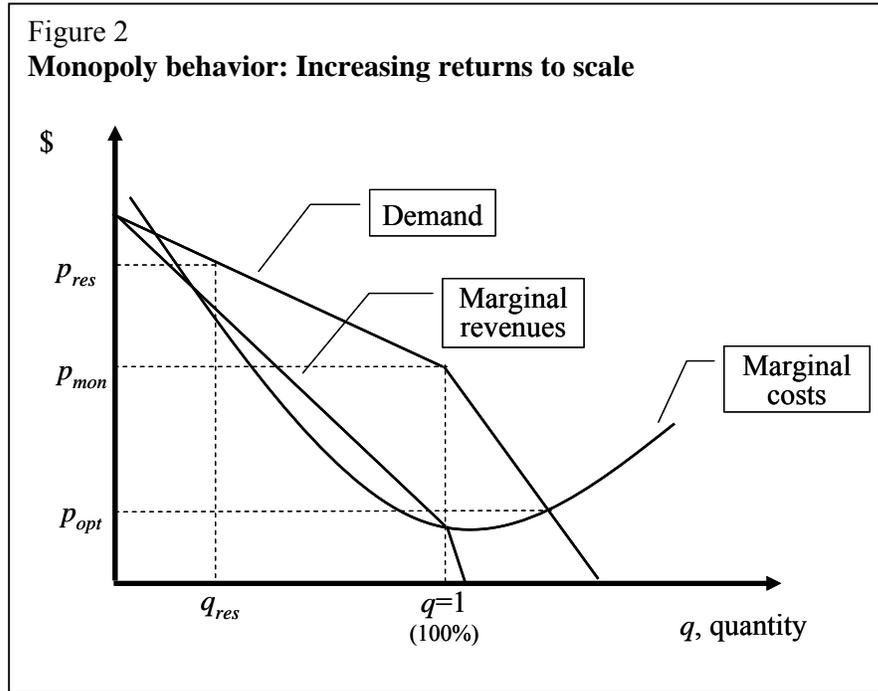The deadweight loss of monopoly represents reduced economic efficiency and is the main economic reason for combating monopolistic behavior. However it is important to realize that this deadweight loss is often not very great and must, whatever it is, be set against any possible social benefits the monopoly (or oligopoly) may confer.

Figure 1
Monopoly behavior

An important possible gain stemming from large companies relative to the total market (or industry) is that they may be able to reap returns to scale. This happens when the marginal cost function in Figure 1 is falling rather than rising and it corresponds to a situation when the marginal profit function is increasing rather than falling (non-concave) over some interval. If this is the case, forcing the large company to be reduced in order to curtail monopoly power may actually reduce overall social benefits. This is because the deadweight losses of monopoly behavior are less the gains from the scale economies realized by the large company.

A possible situation of this kind is illustrated in Figure 2. In this figure, strong increasing returns to scale result in a decreasing marginal cost function over a wide range of output. The demand function is illustrated as seen by the company. This is kinked at its 100% share of the market because the elasticity of demand (the elasticity of the demand curve) increases when the company gets competitors. The company maximizes its profits by producing at $q=1$ where it has 100% of the market. The price it receives at this quantity is p_{mon}, while the socially optimal price is p_{opt} which is much lower and at which price the total quantity would be higher. Consequently, this monopoly behavior results in a monopoly deadweight loss, i.e. a social loss.

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[7] The deadweight loss of monopoly is a limited measure of the actual social loss because it doesn´t involve general equilibrium considerations or consider the dynamic or economic growth impacts of the monopolistic behavior.

Let us now assume that in an attempt to rectify this situation the maximum relative size of the company is restricted to some fraction of the total market indicated by q_{res} in Figure 2. But at this quantity most of the returns to scale are lost and the actual market price, $p_{re,}$, is higher than under the unrestricted monopoly. It is easy to check that the total consumer and producer surplus under the restricted company size situation is less than in the monopoly situation. In other words, the deadweight loss of monopoly in the initial situation is less than the loss in returns to scale in the restricted situation.

Figure 2
Monopoly behavior: Increasing returns to scale

$$\$$$

Demand

Marginal revenues

Marginal costs

p_{res}

p_{mon}

p_{opt}

q_{res}

$q=1$
(100%)

q, quantity

The situation depicted in Figure 2 is often referred to as <u>natural monopoly</u>. This is because the marginal cost function is still declining at the size of the market (albeit not at the optimal size of the market as the figure is drawn). Since the situation is one of natural monopoly, it is not a good idea to restrict the size of the company.

Note that this does not suggest that the initial situation of monopoly is ideal. There is a significant deadweight loss in that situation as we have seen. The point is that dealing with that situation by restricting company size is counterproductive — it results in more losses than gains. A more appropriate policy is to permit the natural monopolist to persist but find ways to reduce the price he is charging.

Addendum 2
Monopolistic behavior in an ITQ fishery: Analysis

In an ITQ fishery, the harvest volume (the basic quantity in the fishery) is bounded above by the TAC (total allowable catch). If the TAC is binding, there is limited room for monopolistic behavior by the fishing firms.[8] However, in ITQ fisheries, fishing firms may withhold quotas from fishing, thus controlling the effective TAC. This may, among other things, increase output prices (monopoly) and reduce input prices (monopsony) and thus potentially increase the firms' profits. The conditions under which this would be profitable for firms are not immediately obvious.

The following examines the conditions under which this kind of monopolistic (monopoly, oligopoly and monopsony) behavior would be profitable for individual firms or a cartel of firms. Unfortunately, it turns out that the relationships involved are somewhat complicated and some of the results are not totally obvious, even when contemplated ex post. Therefore, I have felt it necessary to spell out some of the less obvious aspects of the analysis at considerable length. To compensate for this increase in length, an attempt will be made to summarize the most pertinent results of the analysis toward the end of this chapter.

The fishery

Consider a fishery composed of a number of firms I, $I>0$. Let the profit function of any firm i be:

$$\pi(p;q,x;i),$$

where p refers to input and output prices, q the volume of harvest and x biomass. The profit function is assumed to have the usual properties, i.e., to be (i) differentiable in all variables, (ii) concave in both q and x, (iii) monotonically increasing in biomass and output prices, (iv) having a maximum in q and (v) monotonically decreasing in input prices.

Note 1:   The variable (or vector) p is included in this profit function to allow for possible monopolistic behavior. At a later stage this variable will be decomposed into output and input prices to allow for monopsony as well as monopoly.

Note 2:   As it is specified the profit functions may differ from one firm to another.

Fisheries management

Let this fishery be managed by ITQs. The fisheries manager sets the TAC (hereafter referred to as Q) so as to maximize the present value of the sum of consumer and producer surplus flowing from the fishery. This is the standard fisheries problem (see e.g. Clark 1975). In the ITQ-context the fisheries management problem may be expressed as (Arnason 1990):

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[8]   Monopolistic behavior ultimately consists of manipulating quantities to affect prices or, equivalently, setting the prices and accepting the resulting quantities.

(I) $\quad \underset{Q}{Max} \int_0^\infty \left(\sum_{i=1}^{I} \pi(p, q(i), x; i) \right) \cdot e^{-r \cdot t} dt$

$$s.t. \ \dot{x} = G(x) - Q$$

$$q(i) = \Psi(Q; p, x; i)$$

$$\sum_{i=1}^{I} q(i) = Q$$

Note 3: The second constraint expresses the individual harvesting response to the management control, Q.

Note 4: Profit maximization taking prices as constant implies the maximization of the sum of consumer and producer benefits (Varian 1984).

Note 5: Setting Q so as to solve problem (I) leads to the socially optimal Q, Q^*, say.

Note 6: Corresponding to Q^*, there will be the socially optimal shadow value of biomass, λ^*, say.

Note 7: The ITQ system leads to the socially optimal rental price of ITQs (per volume), s^*, say.

Note 8: If the TAC is set optimally, $Q=Q^*$, then $s^* = \lambda^*$ (Arnason 1990).[9]

Fishing firm behavior

Under the ITQ system, firms hold quota-shares (possibly zero). They may alter these quota share holdings by trading. They may also buy and sell (rent in or out) annual (seasonal) quantity quotas (non-permanent) at the market price s. By withholding quantity quotas from fishing they reduce the total catch below the TAC level, which may affect:

(1) Fishery input and output prices, p.
(2) The rental price of quotas, s.
(3) The evolution of the biomass, x.
(4) The price of quota shares.

Note 9. The price of quota shares is an asset price and is not going to affect monopolistic behavior at any given point of time. Therefore, share quotas and share quota prices can apparently be ignored in this analysis. Moreover, since rental prices of quotas and quota share prices are functionally dependent on each other by trading arbitrage (Arnason 1990), it suffices to consider the former.

Note 10. The firm can only affect prices by withholding quota. This is because total supply of outputs and, therefore, the demand for inputs equals the exogenous TAC less the quantity of quota that is withheld from fishing.

Note 11. Since withholding quota means that the effective TAC is reduced, the rental price of quota will generally be positively affected by quota withholding.

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[9] This actually follows immediately from socially optimal fishing which implies $\pi_{q(i)} = \lambda^*$ all active i and actual fishing under ITQs which implies $\pi_{q(i)} = s$ all active i.

Given this, the following summarizes the relevant profit maximization problem for firm i.[10]

(II) $\underset{q,\Delta}{Max} \int_0^\infty \left(\pi(p(Q-\Delta), q-\Delta, x; i) - s(Q-\Delta) \cdot q \right) \cdot e^{-r \cdot t} dt$

$\qquad$ s.t. $\dot{x} = G(x) - Q - \Delta$

$\qquad\qquad q\text{-}\Delta \geq 0, \Delta \geq 0,$

where q and Δ denote the quota held by the firm and quota withheld from fishing, respectively. The functions $p(Q-\Delta)$ and $s(Q-\Delta)$ represent the input/output price equations and quota rental price equations respectively.

Note 12. q-Δ represents the harvest by the firm. It is convenient to refer this by $h(i) \equiv q$-Δ.

Note 13. Q-Δ represents total harvest. Let us refer to this as $H = Q$-Δ.

A Hamiltonian function for problem (II) may be written as:

$\qquad H = \pi(p(Q-\Delta), q-\Delta, x; i) - s(Q-\Delta) \cdot q + \sigma \cdot (G(x) - Q + \Delta),$

where σ is the firm's private evaluation of the shadow value of biomass.

Necessary conditions for solving (II) include:

$\qquad$ (II.1) $\pi_{h(i)} = s$, for active firms.

$\qquad$ (II.2) $-\pi_p \cdot p_H - \pi_{h(i)} + s_H \cdot q + \sigma \leq 0, \ \Delta \geq 0, \ (-\pi_p \cdot p_H - \pi_{h(i)} + s_H \cdot q + \sigma) \cdot \Delta = 0$

Expression (II.2) is the key to understanding monopolistic behavior in an ITQ fishery. Therefore, in what follows, we will focus on this expression.

(II.2) is designed for a fishing or an integrated fishing fish processing firm. It does not directly cover the case of a quota holder who does neither but just rents out his quota. Without going into detail, a corresponding expression for that situation may be expressed as:

$\qquad$ (II.2') $s_H \cdot (\Delta - \overline{q}) - s + \sigma \leq 0, \ \Delta \geq 0, \ (s_h \cdot (\Delta - \overline{q}) - s + \sigma) \cdot \Delta = 0,$

where $\overline{q}$ is the quota holdings of the agent.

Monopolistic behavior

As stated above, in an ITQ fishery a fishing firm can exert market power by withholding quota from fishing. In fact, since this is the only way to alter quantities, this or the threat of this may be regarded as the only way to exert market power. For instance, trying to get

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[10]   It may be noticed that there are no quota shares. This is because quta shares only relate to the dynamic asset side of the problem and to study the fishery monopoly problem as stated above, it is sufficient to consider an ITQ fishery without permanent quota shares.

suppliers to accept a lower input price and buyers a higher output price requires <u>at least</u> a credible threat of reduced quantities. Similar arguments apply to cartels of firms.

Expression (II.2) shows that quota will be withheld only if the marginal benefits of quota withholding, $\partial H / \partial \Delta$, evaluated at $\Delta=0$ is positive. This, of course, is highly intuitive. Formally we express this as.

(1) $$\left. \frac{\partial H}{\partial \Delta} \right|_{\Delta=0} = -\pi_p \cdot p_H - \pi_{h(i)} + s_H \cdot q + \sigma > 0.$$

This expression is the fundamental condition for it to be profitable for a fishing firm (or a cartel of such firms) to withhold quota from fishing. Careful examination of this equation will elicit the conditions under which this can happen. Among other things, (1) involves a number of price elasticities as well as the size of the firm relative to the total size of the fishery. Therefore, (1) will indicate the relative size of the firm as a function of elasticities at which monopolistic behavior could become a possibility. Of course (1) represents a basic theoretical relationship. For actual fisheries, it needs to be supplied with the empirical structure of the fishery and the numerical estimates of the parameters.

In order to bring out more clearly the main message of expression (1), it may be useful to seek to simplify it.

S-1. For an output price, $\pi_p = h(i)$, [Hotelling's lemma, Varian (1984)].

For an input price, $\pi_p = -z(i)$, where $z(i)$ represents the quantity of inputs,
[Hotelling's lemma, Varian (1984)].

S-2. By (II.1), $\pi_{h(i)} = s$, provided firm i is active in the fishery. (Note that if this is not the case $\pi_{h(i)} < s$).

S-3. Clearly, $p_H \equiv E(p, H) \cdot \dfrac{p}{H}$, $w_H \equiv E(w, H) \cdot \dfrac{w}{H}$, $s_H \equiv E(s, H) \cdot \dfrac{s}{H}$, where $E(a,b)$ denotes the elasticity of a with respect to b.

S-4. In (1), $q \equiv q(i) = h(i)$ since the expression is evaluated at $\Delta=0$.

S-5. In (1), $\sigma \equiv \sigma(i) \approx \left(\dfrac{h(i)}{H} \right) \cdot \lambda^* = \left(\dfrac{h(i)}{H} \right) \cdot s$. [The approximately equal sign, "≈", is shown in Arnason (1990), the last equality sign follows from Note 7 above.

Adopting simplifications S-1 to S-5 and representing input prices by w and output prices by p modifies (1) to:

(2) $$\left. \frac{\partial H}{\partial \Delta} \right|_{\Delta=0} = -\frac{h(i) \cdot p}{H} \cdot E(p, H) + \frac{z(i) \cdot w}{H} \cdot E(w, H) - s + \frac{h(i) \cdot s}{H} E(s, H) + \frac{h(i)}{H} \cdot s > 0.$$

Now, let the relative size of the firm be defined by $\alpha(i) \equiv \dfrac{h(i)}{H}$.

Note 14. Evaluated at $\Delta=0$, $\alpha(i) \equiv h(i)/H \equiv q(i)/Q$, i.e. the quota holding of company i.

