55 C Municipal Wharf
Santa Cruz, CA 95060

Ocean Conservancy
Start a Sea Change

831.425.1363 Telephone
831.425.5604 Facsimilie
www.oceanconservancy.org

November 16, 2008

Ms. Valerie Frances
Executive Director
National Organic Standards Board
USDA-AMS-TMP-NOP
1400 Independence Avenue, SW
Room 4008 – So. Ag. Stop 0268
Washington, DC 20250-0268

Re: Proposed Organic Aquaculture Standards: Fish Feed and Related Management Issues & Net Pens and Related Management Issues (dated September 28, 2008) - Docket No. AMS-AMS-08-0083

Dear Ms. Frances and Committee Members:

Thank you for the opportunity to comment on the proposed organic aquaculture standards for feed and net pens dated September 28, 2008. Ocean Conservancy has engaged in the NOSB's deliberations on these issues over the last several years through George Leonard's current affiliation with Ocean Conservancy as well as his previous affiliation with Monterey Bay Aquarium. We commend the National Organic Standards Board for their diligence in attempting to resolve the substantial challenges surrounding the concept of organic, open net pen farming systems. As the Board is all too aware, this issue is both intellectually complex and politically charged. The former challenge arises from the need to resolve the apparent incompatibility between the unsustainable practice of salmon farming and the requirement of the Organic Food Production Act of 1990 to promote ecological diversity and conserve biodiversity. The latter challenge arises from the conflict between the aquaculture industry (which stands to benefit substantially from a USDA organic label on farmed salmon and other fish) and the conservation community's concern with the integrity of the organic label, the expectations of U.S. organic consumers, and the desire to reduce the global impact of open net pen fish farming on marine ecosystems.

A large number of conservation, fishing and consumer groups[1] have been, and continue to be opposed to fish meal-dependent species, grown in open net pen systems, being eligible to receive the coveted USDA organic label. There is considerable merit to the arguments that have been made to date before the NOSB. However, we see little utility in reiterating the reasons why open net pen systems are fundamentally inconsistent with the letter and spirit of OFPA and that fish meal and fish oil from wild forage fish can not be considered organic and therefore should not be allowed. We recommend the NOSB carefully review the comprehensive comments submitted to the Board on November 3, 2008 by the Center for Food Safety. We have also provided a short primer on the environmental and human health risks of open net pen aquaculture in Appendix A (page 13) of this submission, should further detail be needed.

At this stage, the NOSB must make a decision about which of two potential paths to pursue to resolve this issue. The first and simplest path is to exclude net pens and fish meal/oil-dependent species from consideration of the USDA organic label at this time. This would allow a US organic fish industry to develop around low trophic level species such as catfish, tilapia and shellfish, while a reliable source of organic feed is developed and sustainability solutions for net pen aquaculture are explored. The second, and much riskier path, is to allow wild fish and net pens to move forward, as reflected in the proposed organic aquaculture standards dated September 28, 2008. The success of this second path is highly dependent on developing successful compliance and verification procedures and seriously risks the reputation of the organic label through both consumer confusion and allowing environmental degradation to occur under the auspices of the USDA organic program.

Like many conservation groups, Ocean Conservancy remains troubled that the Board has apparently decided to pursue the second path. We believe the most prudent approach is to reject the proposed standards and return to recommendations made by the Aquaculture Working Group and others to exclude wild-caught fish and net pen systems at this time. Should the NOSB move forward with its current approach, we conclude that it must fully embrace performance metrics throughout all of the standards and build a robust mechanism for their verification for the resulting standards and certified product to be