Inserting this in (2) and simplifying we find:

$$(3) \qquad \left.\frac{\partial H}{\partial \Delta}\right|_{\Delta=0} = -\alpha(i)\cdot E(p,H) + \alpha(i)\cdot\frac{z(i)\cdot w}{p\cdot h(i)}\cdot E(w,H) - \frac{s}{p} + \alpha(i)\cdot\frac{s}{p}\cdot E(s,H) + \alpha(i)\cdot\frac{s}{p} > 0.$$

The expression $\dfrac{z(i)\cdot w}{p\cdot h(i)}$ represents the cost-revenue ratio for the firm. Let us denote this ratio by $\beta(i)$, i.e. $\beta(i) \equiv z(i)\cdot w / p\cdot h(i)$. With that inserted expression (3) becomes

$$\left.\frac{\partial H}{\partial \Delta}\right|_{\Delta=0} = -\alpha(i)\cdot E(p,H) + \alpha(i)\cdot\beta(i)\cdot E(w,H) - \frac{s}{p} + \alpha(i)\cdot\frac{s}{p}\cdot E(s,H) + \alpha(i)\cdot\frac{s}{p} > 0$$

Rearranging yields the following boundary expression for the size of the firm, $\alpha(i)$[11]:

$$(4) \qquad \boxed{\alpha(i) > \frac{1}{1 + E(s,H) + \big(\beta(i)\cdot E(w,H) - E(p,H)\big)\cdot\dfrac{p}{s}}}.$$

Expression (4) gives the relative size of the company, i.e. $\alpha(i)$ for which it is profitable for it to withhold quota from fishing. The largest relative size before this becomes profitable is given by

$$(5) \qquad \boxed{\alpha(i) = 1 \Big/ \left(1 + E(s,H) + \big(\beta(i)\cdot E(w,H) - E(p,H)\big)\cdot\frac{p}{s}\right)}$$

We refer to this $\alpha(i)$ as the <u>critical size</u> of the firm. For any size less or equal to the critical size, it will not be profitable for the firm to withhold quota from fishing-, even if it has market power. For any relative size greater than the critical size, withholding quota will be profitable.

It is convenient to summarize the content of (5) in the following general expression:

$$\alpha_{crit} = \Lambda(E(p,H), E(w,H), E(s,H), s/p, \beta).$$

So, the critical size of the company depends on (i) the elasticity of output price with respect to total harvest, $E(p,H)$, (ii) the elasticity of input price with respect to total harvest, $E(w,H)$. (this represents the monopsony aspects of the situation), (iii) the elasticity of the quota rental price with respect to total harvest, $E(s,H)$, (iv) the output price/quota price ration, p/s, and (v) the cost/revenue ratio, $\beta(i)$.

From (5) it is easy to see that

o   The (numerically) higher the elasticity of output and input prices with respect to harvests the lower is the critical size of the firm.

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[11]   Provided the denominator is positive.

o   The higher (numerically) is the elasticity of the quota rental price with respect to harvests the larger is the critical size of the firm.
o   The higher the p/s ratio, i.e. the lower the marginal profits of fishing, the lower is the critical size of the firm.
o   The higher is the cost to revenue ratio, $\beta(i)$, the lower is the critical firm size.

All these results seem in accordance with a priori economic reasoning. The result that monopoly behavior becomes more profitable with increasing elasticity of price with respect to quantity (less elastic supply and demand curves) is well known (Varian 1984, Tirole 1989). The result for the quota rental price is somewhat novel. However, recognizing that the cost of withholding quota from fishing is equivalent to the quota rental price and that this price increases with the quantity of quota withheld, the result is readily understandable. This also explains the role of the quota rental price in the output price/quota price ratio. Clearly the benefits of quota withholding increase with the price of fish, but they decrease with the rental price of quota as discussed. Finally the cost to revenue ratio is merely a weight on the elasticity of input price with respect to harvest and therefore has exactly the same effect.

The critical firm size: Numerical calculations

Inserting empirical estimates for the arguments (independent variables) in (5) makes it possible to calculate the critical firm size. In the absence of such estimates plausible guesstimates may be used. Such plausible values are listed in Table 1. Since below we will conduct tests of the sensitivity of the critical firm size to these specifications, we refer to them as the base levels.

Table 1 **Assumed base values for the arguments in (5)**		
Argument	Assumed values	Comments
$E(p,H)$	-0.5	This is equivalent to the more commonly used $E(H,p)=-2$
$E(w,H)$	0.2	This is equivalent to the more commonly used $E(H,w)=5$
$E(s,H)$	-1	
s/p	0.5	
β	0.5	Note that $1-\beta$ = profits/revenues

Many empirical studies of the elasticity of fish price to supply suggest low elasticities (highly elastic demand curves, see e.g. Asche and Bjondal 1999). Presumably, this is because of the ready availability of substitutes. Accordingly a demand elasticity of -2 is assumed. The elasticity of input prices in fisheries (labor, capital and materials) is usually very low, especially in well developed market economies. This is because of highly elastic supply. The supply elasticity of 5 is assumed suggesting that when the use of inputs is doubled the price increases by 20%. Little is known about the elasticity of quota price with respect to harvest quantity. This reflects the elasticity of the marginal profit function (demand function for quotas. Assuming unitary elasticity for this seems reasonable.

At the base levels listed in Table 1, the critical firm size is 0.83, i.e. a firm needs to have 83% of the industry before it becomes profitable to withhold quotas. It should be emphasized, however, that this outcome depends on the base level assumptions listed in the table. Thus, it should be regarded as an example rather than an empirical result.
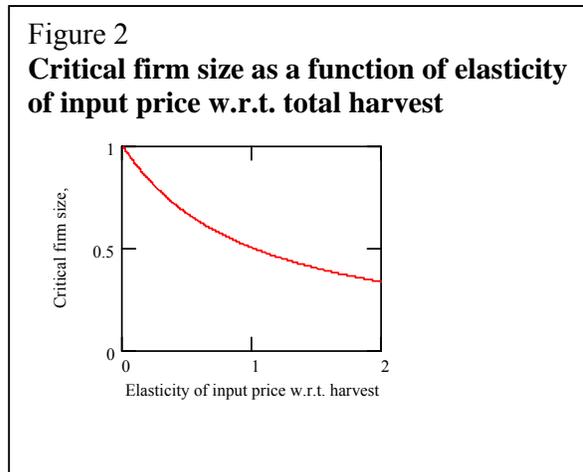
Rather than calculating specific values, it may be more informative to examine how the critical firm size depends on the arguments of (5). Doing that essentially defines a sub-space in the space of relative firm sizes and the functional arguments in (5) where monopolistic behavior becomes profitable. Depicting this subspace, however, is not easy. Therefore, in what follows we resort to a simpler device.

First consider the dependence of the critical firm size on each of the three elasticities in expression (5) keeping the other arguments in (5) constant. This is done in the following sets of diagrams (Figures 1-3).
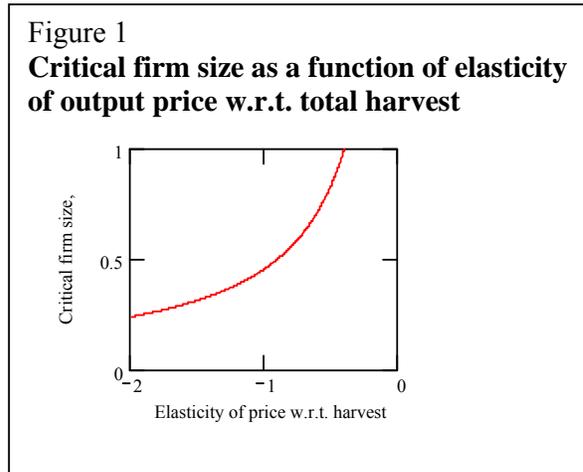
Figure 1
Critical firm size as a function of elasticity of output price w.r.t. total harvest

The schedule of the critical firm size as a function of the elasticity of output price with respect to harvest volume is drawn in Figure 1. When the size of the firm is above the schedule, it is profitable to withhold quotas. As indicated in the diagram, with $E(p,H)=-0.1$, the critical firm size is above 100%. It is about 83% for $E(p,H)=-0.5$ and 45% for $E(p,H)=-1$. With $E(p,H)=-2$, the critical firm size drops to about 24%.

The schedule of the critical firm size as a function of the elasticity of output price with respect to harvesting quantity is drawn in Figure 2. Note that this schedule measures the profitability of monopsonistic rather than monopolistic behavior. As before the firm sizes for which it is profitable to withhold quota are located above the schedule. As shown in the diagram, when the $E(w,H)=0$, the critical firm size is 100%. So, for this elasticity of input price and the base level assumptions for the other arguments of (4), there is no tendency for monopolistic behavior even at 100% firm size. This, of course, is a coincidence of the numerical specifications. With $E(w,H)=0.2$, the base-level assumption, the critical firm size is about 83% as before. With $E(w,H)=0.5$, the base-level assumption, the critical firm size is about 67%. Finally with $E(w,H)=1$, the base-level assumption, the critical firm size is about 50%.

Figure 2
Critical firm size as a function of elasticity of input price w.r.t. total harvest

The schedule of the critical firm size as a function of the elasticity of quota price with respect to harvest is drawn in Figure 3. The interpretation of this schedule is the same as before. Note that the higher the numerical value of this elasticity, the larger is the critical firm size. Thus,

for any elasticity less than -1.2, other arguments of (4) at their base levels, the critical firm size is above 100%.

Figure 3
Critical firm size as a function of elasticity of quota price w.r.t. total harvest
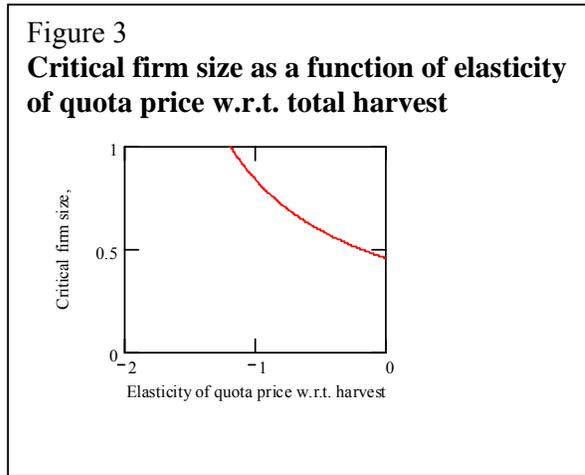
The sensitivity of the critical firm size to deviations in the base level assumptions is illustrated in Figure 4. In this diagram, the base level assumptions of Table 1 are altered from -50% to +50% and the resulting critical firm size calculated. (Note that a -50% reduction in negative elasticities results in a numerical increase in their values).

Figure 4
Sensitivity of the critical firm size to base level assumptions
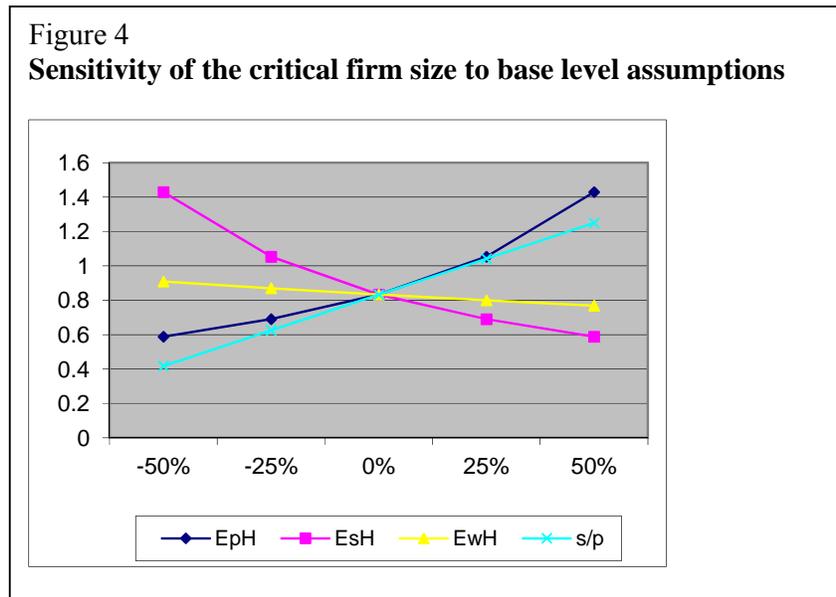
Figure 4 illustrates that the critical firm size is most sensitive to changes in the elasticities of output price and quota price to harvests and the *s/p* ratio. As the elasticity of output price with respect to harvests gets greater (becomes more negative) the smaller the critical firm size and vice versa for the elasticity of quota price. Compared to these impacts the effect of the input price elasticity is smaller. The higher the *s/p* ratio the larger the critical firm size. This makes full sense. One of the costs of withholding quotas is the price of quota. The higher this is relative to the output price the greater this cost.

Conclusions

The above analysis suggests certain seemingly robust results of a general nature:

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- Expressions (1), (4) and (5) show that the critical size of firms, i.e. the size before monopolistic behavior becomes profitable, is in general a complicated function involving several variables and relationships. It follows that a sensible analysis of possible monopolistic behavior under ITQ systems must take account of these complexities.

- The expressions for the critical firm size show that even when market power exists (in the sense that withdrawal of quota will affect prices), it is often not profitable for the firms to exercise this power. It follows that a mere study of market power is insufficient to set a sensible limit on fishing firm size.

- The critical firm size depends on several empirical aspects of the fishery. Many of these aspects are highly variable over time. Moreover, it appears that the critical firm size may be quite sensitive to the numerical values of these empirical aspects. It follows that to set the critical firm size sensibly requires a careful, frequently updated empirical studies.

It is important to realize that the above analysis is subject to considerable limitations. Most importantly, it is limited to studying when it would be profitable for fishing firms to exercise whatever market power they have. It does not even attempt to answer the broader question as to when it would be socially beneficial to impose relative size limitations on fishing firms. Clearly, this would only be beneficial when the following apply.

(1) It is profitable for firms to exercise market power. A necessary (but not sufficient) condition for that is that the firms have exceeded the critical size.

(2) The social costs of larger firms (in terms of deadweight loss) is greater than the social benefits (in terms of increased efficiency (i.e., lower average cost of output)

(3) The costs of enforcing the size constraint is less than the net benefits it generates.

In addition to this, the expressions for the critical firm size are based on certain crucial assumptions.

- The first crucial assumption is that other firms do not react (by following suit). If they do, the individual benefits will be different. Often they will be larger. However, they can be less depending on the various elasticities entering (1) and (4) and how they change with the level of harvest. The analysis of what will happen if the other firms react belongs to the field of game theory and is beyond the scope of this analysis.

- The second crucial assumption is that the firm can act without risk of negative consequences in terms of penalties for monopolistic behavior and negative reputation. If these risks exist, the critical firm size before withdrawing quotas becomes truly profitable will be larger than described above.

Appendix 1
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Appendix 2
Statement of Work for Dr. Ragnar Arnason

External Independent Peer Review by the Center for Independent Experts

Evaluation of excessive shares study in the
Mid-Atlantic surfclam and ocean quahog ITQ fishery

Scope of Work and CIE Process: The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Technical Representative (COTR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. CIE reviewers are selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. Each CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in **Annex 1**. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from www.ciereviews.org.

Project Description: Recently, the Mid-Atlantic Fishery Management Council has been crafting Amendment 15 to the Surfclam and Ocean Quahog Fishery Management Plan, and as part of the Amendment, has been attempting to define an "excessive share" threshold for the Individual Transferable Quota (ITQ) portion of the fishery. Regarding share accumulation, section 303A(c)(5)(D) of the 2006 reauthorized Magnuson-Stevens Act states that ITQ privilege programs should ensure that limited access privilege holders do not acquire an excessive share of the total limited access privileges in the program. In addition, National Standard 4 of the Magnuson Act (16 *U.S.C.* 1851(a)(4)) requires that fishing privilege allocations be carried out so that "no particular individual, corporation, or other entity acquires an excessive share of such privileges." During the course of the Council's deliberations on the market power excessive share issue, it was decided that additional expertise was needed to examine the economic rationale behind the excessive share determination, and to recommend an excessive share level, if needed. In order to provide this expertise, a Technical Group of Experts (not the CIE) is being assembled to give advice on the appropriate excessive share threshold for the surfclam and ocean quahog ITQ system. This Technical Group will assess available models for evaluating the presence of market power, and make recommendations with regard to their appropriateness for setting excessive catch share limits.

The work being performed by this Technical Group could be controversial. It will establish methods for determining excessive shares which might be applied in other fisheries (besides surfclams and ocean quahogs). With the movement by NMFS to catch share systems, determining what constitutes an excessive share and whether limits need to be put in place is extremely important because excessive share may lead to market power. Market power can lead to the ability to influence price in either the final product market or for factors of

production (i.e. the fish resource). Examination of market share has never been formally investigated in this fishery. Thus the study by the Technical Group will be innovative and significant.

After the Technical Group has delivered its recommendations, a peer review (by the CIE) needs to take place to either endorse or reject the findings from the Technical Group. This two-step process was agreed to by the Northeast Fisheries Science Center (NEFSC) and the Mid-Atlantic Fishery Management Council (MAFMC).

The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**. The tentative agenda of the panel review meeting is attached in **Annex 3**.

Requirements for CIE Reviewers: Three CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. CIE reviewers shall have working knowledge and recent experience in the application of economics, with specific expertise in industrial organization. The reviewers should have theoretical and empirical expertise in the economics of market structure/conduct/performance, particularly monopoly/oligopsony, antitrust, firm strategy, and government regulation. Experience conducting studies using econometric models and/or index-based assessments of market concentration and market power would be useful. Experience with markets operating under government permits such as production permit or marketing orders in agriculture, bandwidth for TV and radio, and tradable permit systems like ITQ's in fisheries would be desirable. Empirical studies of market structure in renewable resource industries would be desirable as would an understanding of the statutory context for antitrust regulation. Each CIE reviewer's duties shall not exceed a maximum of 14 days to complete all work tasks of the peer review described herein.

Not covered by the CIE, the CIE chair's duties should not exceed a maximum of 14 days (i.e., several days prior to the meeting for document review; the CIE panel meeting in Woods Hole; several days following the open meeting for SARC Summary Report preparation).

Location of Peer Review: Each CIE reviewer shall conduct an independent peer review during the panel review meeting scheduled in Woods Hole, Massachusetts during 21-23 June 2011.

Statement of Tasks: Each CIE reviewer shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

1. Prior to the Peer Review Meeting:

Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title, affiliation, country, address, email, FAX) to the COTR, who forwards this information to the NMFS Project Contact no later the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents, reports, foreign national security clearance, and other information concerning pertinent meeting arrangements. The NMFS Project Contact is also responsible for providing the Chair (see below) a copy of the SoW, background documents and final report in advance of the panel review meeting. Any

changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

Foreign National Security Clearance: When CIE reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for CIE reviewers who are non-US citizens. For this reason, the CIE reviewers shall provide requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, home country, and FAX number) to the NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Deemed Exports NAO website: http://deemedexports.noaa.gov/sponsor.html).

Pre-review Background Documents: Approximately two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the CIE reviewers the necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review.

2. During the Open Meeting

Panel Review Meeting: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs can not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.** Each CIE reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the ToRs as specified herein. The NMFS Project Contact is responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The NMFS Project Contact is responsible for ensuring that the Chair understands the contractual role of the CIE reviewers as specified herein. The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

Review Meeting Chair

A member of the Mid-Atlantic Management Council Scientific and Statistical Committee will serve as Chairperson. The role of the Chair is to facilitate the meeting, which includes coordination of presentations and discussions, and making sure all Terms of Reference are reviewed. Additionally, the Chair shall prepare the summary report from the meeting. During the meeting the Chair can ask questions or make statements to clarify discussions, and he can move the discussion along to ensure that the CIE reviewers address all of the TORs.

CIE Reviewers

Each CIE reviewer shall participate as a peer reviewer in a panel discussion centered on a report furnished to NMFS by the Technical Group of Experts regarding excessive shares in the surfclam and ocean quahog fishery. Reviewers are to determine whether the findings of the Technical Group are valid given the Terms of Reference provided to the expert panel. If reviewers consider the recommendations of the expert panel to be inappropriate, the reviewers should recommend an alternative.

During the question and answer period, a representative of the NMFS expert panel will be available to answer questions about the report. The CIE members can provide feedback to the expert panel member at that time.

Other Panel Members

A representative from the Mid-Atlantic Fishery Management Council staff, and the Northeast Fisheries Science Center Social Sciences Branch will be available during the meeting to provide any additional information requested by the CIE reviewers. Other panel members may assist the Chair prepare the summary report, if requested.

3. After the Open Meeting

Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

Other Tasks – Contribution to Summary Report: The Chair from the SSC and CIE reviewers will prepare the Peer Review Summary Report. Each CIE reviewer will discuss whether they hold similar views on each Term of Reference and whether their opinions can be summarized into a single conclusion for all or only for some of the Terms of Reference. For terms where a similar view can be reached, the Summary Report will contain a summary of such opinions. In cases where multiple and/or differing views exist on a given Term of Reference, the Report will note that there is no agreement and will specify - in a summary manner – what the different opinions are and the reason(s) for the difference in opinions.

The Chair's objective during this Summary Report development process will be to identify or facilitate the finding of an agreement rather than forcing the panel to reach an agreement. The Chair will take the lead in editing and completing this report. The Report (please see Annex 1 for information on contents) should address whether each Term of Reference was completed successfully. For each Term of Reference, this report should state why that Term of Reference was or was not completed successfully.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.

2) Participate during the panel review meeting at the Northeast Fisheries Science Center, Woods Hole, MA laboratory during 21-23 June, 2011 as specified herein, and conduct an independent peer review in accordance with the ToRs (**Annex 2**).

3) No later than 7 July, 2011, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts", and the report should be sent to Mr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and Dr. David Sampson, CIE Regional Coordinator, via email to david.sampson@oregonstate.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

Schedule of Milestones and Deliverables: CIE shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

17 May 2011	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
7 June 2011	NMFS Project Contact sends the CIE Reviewers the pre-review documents
21-23 June 2011	Each reviewer participates and conducts an independent peer review during the panel review meeting
7 July 2011	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
14 July 2001	Draft of Summary Report, reviewed by all CIE reviewers, due to panel Chair *
21 July 2001	Panel Chair send final Summary Report, approved by CIE reviewers, to NEFSC contact
21 July 2011	CIE submits CIE reports to the COTR
28 July 2011	The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

*The Summary report will not be submitted, reviewed, or approved by the CIE

Modifications to the Statement of Work: Requests to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on substitutions. The COTR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

Acceptance of Deliverables: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee,

these reports shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:
(1) each CIE report shall completed with the format and content in accordance with **Annex 1**,
(2) each CIE report shall address each ToR as specified in **Annex 2**,
(3) the CIE reports shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

Distribution of Approved Deliverables: Upon acceptance by the COTR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COTR. The COTR will distribute the CIE reports to the NMFS Project Contact and Center Director.

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Annex 1: Format and Contents of CIE Independent Peer Review Report

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations in accordance with the ToRs.

2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.

   a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including providing a brief summary of findings, of the science, conclusions, and recommendations.

   b. Reviewers should discuss their independent views on each ToR even if these were consistent with those of other panelists, and especially where there were divergent views.

   c. Reviewers should elaborate on any points raised in the Summary Report that they feel might require further clarification.

   d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.

   e. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The CIE independent report shall be an independent peer review of each ToRs, and shall not simply repeat the contents of the summary report.

3. The reviewer report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review
   Appendix 2: A copy of the CIE Statement of Work
   Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Annex 2: Terms of Reference for the Peer Review

**Evaluation of excessive shares study in the
Mid-Atlantic surfclam and ocean quahog ITQ fishery**

The peer review shall be conducted based on the following Terms of Reference (ToRs):

1. Describe the method or process used by the NMFS Technical Group for determining the maximum possible allowable percentage share of quota ownership that will prevent an entity from obtaining market power.

2. Evaluate the strengths and weaknesses of the proposed method developed by the NMFS Technical group for determining maximum possible allowable percentage share of quota ownership. Review and comment on the data requirements necessary for applying the proposed methods.

3. Evaluate application of the proposed methods to the Surfclam/Ocean Quahog ITQ fishery. If there is disagreement with what the NMFS Technical Group recommended, clearly state that and your reason why.

4. Evaluate whether the approach outlined by the NMFS Technical group is reasonable for setting excessive share limits in fisheries managed through catch shares? As part of this TOR, comment on any constraints that may hinder application of the methods proposed by the NMFS Technical group.

5. Provide any recommendations for further improvement

Annex 3: Tentative Agenda

**Evaluation of excessive shares study in the
Mid-Atlantic surfclam and ocean quahog ITQ fishery**

Falmouth and Woods Hole, Massachusetts during 21-23 June 2011

Tuesday, June 21. Holiday Inn, Lighthouse Room, Jones Road, Falmouth, MA

  9:00-9:15 AM
   Opening
   Welcome
   Introduction   SSC Chair
   Agenda
   Conduct of Meeting

9:15 – 9:30   Background and Need for Expert Panel Report – Lee Anderson
9:30-11   Report of the NMFS Expert Panel - NMFS Expert Panel Rep.

11-11:15   Break

11:15 -Noon   Review Terms of Reference – CIE Panel

Noon – 1:15   Lunch

1:15 – 3:00   CIE Panel Discussion – Terms of Reference #1.

3:00-3:15   Break

3:15-4:00   Public Comments
4:00-4:45   CIE Panel Discussion – Terms of Reference #2
4:45-5:00   Questions for following day

Wednesday, June 22. Holiday Inn, Lighthouse Room, Jones Road, Falmouth, MA

9:00-9:30   Review any outstanding questions from previous day
9:30-10:30   CIE Panel Discussion – Terms of Reference #3

10:30-10:45   Break

10:45-Noon   CIE Panel Discussion – Terms of Reference #4

Noon-1:30   Lunch

1:30 – 3:00   CIE Panel Discussion – Terms of Reference #5

3:00-3:15   Break

3:15-5:00   CIE Panel Discussion – Outstanding Issues

Thursday June 23 Location: Clark Conference Room, Northeast Fisheries Science Center.

9:00 – 5:00 Report writing (Meeting Closed to Public)

Appendix 3
Peer Reviewer Panel

Ani Katchova. Assistant Professor, Department of Agricultural Economics, University of Kentucky   akatchova@uky.edu

Rigeberto Lopez. **Professor,** Agricultural and Resource Economics, University of Connecticut rigoberto.lopez@uconn.edu

Ragnar Arnason. Professor, Department of Economics, University of Iceland. ragnara@hi.is

Chair
James E. Wilen. Professor, Agricultural and Resource Economics, University of California Davis. wilen@primal.ucdavis.edu

Part III: Peer Review Report

by

Ani Katchova

CIE Independent Peer Review Report

On

Recommendations for Excessive-Share Limits in the Surfclam and Ocean Quahog Fisheries, prepared by Glenn Mitchell, Steven Peterson, and Robert Willig

By

Ani Katchova

Assistant Professor

Department of Agricultural Economics

University of Kentucky

E-mail: akatchova@uky.edu

July 1, 2011

Executive Summary

A National Marines Fisheries Service Technical Group of Experts was assembled to give advice on the appropriate excessive share threshold for the Surfclam and Ocean Quahog (SCOQ) ITQ system. The report prepared by Mitchell, Peterson, and Willig provides background information on the SCOQ industry and recommendations on 1) the rule or process that can be used to set an excessive-share limit in terms of the maximum percentage of quota that can be owned or otherwise controlled by a single individual or entity; and 2) the application of this rule or process using available data to determine an appropriate excessive-share limit in the SCOQ ITQ system.

The NMFS technical group argues that the evidence they analyzed does not support a conclusion that market power is currently being exercised through withholding of quota in the SCOQ fisheries. Using the Herfindahl-Hirschman index which is recommended for use in the Horizontal Merger Guidelines, it is found that the levels of concentration vary in the different sectors of the SCOQ industry: quota ownership, harvesting, and processing. The ownership of quota in the SCOQ fisheries is unconcentrated, but the use of quota is highly concentrated, both for harvesting and processing.

The excessive-share proposal is laid out as a series of seven steps. They consider the HHI index using non-SCOQ clams and fringe holders, and the rule of three-firms to ensure adequate competition. At the end, they propose a two-part cap at 30% for long-term quota holdings and 40-60% for short-term quota holdings. They also recommend that there be a mechanism for revealing information on quota prices, such an open auction process.

The proposed method developed by the NMFS technical group has several key strengths and weaknesses. One of the major strengths of the proposed method is that it follows the Horizontal Merger Guidelines for determining concentration and market power. Using the HHI for measuring market concentration strengthens the study as it makes the methods and results comparable across industries. The application of this method presents a problem if there is an uncertainty about the market size (imports, other relevant markets) due to lack of available data. An additional rule was suggested that at least three firms must be present to ensure sufficient competition. There is support in the literature for this rule, although it is somewhat arbitrary how this three-firm rule was introduced to their study.

The proposed excessive share cap percentages include a rather wide range (i.e. 40-60%) of acceptable excessive-share caps that a regulator will have to determine which specific number to use and enforce as an excessive-share cap. The cost associated with the implementation of an excessive-share cap as well as the cost of monitoring and enforcement will likely be substantial, which will also need to be explored.

The boundaries of relevant markets are set based on the ability of consumers to switch products when faced with a small but relevant price increase (the hypothetical monopolist test). In absence of reliable quantitative data, there needs to be an in-depth understanding of the industry,

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major players, products, etc. Therefore, in order to apply an excessive-share cap correctly over time, the cap needs to be dynamically updated based on new information about substitutability and structural changes in the industry.

The analysis of the NMFS technical group is mostly focused on the output markets as opposed to the input markets. Since this approach is applied to a vertically-integrated industry with a small number of processors and vessels predominantly controlled by the processors, the exercise of monopsony power is of primary interest.

One of the major challenges for this approach is the instrument used to address the potential exercise of market power. The only instrument considered in their study is setting excessive-share cap for the ITQ holdings. More transparency and reliable data are needed for the ownership, transfers, and contracts for quotas.

The approach outlined by the NMFS technical group is generally applicable to other fisheries managed through catch shares. The 7 steps as described by the NMFS technical group are relevant for the establishment of ITQs with excessive-share cap in other fisheries, but it may not apply to fisheries without ITQs. It is necessary to analyze all available information and data about the new fishery to assess the similarity and differences with the SCOQ industry before applying this approach. Similar data constraints may be present for other industries as well.

The NMFS technical group study provides a good starting point in considering an excessive-share cap in the SCOQ clam industry. In my opinion, because of data limitations there is still not sufficient understanding of the market structure for this industry and the recommendations apply in a general sense. I would recommend several actions:

1. An open auction or other mechanisms to reveal quota prices and make the market for quota transfers liquid and transparent needs to be established.
2. More information can be collected from industry participants regarding market shares, major buyers of processed output, prices paid and received for claim inputs and outputs, etc.
3. Merger guidelines focus on market shares and price considerations but not on production cost efficiencies. Further studies can be done on the cost efficiencies of operating as large processors.
4. Further studies are needed on the monopsonization of the input markets. Monopsonization of the input market is a larger concern than monopolization of the output market.
5. The study only considered policies regarding excessive share of the ownership quota. Other instruments beyond excessive share cap should be investigated.
6. Monitoring and enforcement of the excessive share cap will need to be studied and implemented.

I.   Background

A. Project Description

The Mid-Atlantic Fishery Management Council has been crafting Amendment 15 to the Surfclam and Ocean Quahog (SCOQ) Fishery Management Plan, and as part of the Amendment, has been attempting to define an "excessive share" threshold for the Individual Transferable Quota (ITQ) portion of the fishery. Regarding share accumulation, the 2006 reauthorized Magnuson-Stevens Act states that ITQ privilege programs should ensure that limited access privilege holders do not acquire an excessive share of the total limited access privileges in the program. In addition, National Standard 4 of the Magnuson Act requires that fishing privilege allocations be carried out so that "no particular individual, corporation, or other entity acquires an excessive share of such privileges."

In order to provide this expertise, a NMFS Technical Group of Experts was assembled to give advice on the appropriate excessive share threshold for the Surfclam and Ocean Quahog ITQ system. This Technical Group assessed available models for evaluating the presence of market power, and made recommendations with regard to their appropriateness for setting excessive catch share limits.