[1] Monterey Bay Aquarium, Ocean Conservancy, Center for Food Safety, Consumers Union, Australian Marine Conservation Society, Beyond Pesticides, Conservation Council of New Brunswick (Canada), David Suzuki Foundation (British Columbia), Ecology Action Centre (Nova Scotia), Equal Exchange, Florida Consumer Action Network, Food and Water Watch, Friends of Clayoquot Sound (British Columbia) , Friends of the Earth Scotland , Friends of the Oldman River (Alberta), George Strait Alliance (British Columbia), Go Wild Campaign, Greenpeace Canada, Greenpeace USA, Gulf Restoration Network, The Humane Society of the United States, Institute for Fisheries Resources, Living Oceans Society (British Columbia), Maine Organic Farmers and Gardeners Association, Mangrove Action Project, National Cooperative Grocers Association, Northeast Organic Dairy Producers Association, Northeast Organic Farming Association, Norwegian Salmon Association (Norway), OCEANA (Chile), Organic Consumers Association, The Organic Research Centre — Elm Farm (United Kingdom), Pure Salmon Campaign, Raincoast Conservation Society (British Columbia), Rural Advancement Foundation International, Save the Swilly (Ireland), Sierra Club (Thomaston, Maine), Sierra Club Canada, Slow Food Canada (British Columbia), T. Buck Suzuki Foundation (British Columbia), Trout Unlimited, Watershed Watch Salmon Society (British Columbia), Wilderness Committee (British Columbia), Wild Farm Alliance, Wild Fish Conservancy, Yukon Salmon Committee (Canada).

able to withstand public scrutiny. In making this case, we build on the submission from Corey Peet and George Leonard to the NOSB organic aquaculture symposium in October 2007.

Fish Feed and Related Management Issues

Wild Fish as Feed

As justification for the inclusion of fish meal and fish oil derived from wild caught fish, the Livestock Committee's introductory statements claim "fish feed derived from terrestrial animal or plant sources or fresh water fish are not considered acceptable alternatives to marine based fish for a variety of reasons". This statement is based, in part, on the conclusion that farmed fish eat wild fish in the natural environment. As we did in May 5, 2008, we want to draw attention to the "Recommendation on the use of fish meal and fish oil in organic aquaculture (dated April 4, 2008) in which this was first raised. We take exception with the statement in the Minority Opinion that "the natural behavior of many fish species is to eat other fish" as justification for the inclusion of fish meal and fish oil derived from wild-caught fishes in organic fish feed. For the vast majority of commonly farmed fish, their natural diets include a large diversity of organisms during different life history stages including phytoplankton, zooplankton, detritus, mollusks and other invertebrates and some species of fish (see Appendix B, page 26, for a detailed list). It is by no means true that these fish primarily eat other fish in the wild, especially at younger age classes when invertebrates and insects dominate the diets. Encouraging the further inclusion of organically-produced algal oils, invertebrates and insects would be more consistent with the natural diets of many commonly farmed fish than encouraging the continued inclusion of fish meal and fish oil from forage-based wild fisheries, as the Minority Opinion recommends.

Should the NOSB be unwilling to categorically exclude wild fish from feed, its only choice is to develop a regulatory standard that does not allow organic systems to support the depletion of wild forage fish for use as meal and oil that will harm ecosystems and negatively affect biodiversity[2]. Doing otherwise would be directly contradictory to the OFP and existing organic regulations applied in terrestrial agriculture. Any forage fish fishery used for organic production therefore must have a very high environmental performance. We recommend a bar considerably higher than that currently proposed (i.e. biomass must be at or above that which yields maximum sustainable yield (MSY) while explicitly allocating sufficient forage to other fish, marine mammals and birds for ecosystem health). As presently written, the standard simply requires forage fisheries to not be overfished or depleted. This is not a measure of sustainability – this is only a statement that the fishery is not in crisis mode.

[2] This issue is separate from the other definitional issues related to whether the inclusion of wild fish in fish feed means the resulting feed ration can not be considered 100% organic and thus is in violation of existing USDA organic standards. This semantic and legal issue is particularly problematic but is not the subject of our submission. See the November 3, 2008 letter from Center for Food Safety for further discussion on this important issue.

Should wild fish ingredients with strong environmental provisions be allowed, they should be included as a last, not first, resort. The standards should codify a tiered approach to sourcing fish meal and fish oil in the following manner:

1. Use of byproducts from other organic fish production that meets or exceeds USDA requirements,
2. Use of byproducts from environmentally responsible food grade fisheries, as these represent nutrient cycling and are therefore compatible with the principles of organic production, and lastly
3. Use of environmentally-responsible forage fish fisheries.