After the Technical Group delivered its recommendations, a peer review (by the CIE) was conducted to either endorse or reject the findings from the Technical Group. This two-step process was agreed to by the Northeast Fisheries Science Center (NEFSC) and the Mid-Atlantic Fishery Management Council (MAFMC).

B. Brief Summary of Findings, of the Science, Conclusions and Recommendations of the Excessive-Share report by Mitchell, Peterson, and Willig.

The report prepared by Mitchell, Peterson, and Willig provides background information on the SCOQ industry as well as recommendations on 1) the rule or process that can be used to set an excessive-share limit in terms of the maximum percentage of quota that can be owned or otherwise controlled by a single individual or entity; and 2) the application of this rule or process using available data to determine an appropriate excessive-share limit in the SCOQ ITQ system.

In 1990, the SCOQ fisheries adopted an ITQ system under which the fishery regulator sets a total allowable catch ("TAC") separately for each of the two species to prevent over-exploitation of the resource, and allocated ITQs permitting harvest of a share of the TAC. ITQs are transferable, which allows shifts in production to industry participants that may be more efficient.

Currently, there are eight processing firms that purchase catch from the SCOQ fisheries. Some processors have developed quota ownership through either the acquisition of vessels and

accompanying quota or the acquisition of quota directly, and it is common for processors to enter into long-term contracts to lease quota from quota holders. Virtually all clams are sold under contract between processors and harvesters, or are harvested by processor-affiliated vessels.

The Mitchell, Peterson, and Willig report addresses the question of whether market power can be exercised through the ownership and withholding of quota in the SCOQ fisheries. The exercise of market power in an ITQ-regulated fishery can occur when a quota owner has the ability and the incentive to affect the price of the regulated harvest or of the quota through its use or suppression of use of quota.

The authors argue that the evidence they analyzed does not support a conclusion that market power is currently being exercised through withholding of quota in the SCOQ fisheries. In particular, processors report that once it is clear that there will be excess quota available in a season (well before the end of the season, leaving sufficient opportunity to continue to harvest if harvesters and processors deem there to be sufficient demand), the price of quota is very low.

There are a number of factors that may constrain the exercise of market power throughout the various levels of activity in the SCOQ fisheries, including cases where the demand were highly elastic and substitutes were amply available.

Using the Herfindahl-Hirschman index which is recommended for use in the Horizontal Merger Guidelines, it is found that the levels of concentration vary in the different sectors of the SCOQ industry: quota ownership, harvesting, and processing. The ownership of quota in the SCOQ fisheries is unconcentrated, but the use of quota is highly concentrated, both for harvesting and processing.

The excessive-share proposal is laid out as a series of seven steps. They consider the HHI index using non-SCOQ clams and fringe holders, and the rule of three-firms to ensure adequate competition. At the end, they propose a two-part cap at 30% for long-term quota holdings and 40-60% for short-term quota holdings.

They also recommend that there be a mechanism for revealing information on quota prices, such as through an open auction process.

II.   Description of the Individual Reviewer's Role in the Review Activities

This report was prepared and written by Dr. Ani Katchova. Before the panel meeting, I carefully read the "Overview of the Surfclam and Ocean Quahog Fisheries and Quota Considerations for 2011, 2012, and 2013" prepared by the Mid-Atlantic Fishery Management Council with the cooperation of National Marine Fisheries Service and the "Recommendations for Excessive-Share Limits in the Surfclam and Ocean Quahog Industries" prepared by Mitchell, Peterson, and Willig. Additional preparation included reading relevant publications on competition, market

power, and fisheries. During the panel meeting in Woods Hole, Massachusetts, June 21-23, 2011, I listened to the information presented and asked questions to clarify my understanding of the report and the fisheries industry. Following the review panel meeting, I prepared this report, according to the Terms of Reference and Statement of Work.

III. Summary of Findings for Each Term of Reference with Description of Strengths and Weaknesses

In this section, the five terms of reference are listed with a summary of findings for each of them. In the discussion, strengths and weaknesses are also discussed.

1. **Describe the method or process used by the NMFS Technical Group for determining the maximum possible allowable percentage share of quota ownership that will prevent an entity from obtaining market power.**

The NMFS Technical Group utilized a 7-step process to determine the maximum possible allowable percentage share of quota ownership that will prevent an entity from obtaining market power. The following steps were proposed and implemented: step 1, determine what constitutes relevant quota ownership and control; step 2, assess the relevant markets, including substitutability of products and product heterogeneity, the relative bargaining power of buyers and sellers, and other competitive information; step 3, establish whether a threshold condition requiring no calculation of cap applies; step 4; establish the appropriate concentration thresholds using the Horizontal Merger Guidelines (to prevent the HHI from exceeding 2500 or have at least three processing firms); step 5, determine the relationship between the excessive share cap and market concentration, using the HHI index and information on substitute products and the size of competitive fringe; step 6, identify regulatory and practical constraints with regards to setting a fixed cap or two-part cap; and step 7, set the excessive-share cap with fixed cap at 30-40% or two-part cap of 30% for long-term and 40-60% for short-term.

2. **Evaluate the strengths and weaknesses of the proposed method developed by the NMFS technical group for determining maximum possible allowable percentage share of quota ownership. Review and comment on the data requirements necessary for applying the proposed methods.**

The proposed method developed by the NMFS technical group has several key strengths and weaknesses.

One of the major strengths of the proposed method is that it follows the Horizontal Merger Guidelines for determining concentration and market power. The standard measure of concentration is the Herfindahl-Hirschman Index (HHI), where markets with an HHI below 1500 are considered unconcentrated; between 1500 and 2500, moderately concentrated; and above 2500, highly concentrated. Using the HHI for measuring market concentration strengthens the

study as it makes the methods and results comparable across industries. The NMFS technical group has appropriately modified the application of the HHI index to consider competition from non-SCOQ clams as well as the aggregate share held by fringe holders. To properly calculate HHI, the necessary data requirements include the market size of the relevant markets (imports, non-SCOQ clams, etc.) and the market shares of the players (for quota ownership, harvesting, and processing). Therefore, the application of this method presents a problem if there is an uncertainty about the market size (imports, state fisheries, other relevant markets) due to lack of available data. An additional rule was suggested that at least 3 firms must be present to ensure sufficient competition. There is support in the literature for this rule (Kwoka; Bresnahan and Reiss), although it is somewhat arbitrary how this three-firm rule was introduced to this study. The NMFS technical group argues that if the excessive share cap is set at 40% that will ensure that at least three firms are present in the industry. It is not clear which rule should be followed (HHI index below 2500 or the three-firm rule) if they reach different conclusions. Finally, the proposed excessive share cap percentages include a rather wide range (i.e. 40-60%) of acceptable excessive-share caps from which a regulator will have to determine which specific number to use and enforce as an excessive-share cap.

The boundaries of relevant markets are set based on the ability of consumers to switch products when faced with a small but relevant price increase (the hypothetical monopolist test). In order to apply the hypothetical monopolist test, there needs to be reliable data on quantities and prices demanded, which are not available for this application. In the absence of reliable quantitative data, there needs to be an in-depth understanding of the industry, major players, products, etc. Moreover, the substitutability of products is generally increasing over time, the demand for products is getting more elastic, and there are substantial income effects. Therefore, in order to apply an excessive-share cap correctly over time, it needs to be dynamically updated based on new information about substitutability and structural changes in the industry. In addition, the HHI is applicable for homogenous products as opposed to differentiated products, and there needs to be qualitative data available regarding whether the processors produce homogenous products or their products are differentiated. While the theoretical considerations are solid, these methods will be hard to apply if appropriate data are not available.

The analysis of the NMFS technical group is focused mostly on the output markets as opposed to the input markets. While their study directly follows the Horizontal Merger Guidelines and provides comparison with other industries, the analysis in this industry must focus on monopsonizing of the input markets. Since this approach is applied to a vertically-integrated industry with a small number of processors and vessels predominantly controlled by the processors, the exercise of monopsony power is of primary interest. Ideally, the hypothetical monopolist test should be modified and used for the input markets. For example, if prices of SCOQ clams go down, can a harvester deliver the clams to another processor? The condition of TAC not binding and quota prices of zero are also consistent with a monopsony scenario which

is not explored by the NMFS technical group. The question is if the pre-conditions for monopsony exist in this market, does the introduction of ITQs facilitate this process?

One of the major challenges for this approach is the instrument used to address the potential exercise of market power. The only instrument considered in their study is by setting an excessive-share cap for the ITQ holdings. Ultimately, the regulator should be concerned about the market shares of actual processed output by the processors. The real challenge is that quota holdings are only an approximation for the market concentration for the processors, as quota holdings may be owned or controlled by entities other than the processors. In general, and in this market in particular, it is very hard to determine control as opposed to ownership of the quota based on affiliations of entities. More transparency and reliable data are needed for the ownership, transfers, and contracts for quotas.

The proposed methods are applicable to a wide-range of industries, but additional considerations are needed on how ITQs affect the market concentration and power so that this method can be generally applied to this and other fisheries. For example, how will the proposed method be modified if the quota prices are of significant value, perhaps indicating the exercise of market power when TAC is not binding? What if the TAC were binding?

In addition, reliable data on quota prices are needed to implement the proposed method, and such data are currently not available or reliable. The establishment of an auction or other mechanism of revealing quota prices and providing volume and liquidity to the market is needed. Further studies will need to be conducted to determine the appropriate mechanism for revealing quota prices in this fishery.

One of the key arguments of the NMFS technical group is that because the quota price is currently close to zero and there are quotas available for trading at this price, there is no market power. However, this scenario is also consistent with a situation where the input market (harvesting) is monopsonized, as processors have constrained their output by exercising monopsony power.

There are other measurements that can be used to measure market power, such as examining the profit margins. For these measurements, detailed data on output prices and input costs will need to be available, which will likely not be the case. When data are available, such as the SCOQ price data used in the report, these data are aggregated and comingled, which makes them unreliable.

The social costs and benefits of market power, including efficiencies in processing, are mentioned but due to lack of data, they are not considered in detail. The cost associated with the implementation of an excessive-share cap as well as monitoring and enforcement will likely be substantial, which will also need to be explored.

3. **Evaluate application of the proposed methods to the Surfclam/Ocean Quahog ITQ fishery. If there is disagreement with what the NMFS Technical Group recommended, clearly state that and your reason why.**

The application of the proposed methods to the Surfclam/Ocean Quahog ITQ fishery includes several steps. One of the steps includes analyzing the HHI index for quota ownership, harvesting, and processing. The results show that quota ownership is unconcentrated, while harvesting and processing are highly concentrated. The HHI index and the three-firm rule are used to recommend the two-part excessive-share cap for quota ownership. The NMFS have done the best possible analysis given the substantial problems related to data limitations and availability.

The application needs to take into account the specific structure of the industry. This industry has been in existence for a number of years and a market structure already exists. The use of HHI is a rather general approach for determining market concentration that might not be specific enough for markets with ITQs. The NMFS technical group relies heavily on the fact that quota prices are currently close to zero. More transparency is needed for the quota prices. The report does not explain how different quota prices may affect the recommendations.

The study uses well-established methods to determine market concentrations based on HHI and make recommendations regarding an excessive-share cap. The lack of adequate data is a major problem when applying the proposed methods. There is a considerable uncertainty with regards to the size of the market (imports, fringe holders) and market shares of the participants. To the extent that the recommendations are based on general guidelines (such as having at least three firms in the industry and the HHI index is below 2500), the specific numbers recommended for the excessive-share cap may change significantly based on the continuously updated information about market size, market share of participants, etc.

Determining the relevant markets is another challenge in the application of the proposed methods. The information on substitutability of products and the elasticity of demand is limited and therefore the recommendations are largely based on anecdotal data. The ability to exercise market power is significantly influenced by these factors, yet because of lack of data, this analysis was not performed.

The HHI index of the quota owners/holders shows that the market is unconcentrated, but data are not available on quota ownership and control following quota transfers and the ownership relations among final quota holders. Therefore, the results that quota ownership and control are unconcentrated are not very reliable (better reporting of quota transfer data and contracting is needed). The correct determination of post-transfer quota ownership and control is extremely important in the implementation, monitoring, and enforcing of the excessive-share cap.

There is a rather wide range (i.e. 40-60% for short-term holdings) of acceptable excessive-share caps that are recommended. A regulator will have to determine which specific number to use

and enforce as an excessive-share cap. Given the data limitations on market size, substitutability of products, quota ownership, I view these recommendations as general guidelines (perhaps even as lower bounds) for setting an excessive-share cap.

4. **Evaluate whether the approach outlined by the NMFS Technical group is reasonable for setting excessive share limits in fisheries managed through catch shares? As part of this TOR, comment on any constraints that may hinder application of the methods proposed by the NMFS Technical group.**

The approach outlined by the NMFS technical group is generally applicable to other fisheries managed through catch shares. The 7 steps as described by the NMFS technical group are relevant for the establishment of ITQs with excessive-share cap in other fisheries, but it may not apply to fisheries without ITQs. One of the constraints in the application of their methods is that every fishery has a path-dependent history, with the size of market, major players, and the structure of industry already being historically determined. This approach can be applied to fisheries to set ITQs and simultaneously determine an excessive-share cap.

It is necessary to analyze all available information and data about the new fishery to assess the similarity and differences with the SCOQ industry before applying this approach. Several factors are very important to take into consideration when applying these methods to other fisheries. These factors include: whether or not the TAC is binding, whether or not the quota prices are transparent and are of significant value, the determination of relevant markets and substitutability with other products, whether ITQ are assigned to vessel owners or not, etc.

Similar data constraints may be available for other industries as well. These include: the transparency of quota prices, the determination of quota ownership and control, the determination of the market size, the determination of relevant markets, etc.

5. **Provide any recommendations for further improvement (of methods).**

The NMFS technical group study provides a good starting point in considering an excessive-share cap in the SCOQ clam industry. In my opinion, because of data limitations there is still not sufficient understanding of the market structure for this industry and the recommendations apply in a general sense. I would recommend several actions:

1. An open auction or other mechanisms to reveal quota prices and make the market for quota transfers liquid and transparent needs to be established.
2. More information can be collected from industry participants regarding market shares, major buyers of processed output, prices paid and received for claim inputs and outputs, etc. There needs to be a general description of all players from crew members to distributors.

3. Merger guidelines focus on market shares and price considerations but not on production cost efficiencies. Further studies can be done on the cost efficiencies of operating as large processors. Currently there are both large and small processors still operating in the industry but there are claims that processors need to be of certain size to achieve efficiency.
4. Further studies are needed on the monopsonization of the input markets. Monopsonization of the input markets is a larger concern than monopolization of the output market.
5. The study only considered policies regarding excessive share of the ownership quota. Other instruments beyond excessive share cap should be investigated.
6. Monitoring and enforcement of the excessive share cap will need to be studied and implemented.

IV.   Conclusions and Recommendations in Accordance with the Terms of Reference

The NMFS Technical Group of Experts assessed available models for evaluating the presence of market power, and made recommendations with regard to their appropriateness for setting excessive catch share limits. The excessive-share proposal is laid out as a series of seven steps. They consider the HHI index using non-SCOQ clams and fringe holders, and the rule of three-firms to ensure adequate competition. At the end, they propose a two-part cap at 30% for long-term quota holdings and 40-60% for short-term quota holdings. They also recommend that there should be a mechanism for revealing information on quota prices, such as through an open auction process.

The NMFS technical group's proposed methods seem well grounded in the Horizontal Merger Guidelines, which ensures comparability with other industries. Their approach is also applicable to other fisheries with ITQs. The main challenge is with regards to the application of the proposed methods because of the lack of appropriate data on the size of the market, major participants and market shares, relevant markets, substitutability of products, and transparency of quota ownership and prices.

I have made several recommendations, including 1) facilitating an open auction or other mechanisms to reveal quota prices, 2) collecting more information from industry participants regarding market shares, major buyers of processed output, prices paid and received for claim inputs and outputs, etc., 3) studying production cost efficiencies for large processors, 4) studying the monopsonization of the input markets, 5) exploring other instruments to control market power in addition to an excessive-share cap of ownership quota, and 6) studying and implementation of the monitoring and enforcement of the excessive share cap.

Overall, the NMFS technical group's study is well executed and provided a good starting point in establishing an excessive-share cap in the Surfclam and Ocean Quahog fishery. The NMFS

should make any efforts to collect more detailed data in the future to aid to the understanding of this industry and the implication of the proposed methods.

Appendix 1: Bibliography of materials provided for review

Mid-Atlantic Fishery Management Council with the cooperation of National Marine Fisheries Service. "Overview of the Surfclam and Ocean Quahog Fisheries and Quota Considerations for 2011, 2012, and 2013."

Glenn Mitchell, Steven Peterson, and Robert Willig. "Recommendations for Excessive-Share Limits in the Surfclam and Ocean Quahog Industries." 2011.

Other documents discussed during the panel meeting:

Bresnahan, Timothy F. and Peter C. Reiss "Entry and Competition in Concentrated Markets" The Journal of Political Economy, Vol. 99, No. 5 (Oct., 1991), pp. 977-1009.

Kwoka, John E. Jr. "The Effect of Market Share Distribution on Industry Performance" The Review of Economics and Statistics, Vol. 61, No. 1 (Feb., 1979), pp. 101-109.

Appendix 2: A copy of the CIE Statement of Work

Attachment A: Statement of Work for Dr. Ani Katchova

External Independent Peer Review by the Center for Independent Experts

Evaluation of excessive shares study in the
Mid-Atlantic surfclam and ocean quahog ITQ fishery

Scope of Work and CIE Process: The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Technical Representative (COTR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. CIE reviewers are selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. Each CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in **Annex 1**. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from www.ciereviews.org.

Project Description: Recently, the Mid-Atlantic Fishery Management Council has been crafting Amendment 15 to the Surfclam and Ocean Quahog Fishery Management Plan, and as part of the Amendment, has been attempting to define an "excessive share" threshold for the Individual Transferable Quota (ITQ) portion of the fishery. Regarding share accumulation, section 303A(c)(5)(D) of the 2006 reauthorized Magnuson-Stevens Act states that ITQ privilege programs should ensure that limited access privilege holders do not acquire an excessive share of the total limited access privileges in the program. In addition, National Standard 4 of the Magnuson Act (16 *U.S.C.* 1851(a)(4)) requires that fishing privilege allocations be carried out so that "no particular individual, corporation, or other entity acquires an excessive share of such privileges." During the course of the Council's deliberations on the market power excessive share issue, it was decided that additional expertise was needed to examine the economic rationale behind the excessive share determination, and to recommend an excessive share level, if needed. In order to provide this expertise, a Technical Group of Experts (not the CIE) is being assembled to give advice on the appropriate excessive share threshold for the surfclam and ocean quahog ITQ system. This Technical Group will assess available models for evaluating the presence of market power, and make recommendations with regard to their appropriateness for setting excessive catch share limits.

The work being performed by this Technical Group could be controversial. It will establish methods for determining excessive shares which might be applied in other fisheries (besides surfclams and ocean quahogs). With the movement by NMFS to catch share systems, determining what constitutes an excessive share and whether limits need to be put in place is

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extremely important because excessive share may lead to market power. Market power can lead to the ability to influence price in either the final product market or for factors of production (i.e. the fish resource). Examination of market share has never been formally investigated in this fishery. Thus the study by the Technical Group will be innovative and significant.

After the Technical Group has delivered its recommendations, a peer review (by the CIE) needs to take place to either endorse or reject the findings from the Technical Group. This two-step process was agreed to by the Northeast Fisheries Science Center (NEFSC) and the Mid-Atlantic Fishery Management Council (MAFMC).

The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**. The tentative agenda of the panel review meeting is attached in **Annex 3**.

Requirements for CIE Reviewers: Three CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. CIE reviewers shall have working knowledge and recent experience in the application of economics, with specific expertise in industrial organization. The reviewers should have theoretical and empirical expertise in the economics of market structure/conduct/performance, particularly monopoly/oligopsony, antitrust, firm strategy, and government regulation. Experience conducting studies using econometric models and/or index-based assessments of market concentration and market power would be useful. Experience with markets operating under government permits such as production permit or marketing orders in agriculture, bandwidth for TV and radio, and tradable permit systems like ITQ's in fisheries would be desirable. Empirical studies of market structure in renewable resource industries would be desirable as would an understanding of the statutory context for antitrust regulation. Each CIE reviewer's duties shall not exceed a maximum of 14 days to complete all work tasks of the peer review described herein.

Not covered by the CIE, the CIE chair's duties should not exceed a maximum of 14 days (i.e., several days prior to the meeting for document review; the CIE panel meeting in Woods Hole; several days following the open meeting for SARC Summary Report preparation).

Location of Peer Review: Each CIE reviewer shall conduct an independent peer review during the panel review meeting scheduled in Woods Hole, Massachusetts during 21-23 June 2011.

Statement of Tasks: Each CIE reviewer shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

1. Prior to the Peer Review Meeting:

Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title, affiliation, country, address, email, FAX) to the COTR, who forwards this information to the NMFS Project Contact no later the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents, reports, foreign national security

clearance, and other information concerning pertinent meeting arrangements. The NMFS Project Contact is also responsible for providing the Chair (see below) a copy of the SoW, background documents and final report in advance of the panel review meeting. Any changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

Foreign National Security Clearance: When CIE reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for CIE reviewers who are non-US citizens. For this reason, the CIE reviewers shall provide requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, home country, and FAX number) to the NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Deemed Exports NAO website: http://deemedexports.noaa.gov/sponsor.html).

Pre-review Background Documents: Approximately two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the CIE reviewers the necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review.

2. During the Open Meeting

Panel Review Meeting: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs can not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.** Each CIE reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the ToRs as specified herein. The NMFS Project Contact is responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The NMFS Project Contact is responsible for ensuring that the Chair understands the contractual role of the CIE reviewers as specified herein. The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

(Review Meeting Chair)

A member of the Mid-Atlantic Management Council Scientific and Statistical Committee will serve as Chairperson. The role of the Chair is to facilitate the meeting, which includes coordination of presentations and discussions, and making sure all Terms of Reference are reviewed. Additionally, the Chair shall prepare the summary report from the meeting. During the

meeting the Chair can ask questions or make statements to clarify discussions, and he can move the discussion along to ensure that the CIE reviewers address all of the TORs.

(CIE Reviewers)

Each CIE reviewer shall participate as a peer reviewer in a panel discussion centered on a report furnished to NMFS by the Technical Group of Experts regarding excessive shares in the surfclam and ocean quahog fishery. Reviewers are to determine whether the findings of the Technical Group are valid given the Terms of Reference provided to the expert panel. If reviewers consider the recommendations of the expert panel to be inappropriate, the reviewers should recommend an alternative.

During the question and answer period, a representative of the NMFS expert panel will be available to answer questions about the report. The CIE members can provide feedback to the expert panel member at that time.

(Other Panel Members)

A representative from the Mid-Atlantic Fishery Management Council staff, and the Northeast Fisheries Science Center Social Sciences Branch will be available during the meeting to provide any additional information requested by the CIE reviewers. Other panel members may assist the Chair prepare the summary report, if requested.

3. After the Open Meeting

Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

Other Tasks – Contribution to Summary Report: The Chair from the SSC and CIE reviewers will prepare the Peer Review Summary Report. Each CIE reviewer will discuss whether they hold similar views on each Term of Reference and whether their opinions can be summarized into a single conclusion for all or only for some of the Terms of Reference. For terms where a similar view can be reached, the Summary Report will contain a summary of such opinions. In cases where multiple and/or differing views exist on a given Term of Reference, the Report will note that there is no agreement and will specify - in a summary manner – what the different opinions are and the reason(s) for the difference in opinions.

The Chair's objective during this Summary Report development process will be to identify or facilitate the finding of an agreement rather than forcing the panel to reach an agreement. The Chair will take the lead in editing and completing this report. The Report (please see Annex 1 for information on contents) should address whether each Term of Reference was completed successfully. For each Term of Reference, this report should state why that Term of Reference was or was not completed successfully.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
2) Participate during the panel review meeting at the Northeast Fisheries Science Center, Woods Hole, MA laboratory during 21-23 June, 2011 as specified herein, and conduct an independent peer review in accordance with the ToRs (**Annex 2**).
3) No later than 7 July, 2011, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts", and the report should be sent to Mr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and Dr. David Sampson, CIE Regional Coordinator, via email to david.sampson@oregonstate.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

Schedule of Milestones and Deliverables: CIE shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

17 May 2011	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
7 June 2011	NMFS Project Contact sends the CIE Reviewers the pre-review documents
21-23 June 2011	Each reviewer participates and conducts an independent peer review during the panel review meeting
7 July 2011	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
14 July 2001	Draft of Summary Report, reviewed by all CIE reviewers, due to panel Chair *
21 July 2001	Panel Chair send final Summary Report, approved by CIE reviewers, to NEFSC contact
21 July 2011	CIE submits CIE reports to the COTR
28 July 2011	The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

*The Summary report will not be submitted, reviewed, or approved by the CIE

Modifications to the Statement of Work: Requests to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent substitutions.

The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on substitutions. The COTR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

Acceptance of Deliverables: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, these reports shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:
(1) each CIE report shall completed with the format and content in accordance with **Annex 1**,
(2) each CIE report shall address each ToR as specified in **Annex 2**,
(3) the CIE reports shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

Distribution of Approved Deliverables: Upon acceptance by the COTR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COTR. The COTR will distribute the CIE reports to the NMFS Project Contact and Center Director.

Support Personnel:

William Michaels, Program Manager, COTR)
NMFS Office of Science and Technology
1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910
William.Michaels@noaa.gov   Phone: 301-713-2363 ext 136

Manoj Shivlani, CIE Lead Coordinator
Northern Taiga Ventures, Inc.
10600 SW 131st Court, Miami, FL 33186
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Roger W. Peretti, Executive Vice President
Northern Taiga Ventures, Inc. (NTVI)
22375 Broderick Drive, Suite 215, Sterling, VA 20166
RPerretti@ntvifederal.com   Phone: 571-223-7717

Key Personnel:

<u>NMFS Project Contact</u>:

John B. Walden
Northeast Fisheries Science Center
166 Water Street, Woods Hole, MA 02536
John.Walden@noaa.gov

Phone: 508-495-2355

Annex 1: Format and Contents of CIE Independent Peer Review Report

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations in accordance with the ToRs.

2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.

   a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including providing a brief summary of findings, of the science, conclusions, and recommendations.

   b. Reviewers should discuss their independent views on each ToR even if these were consistent with those of other panelists, and especially where there were divergent views.

   c. Reviewers should elaborate on any points raised in the Summary Report that they feel might require further clarification.

   d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.

   e. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The CIE independent report shall be an independent peer review of each ToRs, and shall not simply repeat the contents of the summary report.

3. The reviewer report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review
   Appendix 2: A copy of the CIE Statement of Work
   Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Annex 2: Terms of Reference for the Peer Review

Evaluation of excessive shares study in the
Mid-Atlantic surfclam and ocean quahog ITQ fishery

The peer review shall be conducted based on the following Terms of Reference (ToRs):

1. Describe the method or process used by the NMFS Technical Group for determining the maximum possible allowable percentage share of quota ownership that will prevent an entity from obtaining market power.

2. Evaluate the strengths and weaknesses of the proposed method developed by the NMFS Technical group for determining maximum possible allowable percentage share of quota ownership. Review and comment on the data requirements necessary for applying the proposed methods.

3. Evaluate application of the proposed methods to the Surfclam/Ocean Quahog ITQ fishery. If there is disagreement with what the NMFS Technical Group recommended, clearly state that and your reason why.

4. Evaluate whether the approach outlined by the NMFS Technical group is reasonable for setting excessive share limits in fisheries managed through catch shares? As part of this TOR, comment on any constraints that may hinder application of the methods proposed by the NMFS Technical group.

5. Provide any recommendations for further improvement

Annex 3: Tentative Agenda
Evaluation of excessive shares study in the
Mid-Atlantic surfclam and ocean quahog ITQ fishery

Falmouth and Woods Hole, Massachusetts during 21-23 June 2011

Tuesday, June 21. Holiday Inn, Lighthouse Room, Jones Road, Falmouth, MA

 9:00-9:15 AM
  Opening
  Welcome
  Introduction   SSC Chair
  Agenda
  Conduct of Meeting

9:15 – 9:30   Background and Need for Expert Panel Report – Lee Anderson

9:30-11   Report of the NMFS Expert Panel - NMFS Expert Panel Rep.

11-11:15   Break

11:15 -Noon   Review Terms of Reference – CIE Panel

Noon – 1:15 Lunch

1:15 – 3:00   CIE Panel Discussion – Terms of Reference #1.

3:00-3:15   Break

3:15-4:00   Public Comments

4:00-4:45   CIE Panel Discussion – Terms of Reference #2

4:45-5:00   Questions for following day

Wednesday, June 22. Holiday Inn, Lighthouse Room, Jones Road, Falmouth, MA

9:00-9:30   Review any outstanding questions from previous day

9:30-10:30   CIE Panel Discussion – Terms of Reference #3

10:30-10:45   Break

10:45-Noon   CIE Panel Discussion – Terms of Reference #4

Noon-1:30   **Lunch**

1:30 – 3:00   **CIE Panel Discussion – Terms of Reference #5**

3:00-3:15   **Break**

3:15-5:00   **CIE Panel Discussion – Outstanding Issues**

Thursday June 23 Location: Clark Conference Room, Northeast Fisheries Science Center.

9:00 – 5:00 Report writing (Meeting Closed to Public)

Appendix 3: Panel Membership or other pertinent information from the panel review meeting

The panel consisted of James Wilen (University of California at Davis), and three reviewers selected by the CIE: Rigoberto Lopez (University of Connecticut), Ragnar Arnanson (University of Iceland), and Ani Katchova (University of Kentucky). Glenn Mitchell and Steven Peterson were present for most of the panel meeting presenting information and answering questions. John Walden and Dale Squires were present at the panel review as well as panel discussion session to help with the review process and offer additional information when needed. Participants from the industry and various organizations were also present and offered comments/feedback.

Part IV: Peer Review Report

by

Rigoberto A. Lopez

Center for Independent Experts

CIE Independent Review of the Technical Report

on Recommendations for Excessive-Share Limits

in the Surfclam and Ocean Quahog Fisheries

By

Rigoberto A. Lopez

Professor and Head
Department of Agricultural and Resource Economics
Director
The Zwick Center for Food and Resource Policy
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July 4, 2011

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Executive Summary

Background and Objective

Since 1990, surfclam and ocean quahog (SCOQ) fisheries are each managed through setting a total allowable catch and individual transferable quotas. Over the last 20 years, and in the last five in particular, this sector has experienced:

- significant increases in market concentration in both processing and harvesting, resulting in fewer firms either buying or selling SCOQ products; and
- a significant increase in vertical coordination between processors and harvesters.

These trends have raised concerns about market power impacts and also raised awareness of how an excessive-share limit might be implemented in this and any other fishery facing increasing concentration.

At the request of the Center for Independent Experts, the objective of this report is to independently evaluate a report by the Technical Group of Experts (Mitchell, Peterson, and Willig, 2011) containing recommendations for excessive-share limits in the SCOQ and other U.S. fisheries.