We are supportive of setting a performance metric around the inclusion of this third category of fish meal and fish oil, such that the amount of wild fish needed to produce a unit of farmed fish is no greater than 1:1. This would make aquaculture a net producer of marine protein and help reduce its impacts on wild ecosystems[3]. Even so, further clarification is needed in the Proposed Standards. The Committee's recommendation around feed conversion reads "The amount of wild fish that goes into feeding the aquatic animals cannot exceed one pound of wild fish product fed to every pound of live weight of cultured animals at harvest". This language essentially defines the Feed Conversion Ratio, a measure of production efficiency that doesn't measure feed conversion efficiency or the "fish in: fish out" ratio. The latter is the true measure of the amount of wild fish needed to produce farmed fish. We encourage the Committee to carefully review the submission from Monterey Bay Aquarium dated November 3, 2008 as well as the Marine Aquaculture Task Force report dated 2006 for further technical details on how to accurately make this calculation.

In this context, the maximum total allowance for fish meal and fish oil needs to be clarified. As written, the proposed language could be interpreted to mean fish meal and fish oil may be included at up to 25% *each*. We recommend that the sum *total* be no greater than 25%. Even with these values, however, an inclusion rate that totals to 25% *could* result in an FCE of 1.5:1, depending on relative inclusion rates of meal and oil[4]. The standards should make clear that regardless of individual inclusion rates of fish meal and fish oil, the FCE shall not exceed 1:1. We also recommend that it be made clear that use of byproducts from other organic fish production and use of byproducts from environmentally-responsible food grade fisheries not be included in this calculation. Finally, as written, the proposed standards could be interpreted to allow up to 5% inclusion after the sunset date. The standards should make clear that wild fish shall be fully eliminated by this date.

Regardless of these details, there must be an explicit and unambiguous requirement that they be eliminated by a date certain. We are not supportive of the long, 12 year period

[3] Note, however, that without full elimination of wild fish from organic fish production, any increase in overall organic fish fishing would put additional pressure on wild ecosystems and would violate principles of organic farming.

[4] Tacon, Albert G. J. 2005 "State of information on salmon aquaculture feed and the environment" Aquatic Farms, Ltd.

proposed in the draft standards. Although any date is somewhat arbitrary, an 8 year period should be sufficient to implement substitutes given the rapid advancement of alternative protein sources.

Ocean Conservancy is also troubled by the proposal to add the language "fed sustainably-sourced wild fish" to the package of a farmed fish that has received the USDA organic label. First, this label essentially admits that the feed is not organic and thus a violation of the organic standards. If this is true, then these types of farmed fish should not receive the label at all – rather than have a caveat applied to the package to inform consumers. Secondly, such a label is most likely to confuse consumers rather than actually clarify the issue. This is especially true given that there is no transitional label for organics at this time. Thirdly, one must question why only this aspect of the production process is included on the label. To be consistent, other ingredients or treatments identified on the national list should likely be included on the label. But at this point, the value of the organic label itself would be called into question. While we are supportive of transparency in all aspects of consumer products, the proposed language simply will not resolve the fundamental question of whether fish fed wild fish can be considered organic under U.S. law. Should some sort of additional language be deemed necessary, we suggest "fed wild, non-organic fish". For consistency, this language should also apply to packaging on terrestrial organic production as well.

Finally, Ocean Conservancy is not supportive of any language that might be construed as implying that wild caught fish are organic. While we recognize the existence of the Stevens Rider (which would allow wild fish to be certified organic, after promulgation of rules by USDA) we do not accept it. Allowing wild fish to be considered organic is fundamentally at odds to the control over husbandry practices implicit in the concept of farming. Wild fisheries are better off illustrating their positive attributes by seeking third party certification of environmental performance, not misapplying the concept of "organic".

Chemicals in Fish Feed

We are pleased that the Livestock Committee has categorically excluded antibiotics as a permissible substance in organic production. However, language in the proposed standards is ambiguous about whether other chemical treatments, especially those used to treat parasites, would be permitted. We strongly recommend that all chemicals except those on the National List be excluded, including antibiotics *and* parasiticides, such as emamectin benzoate. We would also not be supportive of a move to have emamectin benzoate and other parasiticides added to National List. While it is presently unclear whether "organic" fish farms can be effectively managed without the use of antibiotics or parasiticides, the USDA should respect consumer's desires that these types of chemicals be explicitly excluded from U.S. organic production and the resulting food supply.

Contaminants in Fish Feed

We are pleased that the proposed standards address the level of contaminants in feed inputs, however the requirement that contaminant levels in fish meal and fish oil not exceed regulatory levels needs further clarification. At present, FDA has not set levels

for contaminants in fish meal and fish oil, so there are no federal regulatory requirements to reference. Our understanding is that the American Association of Feed Control Officials (AAFCO) has only established levels for a subset of relevant contaminants – chiefly heavy metals – and we do not know whether any states have adopted these levels under their feed regulations. Because there are no nationwide regulatory levels for contaminants in fish meal and oil, we urge that the NOSB to revise its recommendation based on the provision on contaminants recommended by the Aquaculture Working Group:

> "For fish meal and fish oil from wild fish used in organic feeds, levels of unavoidable residual environmental contaminants, including persistent bioaccumulative toxins (PBTs) and mercury, cadmium, lead, arsenic and tin must be less than or equal to the lowest levels found in commercially available fish meal and fish oil, provided, however, that the comparable products are classes of fish meal and fish oil allowed in this section, and do not include those produced with volatile organic solvents not allowed under § 205.603. Fish oil must be treated with activated carbon, which may include synthetic activated carbon, or any process using water as a solvent, for removal of contaminants

Net Pens and Related Management Issues

As is evident above, the definitional, operational, and conservation challenges of allowing fish meal and fish oil derived from wild fish to be permitted under USDA organic standards are considerable. Similar, and no less significant, challenges arise during the consideration of net pens as allowable production systems for U.S. organic farmed fish. A large and growing body of scientific literature has identified a host of environmental impacts of open net aquaculture including nutrient impacts, community consequences of escaped fish, and amplification and retransmission of disease from farmed fish to wild fish. Given that these impacts are clearly at odds with the requirement of organic production to promote ecological diversity and conserve biodiversity, many have argued that open net pen systems should be excluded from organic production at this time. This is the simplest and least risky approach for the NOSB to take at the present time.

However, an alternative approach may be to develop quantitative and enforceable performance metrics to reduce these environmental impacts to levels that are consistent with organic principles. While considerably more difficult and complex than excluding these systems, performance metrics may act as incentives for fish farmers to reduce environmental impacts by modifying production practices to reach organic certification. Monterey Bay Aquarium's symposium paper in October 2007 to the NOSB entitled "Performance metrics for net pen production of organic fish: a discussion paper" was an attempt to define production metrics to accomplish this goal. At present, only one performance metric is reflected in the proposed standards (i.e. 50% nutrient recycling requirement). Should the NOBS wish to proceed in this manner it must include analogous metrics for *all* the relevant environmental risks.

Risk of Pollution and Habitat Impacts
Ocean Conservancy is strongly supportive of the concept of nutrient cycling reflected in the proposed standards. This concept is wholly consistent with the Organic Food Production Act and expectations of consumers of organic food. We suggest the following language:

- Multiple species of aquatic plants and animals - all native species of local genotype - shall be raised in an integrated aquaculture system so that at least 50% of dissolved nutrients and organic material shall be recycled within the farm tenure.
- Farm level effluents and the potential influence of other farms (both conventional and organic) must be shown not to exceed the natural assimilative capacity of the surrounding ecosystem.
- In all cases, benthic habitats under net pens must be shown to not have significant measurable changes in chemistry and biodiversity.