Major Findings

Methodology Used by the Technical Group

The primary tool used by the Technical Group for determining the maximum possible allowable percentage share of quota ownership that will prevent market power is the 2010 *Horizontal Merger Guidelines* by the U.S. Department of Justice and the Federal Trade Commission, particularly the sections pertaining to market concentration. The steps may be summarized as:

- Determine the ownership and control of quotas in the fishery
- Determine the relevant market, particularly in reference to competition from outside the fishery, such as state fisheries and imports.
- Compute market shares based on the previous steps
- Compute the Herfindhal-Hirshmann index based on a hypothetical maximum share cap and ensure that the share cap does not lead to an HHI that exceeds 2500, which is the

threshold determined by the *Horizontal Merger Guidelines* for an industry to be deemed "highly concentrated."

A corollary tool is to ensure that there are three efficient processors in the fishery.

Strengths and Weaknesses of the Technical Group Report

The following are deemed strengths of the report:

- Use of the most universal guidelines for assessing competition: the *Horizontal Merger Guidelines*, particularly a threshold HHI of 2500, which is the gold standard.
- Inclusion of outside competitors that determine the relevant output market, particularly imports and state fisheries as well as fringe firms in the fisheries, which are bound to behave competitively regardless of the excessive share cap.

The following are deemed issues that require further attention:

- Focusing exclusively on monopoly power at the expense of a focus on monopsony power, which is likely to be the prevailing case in fisheries.
- Lack of explicit consideration of harvesting and processing efficiency, which may give room to improve performance of the fishery, particularly if market power effects are weak. Cost reductions may reduce or even reverse a firm's incentive to elevate price in the monopoly case.

Crucial information to implement the approach requires careful definition of quota ownership and control and of the relevant market.

Applicability to the SCOQ and Other Fisheries

The approach used by the Technical Group is generic and is applicable to just about any fisheries, provided accurate information is obtained on quota rights and control, boundaries of the relevant market, and efficiency effects of the scale of operation. For the case of the SCOQ fisheries, given current conditions, it is recommended to set a fixed excessive-share cap of 30-40%, or a more flexible two-part cap of 30% long term, 40-60% short term.

Although a 30-40% cap may be restrictive if the market is defined too narrowly or if efficiency effects of concentration are ignored, it is likely to be appropriate if there are buying power or

monopsony concerns since, for the latter, the relevant market is geographically confined to the fishery in question.

Besides the monopsony and efficiency concerns pointed out, the main room for improvement is collecting accurate information about the fishery, the market, and performance indicators such as quota prices.

Public policy to restrain excessive market concentration via excessive-share caps or by other means is commonplace in non-fish U.S. markets and has been the focus of antitrust and competition policy for many years. When evaluating excessive-share caps, the ultimate issue is not only whether adverse competitive effects have resulted from ongoing concentration, but whether such effects are likely to arise in the future and if excessive-share caps can deter such trends without harming market performance and competitiveness.

Background

Federal fisheries are commonly managed under annual catch limits and some type of limited access programs to address both economic and environmental sustainability. Since 1990, surfclam and ocean quahog (SCOQ) fisheries are each managed through setting a total allowable catch (TAC) and individual transferable quotas (ITQs).

Over the last 20 years, there have been two significant changes in market structure leading to concerns over competition, or lack thereof, with regard to the current ITQ system:

- a significant increase in market concentration of firms at both the harvesting and processing stages resulting in fewer firms either buying or selling SCOQ products; and
- a significant increase in vertical coordination between processors and harvesters, specifically the use of contracts and, in the clam subsector in particular, processor control of ITQs.

Given these changes, a central concern is the potential market power effects from market concentration of SCOQ quota ownership and control. One instrument available to regulators, and the focus of this report, is to set an excessive catch share, i.e., the maximum catch share allowable to a harvester or to an entity such as a processor who may also control part of the harvest in order to mitigate or prevent market power.

The golden rule of market concentration regulation is provided by the Department of Justice and the Federal Trade Commission's *Horizontal Merger Guidelines* (HMG).[1] Accordingly, the threshold for an industry to be deemed "highly concentrated" is determined by an excessive share of the quota calculated by the Herfindahl-Hirschman Index (HHI), which measures the size distribution of firms by summing their squared market shares (thus ranging from 0 to 10,000), with H=2,500 being a cause of concern, as based on past experience by U.S. antitrust authorities.

By this standard, the HHI of surfclam and ocean quahog processing purchases have already surpassed this threshold, raising concern about the exercise of market power, particularly if the current trend in processing concentration continues, which is likely to be the case if left unchecked.

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[1] U.S. Department of Justice and the Federal Trade Commisssion. *Horizontal Merger Guidelines.* Washington, D.C., August 19, 2010. Available at: http://www.justice.gov/atr/public/guidelines/hmg-2010.html

With regard to pending Amendment 15 to the SCOQ Fishery Management Plan, administered by the Mid-Atlantic Fishery Management Council (MAFMC), the goal is to define an "excessive share" threshold for the ITQ to prevent limited access holders from acquiring an excessive share of the TAC privileges, in compliance with the Magnuson-Stevens Act. The issue of market power effects of excessive shares is an overriding concern. At the request of the MAFMC and the National Marine Fisheries Service (NMFS), a group of technical experts (Mitchell, Peterson and Willig, 2011, Appendix A) provided recommendations for excessive-share limits for SCOQ fisheries.

Reviewer's Role in the Review Process

At the request of the Center for Independent Experts (CIE), I was asked to provide an impartial and independent peer review, without conflicts of interest, of a report by the Technical Group of Experts (Mitchell, Peterson, and Willig, 2011, Appendix A) containing recommendations for excessive-share limits in the SCOQ fisheries. The Statement of Work (tasks and deliverables), the Terms of Reference and the agenda for the CIE panel review are in Appendix B. This report follows the content requirement as specified in Annex 1 of Appendix B. The period of review spanned from May 17 through July 21, 2011, and included an open, in-person meeting on June 21-23, 2011 at Falmouth/Woods Hole, Massachusetts, and a pre-meeting review of the background documents received as well as the post-meeting writing of this report.

Dr. Rigoberto A. Lopez is a professor and Head of the Department of Agricultural and Resource Economics and Director of the Charles J. Zwick Center for Food and Resource Policy at the University of Connecticut. He has extensive expertise in food policy and industrial organization and has published on the effects of industrial concentration on market power and cost efficiency as well as econometric analyses of market power in the food industries. He has also published on the analysis of quantitative trade barriers and their impact on welfare participants.[2] This report summarizes his evaluation of the Mitchell, Peterson and Willig (2011) recommendations, both independently and collectively as a CIE panel member.

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[2] Lopez, R.A., A. Azzam, and C. Lirón-España. "Market Power and/or Efficiency: A Structural Approach." *Rev. Ind. Org.* 20(2002): 115-126. Bhuyan, S. and R.A. Lopez. "Oligopoly Power in the Food and Tobacco Industries." *Amer. J. Agric. Econ.* 79(1997): 1035-1043. Bonanno, A. and R.A. Lopez. "Competition Effects of Supermarket Services." *Amer. J. Agric. Econ.* 91(2009): 555-568. Lopez,R.A. and E. Lopez. "The Impact of Imports on Price Cost Margins: An Empirical Illustration." *Emp. Econ.* 28(2003): 403-416. Lopez, R.A. and Z. You. "Determinants of Oligopsony Power: The Haitian Coffee Case." *J. Dev. Econ.* 35(1993): 465-473.

Summary of Findings for Terms of Reference

Terms of Reference 1: *Describe the method or process used by the NMFS Technical Group for determining the maximum possible allowable percentage share of quota ownership that will prevent an entity from obtaining market power.*

An excessive-share cap limits the amount of quota of any harvesting quota holder. The primary method used by the NMFS Technical Group is to set the excessive-share cap so that the HHI does not exceed 2500, based on the Federal Trade Commission's 2010 *Horizontal Merger Guidelines*, in order to ensure that there are at least three efficient processors, based on a common (Kwoka, 1979), albeit not universal, principle that a third firm imposes a crucial pro-competitive effect, as reflected by price-cost margins.[3] As with any excessive-share cap, the process requires information on ITQ ownership and control, economies of scale, substitutability of products, and definition of relevant markets or size of the market in order to compute the correct market shares.

To determine *a priori* whether or not an excessive share cap is necessary, the Technical Report compares TAC relative to the monopoly equilibrium. If TAC is below the monopoly output, TAC would be binding and force the market to operate at an output more constraining than one being controlled by a single monopolist. In this case, an excessive-share cap is not necessary because there would be no incentive to withhold quota (meaning withholding harvesting through not using all the ITQs) in order to raise price. An interesting point is that, at the margin, a unit of an ITQ is worth the difference between the demand price and the marginal cost of harvesting. Thus, the "price" of the quota is positive if there is monopoly power or if there is competitive behavior; but TAC is binding, creating a wedge between price and marginal cost. If there is perfectly competitive behavior and TAC is non-binding (there is unused, surplus quota in the market), then the price of the quota is zero. Thus, the price of the quota conveys relevant information as to the pre-existing competitive conditions in a fishery.

In terms of the relevant market, the technical group focuses on two elements and how they affect market shares and, therefore, the determination of an excessive-share cap:

- the share of non-SCOQ fisheries (state fisheries and imports) as their increasing presence defines a larger market, provided they are significant substitutes for the fishery product and geography in question, and

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[3] Kwoka, J.E. Jr. "The Effect of Market Share Distribution on Industry Performance." *Rev. Econ. Stat.* 61(1979): 101-109. In the business literature, there is a widely accepted notion that a Rule of Three structure is optimal because three big and efficient companies (e.g., with more than 10% market share) act as a tripod to ensure that neither destructive competition nor collusion prevails (see Sheth, J.N. and S. Sisodia. *The Rule of Three: Surviving and Thriving in Competitive Markets.* New York: Free Press, 2002).

- the share of fringe firms as their increasing presence reduces the market subject to excessive-share caps and, by nature of behaving competitively, exerts a disciplining effect.

The Technical Group's determination of market shares is as follows. First, participants are classified into (1) regular quota holders or controllers who can be affected by the excessive-share caps (e.g., TAC shares of more than 10%) and (2) fringe firms holding small market shares or serving niche markets. Let TAC_i denote the quota allocated to the ith quota holder, where TAC is simply the sum over *all* ITQs as set by the fishery authority. Let M denote the size of the market which is composed of TAC (effective or binding) plus "outside" (O) fisheries to account for imports and state fisheries that may be substitutes for SCOQ fisheries. Thus, $M=TAC+O$ denotes the size of the market. Thus, a relevant or "effective" market share is defined as $TAC_i/M.$ By squaring these market shares and adding up one obtains the 'relevant' HHI. The sum of the squared shares of the fringe firms is excluded from the summation for computational convenience, as small shares' squares have little impact on the HHI. However, their aggregate share limits the portion of TAC subject to the excessive-share cap.

The Technical Group relies on four alternative scenarios corresponding to different levels of non-SCOQ fisheries (0, 10, 20 and 40% of TAC), where 0% denotes the case where there are no substitutes from outside fisheries. The Technical Report then presents a table for each scenario with computed HHIs resulting from combinations of alternative levels of excessive-share caps (20-70%) and aggregate shares of fringe firms (0-30%) in the SCOQ fisheries. As the market expands beyond the product and/or geographic boundaries of the SCOQ fisheries, or as the aggregate share of fringe firms increases, the excessive-share cap corresponding to an HHI of 2500 increases.

For example, scenario 1 assumes a market with zero non-SCOQ fisheries. In this case, a 20% excessive-share cap (i.e., 20% of TAC) with no fringe firms results in an HHI of 2000. Scenario 2 assumes a market with non-SCOQ fisheries equivalent to 10% of TAC. The same share cap of 20% of TAC as in scenario 1 would now result in an effective HHI of 1653 as the market is defined more broadly. In other words, in scenario 2, a 20% share cap corresponds to an 18.182% market share since the market is 10% larger (M=1.10 TAC, and 18.182%=20%/1.10), thus reducing the HHI.

Generation of effective HHIs over four scenarios depicting shares of fringe firms of up to 30% of TAC and state fisheries and imports with volumes of up to 40% of TAC lead to a range of acceptable combinations of excessive-share caps to ensure an effective HHI of 2500 and three non-fringe firms operating in the market. In other words, any level of excessive-share cap with combinations of non-SCOQ fisheries and aggregate shares of fringe firms resulting in HHIs over

2500 are deemed undesirable as they would result in a highly-concentrated market by the *Horizontal Merger Guidelines.*

The above scenarios lead the Technical Group to recommend setting the excessive-share caps at either (a) a fixed cap at 30-40%, or (b) a two-part cap at 30% for the long-term and a 40-60% for the short term (which could lead to an HHI over 2500 in the short term).

Terms of Reference 2: *Evaluate the strengths and weaknesses of the proposed method developed by the NMFS Technical Group for determining maximum possible allowable percentage share of quota ownership. Review and comment on the data requirements necessary for applying the proposed methods.*

Among the strengths of the Technical Group's proposed method for fisheries in general are:

- *Merger Guidelines:* Uses 2010 DOJ-FTC *Horizontal Merger Guidelines*, particularly a threshold Herfindahl-Hirshmann Index of 2500, which is the gold standard for analyzing competition in the United States and abroad. Thus, it brings the problem into a class of more generalizable situations for which ready comparison can be made across fisheries and non-fishery cases.
- *Inclusion of non-SCOQ Fisheries:* Considers the effect of a competitive fringe as well as the effects of state fisheries and imports in determining the relevant market and, therefore, the relevant market shares which are bounded from below by the TAC shares. The larger the relevant market or degree of demand substitution from outside the fisheries area, the greater the allowable excessive-share cap.
- *Efficiency Consideration:* Recognizes, although not explicitly incorporating, the importance of potential processing and harvesting efficiency effects from increased concentration. Requiring three 'efficient' processors under the suggested HHI will encourage economies of size as well as ensuring a minimum degree of competition in the geographic region of the fisheries, regardless of the size of the relevant market for processed fishery products.

Among the weaknesses of the methodology are:

- *Monopsony Power:* Focusing on monopoly power sidesteps the possibility of monopsony or buying power, which seems to be more relevant in many fisheries. Harvesters and processors tend to face an elastic demand for their products as wholesale output markets are often much larger than the fisheries. The relevant market for monopsony power is bound to be more geographically localized than the output market. Thus, a fishery is more likely to face monopsony power than it does monopoly power.

- *Efficiency Effects:* Underlying many of the analyses regarding industrial concentration, and the HHI in particular, is an overriding concern with market power, particularly if it results in significant increases in the price of output through restriction of the use of ITQs, but recent literature and even the *Horizontal Merger Guidelines* consider the possibilities of factoring in efficiencies that result from mergers or increases in concentration.[4] This issue is not addressed although, in a unilateral context, cost reductions resulting from concentration or expansion that may be limited by a cap may reduce or even reverse a firm's incentive to elevate price. [5]

- *Numerator of Market Shares:* Quota control and ownership are disjoined from volume processed in the definition of market shares. Normally, the Herfindahl Index is defined based on market shares in the output or input market based on transactions (revenues or expenditures on the input in question). The current definition of an excessive-share cap separates ownership and control and can yield a situation where a single processor processes 2/3 of the harvest but only officially controls 1/3 without owning any. In the standard literature a 2/3 purchase of the total volume would be of concern.

- *Denominator of Market Shares:* The relevant product and geographic markets are not defined, although market shares are computed as the ratio of the quota or cap shares divided by the size of the 'relevant' market. In other words, the denominator of the share expression becomes crucial information as the allowable excessive-share cap increases with the size of the relevant market.

Implementation of the method proposed by the Technical Group requires at least the following data:

- *Quota ownership and control*: Clear records of the number of independent entities that own the quota and who controls it through long term contracts or through vertical arrangements (e.g., quota owners who also own shares of processing firms). This is crucial to compute the numerator of market shares used in the HHI.

- *Processing volumes and capacity*: It is standard also to base HHI on actual market transactions (revenues or expenses). Processing capacity also indicates the possibility of fast entry that may threaten anti-competitive behavior.

- *Size of the Relevant Market*: Data on substitutability of products at the level of demand facing the fisheries (primary processing), through customer surveys or through evidence

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[4] Azzam, A. M. "Measuring Market Power and Cost-Efficiency Effects of Industrial Concentration." *J. Ind. Econ.* 45 (1997): 377-386. Focarelli, D. and F. Panetta. "Are Mergers Beneficial to Consumers? Evidence from the Market for Bank Deposits." *Amer. Econ. Rev.* 93 (2003): 1152-1172. Bian, L. and D.G. McFetridge. "The Efficiencies Defense in Merger Cases: Implications of Alternative Standards." *Can. J. Econ.* 33 (2000):297-318.

[5] DOJ-FTC, *Horizontal Merger Guidelines,* p. 29.

from econometric studies on cross-price elasticities and sensitivity of demand to imports and the volume produced at other fisheries of species relevant to the market in question, is also necessary.

Other necessary data on market structure, conditions of entry, behavior of market participants, and economies of size are mentioned in the report but are not essential in the determination of the excessive-share methodology proposed. Rather, they are supportive evidence for the methodology proposed.

Terms of Reference 3: *Evaluate application of the proposed methods to the Surfclam/Ocean Quahog ITQ fishery. If there is disagreement with what the NMFS Technical Group recommended, clearly state that and your reason why.*

The economic entities in the SCOQ fisheries are clearly three groups: harvesters, primary processors, and quota owners who can be harvesters, processors, corporations, or other economic agents. Demand facing processors seems to be fairly price elastic, reflecting the fact that upstream buyers can obtain substitutes for SCOQ fisheries, at least in the long run, and substitution from other clam species to other forms of ingredients. In addition, there seems to be a large degree of backward integration of processing into harvesting which would to a certain degree obviate the potential monopsony power issue.

An important aspect for the applicability of the proposed method to the SCOQ fishery is that currently fringe firms can be safely assumed to hold approximately 10% of the fishery and that net imports (imports less exports) that compete domestically are in the vicinity of 20-25%. Thus, the scenarios presented by the Technical Group apply to the case of SCOQ fisheries provided that non-SCOQ fisheries directly compete with SCOQ fisheries in the relevant market.[6]

Given the foregoing, the Technical Group recommends a fixed excessive-share cap of 30-40 % or, alternatively, a flexible cap of 30% long term and 40-60% short term. The key number emerging in the report is a 40% excessive-share cap, which automatically ensures independent harvest supply to sustain at least three processors in the market.

First, there is no constitutional basis to interpret "excessive" solely based on market power, or in this case, monopoly power. If efficiency effects are strong (e.g., strong economies of scale) and processors face a much larger market than the SCOQ fisheries, then efficiency considerations may be more significant than faltering market power. As concentration affects harvesting and particularly processing costs, costs may be bound to be affected more than wholesale price paid to processors. In other words, profit margins of processors, as determined

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[6] In 2008, the SCOQ fisheries supplied approximately 83 million pounds, imports from Canada and other countries additionally supplied approximately 33 million pounds, and exports accounted for 13 million pounds, according to personal communication with Dr. Jose Montanez, Fishery Management Specialist at MAFMC.

by price received minus cost, might be importantly determined more by cost than by their influence on the price they receive. Ultimately, given a potential trade-off between price set and production cost from the excessive-share cap in SCOQ, what matters more from an antitrust perspective is the level of the price set which will also depend on the passthrough of any potential cost savings. It might be the case that consolidation is necessary for survival, in which case a higher excessive-share cap might be recommended.

What might be more useful for incorporating efficiencies is the relationship between output price and the HHI induced by the excessive-share cap, where the market power test might be a 5% increase in output price (or a 5% reduction in the price paid to harvesters) rather than relying solely on an effective HHI of 2500. As the *Horizontal Merger Guidelines* suggest, market shares may not fully reflect the competitive significance of firms in the market and should be used in conjunction with other evidence of competitive effects.[7]

In conclusion, I reckon that an excessive-share cap for the SCOQ fisheries of 30-40% or the two-part cap counterpart might be rather conservative estimates and that it might not be surprising that, considering efficiency impacts, an excessive-share cap of 2/3 of TAC or eventually a natural monopoly or monopsony might be preferable.

Terms of Reference 4: *Evaluate whether the approach outlined by the NMFS Technical group is reasonable for setting excessive share limits in fisheries managed through catch shares? As part of this TOR, comment on any constraints that may hinder application of the methods proposed by the NMFS Technical Group.*

The approach used by the Technical Group is generic and is applicable to just about any fisheries, provided accurate information is obtained on quota rights and control, boundaries of the relevant markets, and efficiency effects of scale of operation. The first two are essential to compute the correct market shares from which to compute the HHI and impute the appropriate excessive-share cap to induce a relevant HHI of 2500 in a fishery.

The main constraints remain access to the accurate information needed to appropriately implement the approach. Some of this information may be considered proprietary and it may not be in the best interest of dominant producers, for instance, to reveal all necessary information. As in any market, full and accurate information is needed for markets to work smoothly. Asymmetric information will generate advantages to those who have access to it and will make the regulator's job more imprecise and difficult. It may also lead to suboptimal policies from the perspective of a social planner.

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[7] DOJ-FTC, *Op cit.*

Terms of Reference 5: *Provide any recommendations for further improvement.*

The report relies on the legal foundation of protecting against market power under any conceivable market condition and also relies on a "blunt" instrument, i.e. an excessive- share cap. This is accomplished by tying share caps to market shares, and hence, to market structure, which is bound to affect market conduct and performance. However, the same market structure can lead to a variety of performance outcomes, i.e., price levels, price-cost margins, cost efficiency, and social welfare.

Further recommendations fall into two areas: (1) consideration of monopsony power, particularly if monopoly power seems weak; and (2) consideration of efficiency effects of excessive-share caps that may correspond to high HHI levels, possibly beyond 2500.

In considering the lack of focus on monopsony power case, and in view of the intended application of the methodology, consider a fishery-processing industry consisting of *N* firms converting raw fish into fish products for the wholesale market. For simplicity, assume fixed proportions between the fish input and the output and that each firm sells output in a competitive market and buys non-fish inputs also in a competitive market. Let q_i denote the raw fish bought by the ith processor and let the total amount bought by all processors be given by $Q = \sum q_i \, (i = 1, \ldots, N)$. A processor's profit maximization problem is given by $Max \, \Pi_i = [\, P_w - c - P \,] \, q_i$, where P_w is the wholesale price of the processed fish product, c is the per unit processing cost, and P is the price paid to fish harvesters. To maximize profits, the processors set a price for fish so that their net value of marginal product, $NVMP = P_w - c$, equals their marginal input cost, $MIC = P(1 + \theta_i / \eta)$, where $\theta_i = S_i(1 + \lambda_i)$ is a measure of perceived coordination across processors, market share is $S_i = q_i / Q$; the reaction of other firms is given by $\lambda_i = \sum \partial q_j / \partial Q$; and $\eta = -(\partial Q/\partial P)(P/Q)$ is the price elasticity of harvesters' supply. At equilibrium, given our assumptions, $\theta_i = \theta$ since all processors are assumed to face the same $NVMP$ and pay P to the harvesters. One point here is that not only market shares collectively determine the price paid to harvesters but also processing efficiency and the degree of coordination among processors.[8]

The Technical Report relates the price of the quota as *prima facie* evidence of market power. It argues that a competitive market equilibrium with a non-binding TAC results essentially in a zero quota price as the competitive market, not TAC, determines market equilibrium and therefore the price of fish equals the marginal cost of harvesting. Alternatively, a monopoly equilibrium or a competitive market with a binding TAC (below market equilibrium) results in a positive quota price because the price of fish exceeds the cost of harvesting. Currently and in the last few years, TAC has not been binding as there has been surplus quota and the price of the quota has been neglible. An alternative explanation is given to those in the report.

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[8] For similar models, see Azzam (1997) and Lopez and You (1993), *Op. Cit.*

Figure 1 illustrates the case of monopsony equilibrium instead of a competitive equilibrium (point C) where there is a non-binding TAC (*TAC* or a more constraining *TAC'*). If, as stated before, the 'free' market equilibrium is not a competitive equilibrium but a monopsonistic one where buyers have market power over harvesters or independent quota holders, then it is possible that a non-binding quota is partially the result of constraining the *use* of quotas rather than withholding quota from the supply side; however, the surplus quota may in this case have a neglible price, not necessarily a positive price as stated in the case presented in the report. This equilibrium occurs, as shown above, where the net value of marginal product equals the marginal input cost at point A in Figure 1, resulting in a non-competitive margin that accrues to processors, depressing the price of fish to the harvester and resulting in a zero quota price at the margin. In the case that quota holders exercise *monopoly* power, as in the report (e.g., Figure 5), then equilibrium occurs at point B but the quota would have a *positive* price reflected by the difference between the higher price at point A and the harvesting cost at point B, also constraining volume below the competitive level. Thus, the price of the quota depends on the type of market power considered, structure of quota rights and vertical integration. In the case of a monopsony, where quota owners also own processing facilities, transactions will give priority to those vertically integrated or who will enter into a vertical agreement with a non-compete clause. This would be disadvantageous to independent quota owners who would be likely to be the ones left out with a zero quota price if TAC is non-binding.

Figure 1

Monopsony Equilibrium in an ITQ-Regulated Fishery with Non-Binding TAC
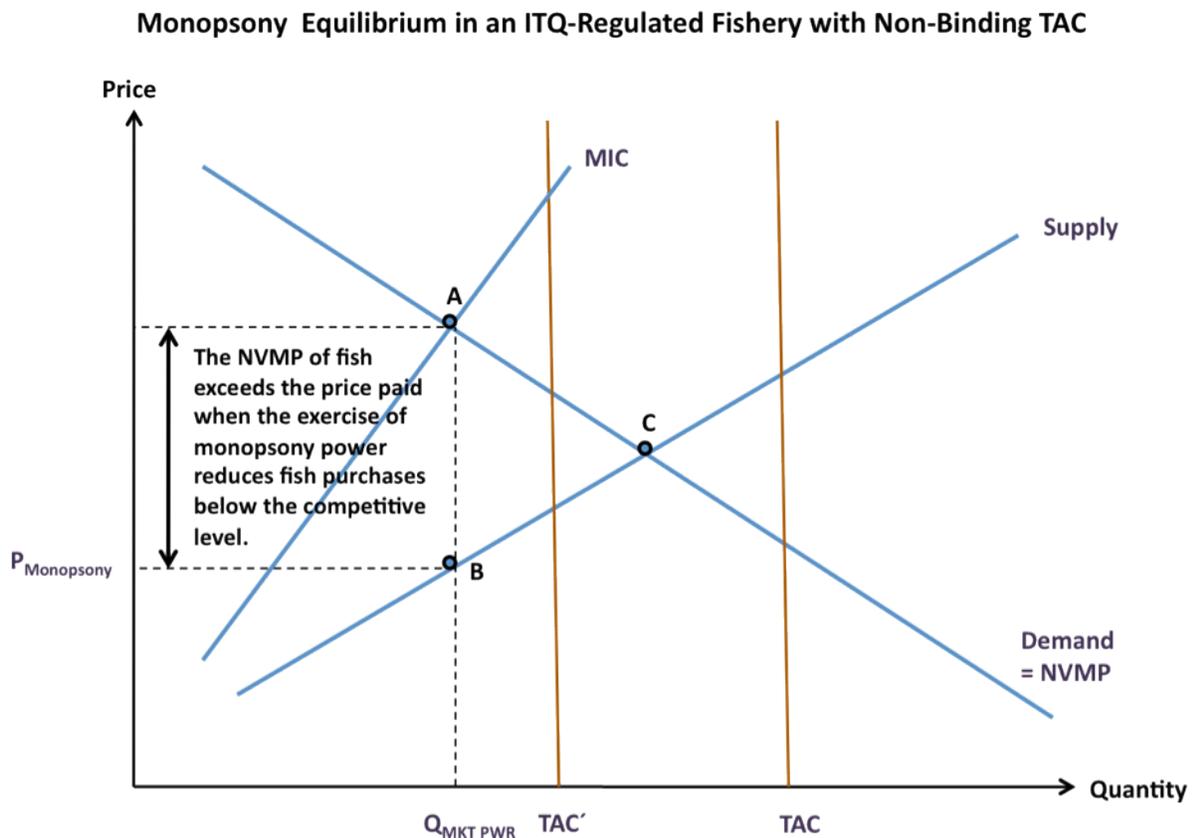
Given the foregoing, the following is recommended:

- Focus more on the potential monopsony power effects rather than just monopoly power, explicitly considering alternative vertical coordination arrangements.

Contrary to traditional thinking, which only considered market power effects from increased market concentration, concentration can also lead to significant efficiency gains through redistribution of output toward more efficient (e.g., lower cost) firms, resulting in a potential trade-off between market power and efficiency.
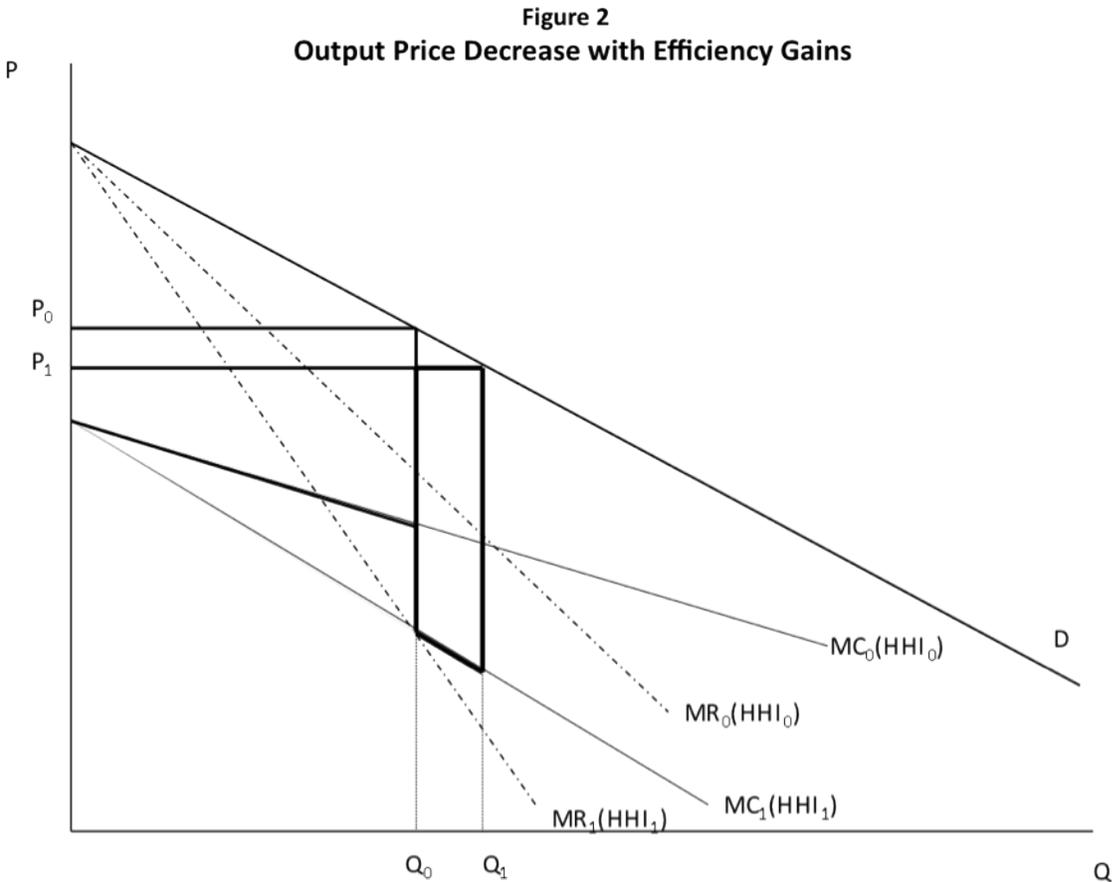
In considering the lack of focus on efficiency effects, consider that The *Horizontal Merger Guidelines*, in addition to prescribing an HHI of 2500, also provide a performance outcome: the resulting increase (decrease in a monopsonistic situation) in price should be less than 5% relative to a benchmark such as the competitive outcome. A suggestion for further improvement is to focus more broadly on the balance of market power and efficiency. The problem with market power is price. If all one wants to avoid is market power, there is a danger of overlooking efficiency effects that may be crucial for the survival of the industry, particularly when demand is depressed due to economic or competitive conditions brought about from outside the fishery area. Why should two fisheries, one with strong economies of scale and one without, have the same HHI prescription?