We are pleased that the Livestock Committee has embraced the 50% nutrient recycling requirement as we believe this will require the use of polyculture/integrated aquaculture. While this requirement for multiple species runs counter to the general trend to farm single species, integrated aquaculture is both technically feasible and has been shown to have net ecological benefits[5]. By mandating substantial nutrient recycling, no detectable impacts on benthic habitats, and ecosystem modeling to ensure remaining inputs are not beyond the assimilative capacity of the surrounding ecosystem, open net pens may be capable of meeting the organic goal to "promote and enhance biodiversity, biological cycles and soil biological activity" at least as well as terrestrial organic production.

This nutrient and habitat standard may exclude a large fraction of present-day open net pen producers from being certified organic. This is especially true for nearshore producers with demonstrable habitat impacts (such as farmed salmon), at least until producers substantially reduce stocking densities. In the absence of excluding open net pen systems altogether, such a strong performance metric is necessary for production to be consistent with organic principles and consumer expectations.

Risk of Escaped Fish to Wild Stocks
Current language in the proposed standards is insufficient to protect wild stocks and ecosystems from the risks of escaped fish. Standard industry practice is for "aquaculture facilities to be managed with all reasonable security measures (mechanical, physical and biological barriers) with the goal of eliminating escapes by predators, adverse weather

[5] Folke, C., Kautsky, N., Berg, H., Asa, J., and M. Troell. 1998. The ecological footprint concept for sustainable seafood production: A Review. Ecological Applications, 8(1) Supplement, S63-S71.; Neori, A., Chopin, T., Troell, M., Buschmann, A., Kraemer G., Halling C., Muki Shpigel, M., and C. Yarish. 2004. Integrated aquaculture: rationale, evolution and state of the art emphasizing seaweed biofiltration in modem mariculture. Aquaculture, 231 (1-4): 361-391.; Whitmarsh, DJ, Cook, EJ, and K.D. Black. 2006. Searching for sustainability in aquaculture: An investigation into the economic prospects for an integrated salmon-mussel production system. Marine Policy, 30 (3): 293-298.

conditions, facility malfunction, facility damage or other causes" as articulated in the current language. But a goal of having no escapes is not the same thing as having a performance metric that verifies that no escapes have occurred – and having organic certification contingent upon successfully meeting this performance. It is worth noting that fish escapes continue to occur in all forms of open net pen aquaculture[6] including "organic" systems in Scotland that were responsible for 70% of all reported escapes in 2008[7].

Ocean Conservancy proposes the following performance goal:

> Only native fish of local genotype shall be cultured. Non-native species or native species with significant genetic divergence compared to wild stock (i.e. due to selective breeding or other processes), may not be certified as organic if produced in net pens. Operations with escapes greater than 0.5% of cultured stock (within each containment device) over the course of a grow out season shall have their organic status revoked.
>
> Definitions:
>
> > Native Species: Species endemic to the local area of culture.
> >
> > Local Genotype: Fish spawned from a group of broodstock, with no broodstock fish beyond the F2 generation and local, wild fish added to the broodstock every year.

As currently practiced, farming in open net pen systems poses inherent environmental risks that are generally inconsistent with organic production. Salmon farming's track record of leakage (continuous, low level escapes) as well as catastrophic escape events due to weather and human error demonstrates that open net pens will never be escape-proof. However, our requirement to raise only native species of local genotype substantially reduces the threat to marine ecosystems of those fish that will inevitably escape. While the risk is clearly not eliminated, it would put organic production on par with many fish stocking programs designed to enhance fish populations that are under threat from historical overfishing, habitat destruction or other causes. It would be disingenuous to not acknowledge that the use of hatchery practices is itself coming under increasing scrutiny as more is learned about fish population genetics and unintentional selection within hatcheries[8]. However, short of disallowing open net pens entirely, our requirements reduce the threat to the lowest possible level.

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[6] Kavanagh, A., R. Hopkins and D. Staniford 2007. A review of research on the causes and quantities of farmed fish escapes from open net cage systems and a literature review of the impact of escapes on wild fish populations, using farmed salmon as a case study. Paper submitted to the NOSB on October 4, 2007. 56 pp.