Given the foregoing, the following is recommended:

- Focus more on potential price effects rather than just HHI, explicitly considering harvesting and processing efficiency effects.

To illustrate, Figure 2 shows an industry equilibrium in which market power increases and industry marginal cost decreases with an increase in HHI (from HHI_0 to HHI_1). Market equilibrium occurs when marginal revenue *MR* equals marginal cost *MC* at a given level of *HHI*. [9] At industry equilibrium, the increase in concentration causes an increase in market power that is more than offset by an increase in efficiency by redistributing output to the most efficient firms, thus resulting in a lower output price *P* and an expansion of output from Q_0 to Q_1, which would be beneficial to consumers. The point is that the report seems to imply that at the moment market power is either non-existent or very limited (near-zero price for the quota). If that is the case then, efficiency considerations might be given greater weight as long as they can be substantiated.

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[9] See Lopez, R.A. and C. Lirón-España. "Social Welfare and the Oligopoly-Efficiency Tradeoff in U.S. Food Processing: A Note." *J. Agric. Food Ind. Org.* 1(2003): Article 5 (10 pages). Available from http://www.bepress.com/jafio/vol1/iss1/art5.

Figure 2
Output Price Decrease with Efficiency Gains

Another improvement, mentioned in the report, is collecting information on the shadow price of the quota, either through creating an auction mechanism to reveal prices or by soliciting this information explicitly from quota holders.

To conclude, public policy to restrain excessive market concentration via excessive-share caps or by other means is commonplace in non-fish U.S. markets and has been the focus of antitrust and competition policy for many years particularly focused on market concentration. When evaluating excessive-share caps, the ultimate issue is not only whether adverse competitive effects have resulted from ongoing concentration, but whether such effects are likely to arise in the future and if excessive-share caps can deter such trends without harming market performance and competitiveness.

Appendix 1: Bibliography of Materials Provided

Mitchell, Glenn, Steven Peterson, and Robert Willig. *Recommendations for Excessive-Share Limits in the Surclam and Ocean Quahog Fisheries.* Compass Lexecon, May 3, 2011.

Mid-Atlantic Fishery Management Council in cooperation with National Marine Fisheries Service. *Overview of the Surfclam and Ocean Quahog Fisheries and Quota Considerations for 2011, 2012, and 2013.* Dover, Delaware, April 2010.

Appendix 2: Statement of Work for Dr. Rigoberto Lopez

External Independent Peer Review by the Center for Independent Experts

Evaluation of excessive shares study in the

Mid-Atlantic surfclam and ocean quahog ITQ fishery

Scope of Work and CIE Process: The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Technical Representative (COTR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. CIE reviewers are selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. Each CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in **Annex 1**. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from www.ciereviews.org.

Project Description: Recently, the Mid-Atlantic Fishery Management Council has been crafting Amendment 15 to the Surfclam and Ocean Quahog Fishery Management Plan, and as part of the Amendment, has been attempting to define an "excessive share" threshold for the Individual Transferable Quota (ITQ) portion of the fishery. Regarding share accumulation, section 303A(c)(5)(D) of the 2006 reauthorized Magnuson-Stevens Act states that ITQ privilege programs should ensure that limited access privilege holders do not acquire an excessive share of the total limited access privileges in the program. In addition, National Standard 4 of the Magnuson Act (16 *U.S.C.* 1851(a)(4)) requires that fishing privilege allocations be carried out so that "no particular individual, corporation, or other entity acquires an excessive share of such privileges." During the course of the Council's deliberations on the market power excessive share issue, it was decided that additional expertise was needed to examine the economic rationale behind the excessive share determination, and to recommend an excessive share level, if needed. In order to provide this expertise, a Technical Group of Experts (not the CIE) is being assembled to give advice on the appropriate excessive share threshold for the surfclam and ocean quahog ITQ system. This Technical Group will assess available models for evaluating the presence of market power, and make recommendations with regard to their appropriateness for setting excessive catch share limits.

The work being performed by this Technical Group could be controversial. It will establish methods for determining excessive shares which might be applied in other fisheries (besides surfclams and ocean quahogs). With the movement by NMFS to catch share systems, determining what constitutes an excessive share and whether limits need to be put in place is extremely important because excessive

share may lead to market power. Market power can lead to the ability to influence price in either the final product market or for factors of production (i.e. the fish resource). Examination of market share has never been formally investigated in this fishery. Thus the study by the Technical Group will be innovative and significant.

After the Technical Group has delivered its recommendations, a peer review (by the CIE) needs to take place to either endorse or reject the findings from the Technical Group. This two-step process was agreed to by the Northeast Fisheries Science Center (NEFSC) and the Mid-Atlantic Fishery Management Council (MAFMC).

The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**. The tentative agenda of the panel review meeting is attached in **Annex 3**.

Requirements for CIE Reviewers: Three CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. CIE reviewers shall have working knowledge and recent experience in the application of economics, with specific expertise in industrial organization. The reviewers should have theoretical and empirical expertise in the economics of market structure/conduct/performance, particularly monopoly/oligopsony, antitrust, firm strategy, and government regulation. Experience conducting studies using econometric models and/or index-based assessments of market concentration and market power would be useful. Experience with markets operating under government permits such as production permit or marketing orders in agriculture, bandwidth for TV and radio, and tradable permit systems like ITQ's in fisheries would be desirable. Empirical studies of market structure in renewable resource industries would be desirable as would an understanding of the statutory context for antitrust regulation. Each CIE reviewer's duties shall not exceed a maximum of 14 days to complete all work tasks of the peer review described herein.

Not covered by the CIE, the CIE chair's duties should not exceed a maximum of 14 days (i.e., several days prior to the meeting for document review; the CIE panel meeting in Woods Hole; several days following the open meeting for SARC Summary Report preparation).

Location of Peer Review: Each CIE reviewer shall conduct an independent peer review during the panel review meeting scheduled in Woods Hole, Massachusetts during 21-23 June 2011.

Statement of Tasks: Each CIE reviewer shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

1. Prior to the Peer Review Meeting:

Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title, affiliation, country, address, email, FAX) to the COTR, who forwards this information to the NMFS Project Contact no later the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents, reports, foreign national security clearance, and other information concerning pertinent

meeting arrangements. The NMFS Project Contact is also responsible for providing the Chair (see below) a copy of the SoW, background documents and final report in advance of the panel review meeting. Any changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

Foreign National Security Clearance: When CIE reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for CIE reviewers who are non-US citizens. For this reason, the CIE reviewers shall provide requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, home country, and FAX number) to the NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Deemed Exports NAO website: http://deemedexports.noaa.gov/sponsor.html).

Pre-review Background Documents: Approximately two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the CIE reviewers the necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review.

2. During the Open Meeting

Panel Review Meeting: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs can not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.** Each CIE reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the ToRs as specified herein. The NMFS Project Contact is responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The NMFS Project Contact is responsible for ensuring that the Chair understands the contractual role of the CIE reviewers as specified herein. The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

(Review Meeting Chair)

A member of the Mid-Atlantic Management Council Scientific and Statistical Committee will serve as Chairperson. The role of the Chair is to facilitate the meeting, which includes coordination of presentations and discussions, and making sure all Terms of Reference are reviewed. Additionally, the Chair shall prepare the summary report from the meeting. During the meeting the Chair can ask

questions or make statements to clarify discussions, and he can move the discussion along to ensure that the CIE reviewers address all of the TORs.

(CIE Reviewers)

Each CIE reviewer shall participate as a peer reviewer in a panel discussion centered on a report furnished to NMFS by the Technical Group of Experts regarding excessive shares in the surfclam and ocean quahog fishery. Reviewers are to determine whether the findings of the Technical Group are valid given the Terms of Reference provided to the expert panel. If reviewers consider the recommendations of the expert panel to be inappropriate, the reviewers should recommend an alternative.

During the question and answer period, a representative of the NMFS expert panel will be available to answer questions about the report. The CIE members can provide feedback to the expert panel member at that time.

(Other Panel Members)

A representative from the Mid-Atlantic Fishery Management Council staff, and the Northeast Fisheries Science Center Social Sciences Branch will be available during the meeting to provide any additional information requested by the CIE reviewers. Other panel members may assist the Chair prepare the summary report, if requested.

3. After the Open Meeting

  Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

Other Tasks – Contribution to Summary Report: The Chair from the SSC and CIE reviewers will prepare the Peer Review Summary Report. Each CIE reviewer will discuss whether they hold similar views on each Term of Reference and whether their opinions can be summarized into a single conclusion for all or only for some of the Terms of Reference. For terms where a similar view can be reached, the Summary Report will contain a summary of such opinions. In cases where multiple and/or differing views exist on a given Term of Reference, the Report will note that there is no agreement and will specify - in a summary manner – what the different opinions are and the reason(s) for the difference in opinions.

The Chair's objective during this Summary Report development process will be to identify or facilitate the finding of an agreement rather than forcing the panel to reach an agreement. The Chair will take the lead in editing and completing this report. The Report (please see Annex 1 for information on contents) should address whether each Term of Reference was completed successfully. For each Term of Reference, this report should state why that Term of Reference was or was not completed successfully.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
2) Participate during the panel review meeting at the Northeast Fisheries Science Center, Woods Hole, MA laboratory during 21-23 June, 2011 as specified herein, and conduct an independent peer review in accordance with the ToRs (**Annex 2**).
3) No later than 7 July, 2011, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts", and the report should be sent to Mr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and Dr. David Sampson, CIE Regional Coordinator, via email to david.sampson@oregonstate.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

Schedule of Milestones and Deliverables: CIE shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

17 May 2011	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
7 June 2011	NMFS Project Contact sends the CIE Reviewers the pre-review documents
21-23 June 2011	Each reviewer participates and conducts an independent peer review during the panel review meeting
7 July 2011	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
14 July 2001	Draft of Summary Report, reviewed by all CIE reviewers, due to panel Chair *
21 July 2001	Panel Chair send final Summary Report, approved by CIE reviewers, to NEFSC contact
21 July 2011	CIE submits CIE reports to the COTR
28 July 2011	The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

*The Summary report will not be submitted, reviewed, or approved by the CIE

Modifications to the Statement of Work: Requests to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on substitutions. The COTR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to

complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

Acceptance of Deliverables: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, these reports shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:

(1) each CIE report shall completed with the format and content in accordance with **Annex 1**,

(2) each CIE report shall address each ToR as specified in **Annex 2**,

(3) the CIE reports shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

Distribution of Approved Deliverables: Upon acceptance by the COTR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COTR. The COTR will distribute the CIE reports to the NMFS Project Contact and Center Director.

Support Personnel:

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Key Personnel:

NMFS Project Contact:

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Northeast Fisheries Science Center

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Annex 1: Format and Contents of CIE Independent Peer Review Report

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations in accordance with the ToRs.

2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.

   a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including providing a brief summary of findings, of the science, conclusions, and recommendations.

   b. Reviewers should discuss their independent views on each ToR even if these were consistent with those of other panelists, and especially where there were divergent views.

   c. Reviewers should elaborate on any points raised in the Summary Report that they feel might require further clarification.

   d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.

   e. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The CIE independent report shall be an independent peer review of each ToRs, and shall not simply repeat the contents of the summary report.

3. The reviewer report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review

   Appendix 2: A copy of the CIE Statement of Work

   Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Annex 2: Terms of Reference for the Peer Review

Evaluation of excessive shares study in the

Mid-Atlantic surfclam and ocean quahog ITQ fishery

The peer review shall be conducted based on the following Terms of Reference (ToRs):

1. Describe the method or process used by the NMFS Technical Group for determining the maximum possible allowable percentage share of quota ownership that will prevent an entity from obtaining market power.

2. Evaluate the strengths and weaknesses of the proposed method developed by the NMFS Technical group for determining maximum possible allowable percentage share of quota ownership. Review and comment on the data requirements necessary for applying the proposed methods.

3. Evaluate application of the proposed methods to the Surfclam/Ocean Quahog ITQ fishery. If there is disagreement with what the NMFS Technical Group recommended, clearly state that and your reason why.

4. Evaluate whether the approach outlined by the NMFS Technical group is reasonable for setting excessive share limits in fisheries managed through catch shares? As part of this TOR, comment on any constraints that may hinder application of the methods proposed by the NMFS Technical group.

5. Provide any recommendations for further improvement

Appendix 2-Annex 3: Tentative Agenda

Evaluation of excessive shares study in the

Mid-Atlantic surfclam and ocean quahog ITQ fishery

Falmouth and Woods Hole, Massachusetts during 21-23 June 2011

Tuesday, June 21. Holiday Inn, Lighthouse Room, Jones Road, Falmouth, MA

9:00-9:15 AM

Opening

Welcome

Introduction   SSC Chair

Agenda

Conduct of Meeting

9:15 – 9:30   Background and Need for Expert Panel Report – Lee Anderson

9:30-11   Report of the NMFS Expert Panel - NMFS Expert Panel Rep.

11-11:15   Break

11:15 -Noon   Review Terms of Reference – CIE Panel

Noon – 1:15   Lunch

1:15 – 3:00   CIE Panel Discussion – Terms of Reference #1.

3:00-3:15   Break

3:15-4:00   Public Comments

4:00-4:45   CIE Panel Discussion – Terms of Reference #2

4:45-5:00   Questions for following day

Wednesday, June 22. Holiday Inn, Lighthouse Room, Jones Road, Falmouth, MA

9:00-9:30   Review any outstanding questions from previous day

9:30-10:30   CIE Panel Discussion – Terms of Reference #3

10:30-10:45   Break

10:45-Noon   CIE Panel Discussion – Terms of Reference #4

Noon-1:30   Lunch

1:30 – 3:00   CIE Panel Discussion – Terms of Reference #5

3:00-3:15   Break

3:15-5:00   CIE Panel Discussion – Outstanding Issues

Thursday June 23 Location: Clark Conference Room, Northeast Fisheries Science Center.

9:00 – 5:00 Report writing (Meeting Closed to Public)

Appendix 3: Panel Membership

Panel Chair:

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The mission of NOAA's National Marine Fisheries Service (NMFS) is "stewardship of living marine resources for the benefit of the nation through their science-based conservation and management and promotion of the health of their environment." As the research arm of the NMFS's Northeast Region, the Northeast Fisheries Science Center (NEFSC) supports the NMFS mission by "conducting ecosystem-based research and assessments of living marine resources, with a focus on the Northeast Shelf, to promote the recovery and long-term sustainability of these resources and to generate social and economic opportunities and benefits from their use." Results of NEFSC research are largely reported in primary scientific media (*e.g.*, anonymously-peer-reviewed scientific journals). However, to assist itself in providing data, information, and advice to its constituents, the NEFSC occasionally releases its results in its own media. Currently, there are three such media:

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