[7] The Scottish Government, Fisheries Department: Farmed Fish Escapes 2008 http://www.scotland.gov.uk/topics/fisheries/fish-shellfish/18692/2008

[8] Araki, H., W.R. Ardren, E. Olsen, B. Cooper and M.S. Blouin. 2007. Reproductive success of captive-bred steelhead trout in the wild: evaluation of three hatchery programs in the Hood River. *Conservation Biology*, 21:181-190.

We acknowledge that this standard would likely eliminate a large fraction of present-day open net pen production from being certified as organic. In particular, farmed Atlantic salmon would not be likely to meet this standard. It is either non-native in the Pacific Ocean (e.g. in British Columbia and Chile), or is native, with current farmed stocks having substantial genetic divergence from the few remaining wild populations (e.g. eastern Canada and Europe). Conversely, production of native fish under careful broodstock management (e.g. yellowtail in Hawaii or cod in the Shetlands) may be viable organic candidates under this standard. In any case, this standard would encourage the farming of native species – a net benefit over the status quo of expanding the farming of non-natives.

Impact on Predator Populations

As presently written, the intent of the predator standard in the proposed rules is sound but is vaguely worded, especially concerning allowable predator control measures. Furthermore, all producers would likely argue that they are managing their operations "to minimize the risk of losses of cultured stock, stress to cultured aquatic animals caused by predators, and harm to predators" making it difficult to differentiate organic from conventional producers on this issue.

We propose the following performance standard:

- A comprehensive integrated predator management plan, which employs non-lethal deterrents as a first course of action, shall be developed and implemented as part of the organic farm plan.
- Underwater acoustic deterrent devices of any kind shall not be permitted.
- No intentional killing of marine mammals or other predators of farmed fish shall occur unless human safety is immediately threatened. Farms that experience more than a rare[9] marine mammal death due to entanglement or other accidental cause shall lose organic certification.
- There is an absolute prohibition on predator mortality if the species is listed nationally or globally as vulnerable, endangered, or critically endangered (i.e. present on the IUCN red list).

While the OFPA makes no provisions (beyond compliance with local laws) for the killing of farm predators, this issue must be addressed in open net pen production to meet the expectations of organic consumers and to ensure compliance with organic production principles (i.e. promotion and enhancement of biodiversity and the development of a harmonious relationship between production and the surrounding ecosystem). Predators can not always be effectively and safely separated from open net pens. However, careful site selection, low stocking densities, and vigilant attention to predator exclusion and deterrence methods may allow the performance goal of no predator mortality events to be achieved. As production practices alone can not guarantee success at avoiding predator

[9] Rare is defined as one predator mortality event per certification period (i.e. 5 years) and no killing of cetaceans at any time.

events, only a performance-based metric rigorously applied and enforced can meet the expectations of both organic customers and compliance with organic principles.

Risk of Disease and Parasite Transfer
The existing language in the proposed standards for preventative health care and disease prevention (including nutrition, water quality, and biosecurity) is laudable but it is not clear how these standards differentiate organic from conventional fish farming practices. All reputable companies now have such measures in place but disease and parasites continue to be amplified on farms, putting wild fish at risk.

We propose the following performance metric:

- Fish in net pens must not exhibit clinical signs of disease and must not be treated with synthetic animal drugs except those listed under 205.603 "Synthetic substances permitted for use in organic livestock production to be deemed organic". However, fish which do show clinical signs of disease must be treated as necessary for their welfare.
- Whether or not diseased fish are treated, they may not be sold as organic.
- Furthermore, as a precautionary measure, open net pens shall not be sited in regions where lethal impacts on wild species or disturbance of reproductive patterns have been identified as potential risks.

The most daunting challenge for organic production in net pens surrounds the risk of disease and parasite transfer to wild fish and ecosystems. Organic open net pen production of aquatic animals requires a very high standard because water is an especially powerful vector for any disease that is amplified by farming operations. Moreover any chemicals used to treat farmed animals are readily dispersed to the surrounding ecosystem. The deleterious effects of both disease transfer and chemical residues from net pens on aquatic systems are well documented in the scientific literature.

This standard thus strictly adheres to the core principle of organic farming that animals should be raised under healthful conditions such that the occurrence of disease is rare. Because fish farmers would lose the price premium for organic aquatic animals should their animals become diseased, they should have a strong economic incentive to maintain the health of their animals. This (dis)incentive structure is similar to the one established for terrestrial livestock, whereby animals treated with antibiotics or other prohibited substances may not be sold as organic. In the case of aquatic animals, fish could not be sold as organic if they had suffered disease because the presence of disease violates organic principles by putting both farmed stock and wild stocks at risk.

This performance based standard may be the most difficult standard for any open net pen producer to achieve. Predicting disease risk of novel species in new conditions is very difficult to do *a priori*. Sea lice are an ongoing conservation and husbandry concern of many of the world's salmon producers. While synthetic parasiticides such as Slice (emamectin benzoate) are effective at reducing infection rates, these chemicals are potent toxins in the marine environment and their use is not consistent with organic principles.

As with escapes, nutrients and predators, most salmon production would likely be excluded from potential organic certification because of this performance standard for disease.

New species (such as amberjack, cobia, sablefish, cod, etc) may be more viable candidates as their shorter culture history inevitably results in a shorter track record for disease. However as production scales increase and a longer track record of disease performance is developed, these species may not be able to meet the "no disease/no treatment" standard. In these cases, either previously certified operations would have to lose their organic certification or producers would have to petition the National List for the inclusion of effective drugs to treat the disease(s). While the latter option is available under current OFPA regulations, we conclude that such a measure would violate the original spirit of organic production, and unless the chemical was environmentally-benign, pose ecosystem risks that would be unacceptable to organic customers.

A Critical Component: Compliance and Verification

Should NOSB move forward with a set of performance metrics such as those detailed here, a critical component to the success of their application will be a new compliance and verification system. This approach, however, is outside the experience and expertise of both the NOSB and most organic certifiers. Ocean Conservancy strongly encourages NOSB to think through all the components necessary to develop such an effective system. Among others, these include:

- At present, chain of custody does not exist for fish meal and fish oil, making it difficult to determine the species and stock of origin of most forage fish used to produce these materials.
- Stock status for many of the world's forage fish is unknown, making it difficult to determine if these fisheries meet environmental expectations.
- Appropriate reference levels for contaminants must be resolved and sampling and reporting protocols need to be developed.
- An accounting system will need to be developed to accurately and repeatedly characterize the amount of nutrients recycled within the farm tenure.
- Self-reported records of predator interactions and incidence of disease on farm stock need to be independently verified given the strong disincentive to accurately report these data.

The need for such a compliance and verification system can not be overemphasized. Net pens directly interact with marine ecosystems. They are also a relatively new production system and the state of knowledge concerning their impacts is still in the early stages. To ensure farms are meeting these proposed performance standards, a mechanism for consistently reporting data and interpreting results, across the community of organic certifiers, needs to be established. We would recommend that both experts in aquaculture and marine ecology be an integral part of a committee designed to establish and oversee the implementation of this new system.

Should NOSB not be willing to encourage and fully support the development of this verification and compliance system, we would strongly recommend that they choose to exclude wild fish and open net pen systems from consideration for organic status at this time. Given the substantial environment challenges of these production systems and the high standards of organic consumers, there is only one chance for NOSB to "get it right". If there is any doubt that these issues can't be resolved, moving forward with the proposed standards, as written, is ill-advised.

Thank you for the opportunity to comment on the proposed organic aquaculture standards for fish feed, net pens and related issues (dated September 28, 2008). Should you have any questions, please don't hesitate to contact me at the coordinates below.

Sincerely,

George H. Leonard, Ph. D.
Director, Aquaculture Program
831-454-7477
gleonard@oceanconservancy.org

Appendix A
A Primer on the Environmental and Human Health Risks of Open Net Pen Aquaculture

With the rise in production of carnivorous farmed fish over the last several decades has come evidence of a host of environmental risks of open, net pen farming technology (Naylor et al. 1998; Naylor et al. 2000). While much of this evidence comes from the world's experience with salmon farming, data from other species farmed in the U.S. and abroad suggest these risks are universal to open net pen farming and are likely to apply broadly to other marine species at similar trophic levels (e.g. cod, halibut, sablefish, tuna, etc) that are likely to be the focus of an expanded domestic offshore aquaculture industry as well as be potential candidates for organic certification under proposed USDA regulations. Because net pens are open systems (where water flows freely through the farm to the surrounding ecosystem), their use regularly results in six major impacts that are likely to pose management challenges in the open ocean environment as well as pose challenges to the concept of organic farmed fish. They are:

1. Added pressure on wild fish populations via aquaculture's current dependence on wild fish for fish meal, fish oil and related products for feed ingredients,

2. Effect of escaped farmed fish on wild fish and associated ecosystems,

3. Risk of disease and parasite amplification and retransmission from farmed fish to wild fish,

4. Nutrient and habitat impacts from ongoing farming operations,

5. Impacts on predator populations, and

6. Impacts of the use of drugs, parasiticides, antifoulants and other chemicals on sensitive marine life and human health.

Use of Marine Resources
The International Organization of Fish Meal and Fish Oil (2001) concluded that if the farming of carnivorous fish continues to grow at its current rate, the demand for fish oil is expected to outstrip supply within a decade, while a similar result is expected for fish meal by 2050. The growth of carnivorous fish farming is thus predicted to put additional pressure on wild forage fish stocks, including domestic (e.g. menhaden) and international (e.g. Peruvian anchovy) fisheries. Furthermore, a number of leading scientists have warned about the inherent unsustainability of "farming up the food web", because of the relatively inefficient use of marine resources, all of which are already used by humans (commercially) or other organisms (e.g. Pauly et al. 2002; Pauly et al. 2005).

Although some would conclude that many of these forage fisheries are presently sustainable, current fisheries science models generally do not adequately incorporate the importance of small pelagic fish in the wider ecosystem (Tacon 2005). Furthermore, at

the broadest scale, the loss of biodiversity resulting from harvest through fisheries and aquaculture has major implications for ecosystem function, critically important to the maintenance of healthy fish populations (Worm et al. 2006). The sustainability of forage fisheries must be addressed before the farming of species heavily dependent on these forage fish inputs legitimately can be considered a means to increase the domestic seafood supply. Doing so will require the implementation of ecosystem-based fishery management for forage fisheries and third-party eco-certification of environmentally responsible fishing practices. Furthermore, substitutes for wild-caught fish meal and fish oil (including seafood processing byproducts, terrestrial plants, animal byproducts, single cell proteins and oils, and marine and terrestrial invertebrates) must be widely adopted by the aquaculture industry if further growth is to not overtax marine food webs (Chiu et al 2008).

Risks of Escaped Fish to Wild Fish and Associated Ecosystems

Aquaculture is known to be a major vector for exotic species introduction (Carlton 1992; Carlton 2001), causing concern over the ecological impacts that escaped species can have on wild species (Volpe et al. 2000, Naylor et al. 2001, Youngson et al. 2001, Weber 2003). Myrick (2002) described six potential negative impacts of escaped farmed fish: genetic impacts, disease impacts, competition, predation, habitat alteration, and colonization. Escaped farmed fish can negatively impact the environment and wild populations of fish whether they are native or exotic to the area in which they are farmed, and the probability of significant ecological impact increases as the number of escaped individuals increases (Myrick 2002).

While aquaculture utilizes a wide variety of farming techniques around the world, open net pen systems carry the greatest risk of escaped fish. These systems have received the most criticism, particularly those used to farm Atlantic salmon. Fish regularly escape from salmon net pens, negatively impacting wild salmon stocks by increasing competition for food and breeding sites, and reducing the fitness of wild fish through interbreeding (Youngson and Verspoor 1998; Volpe and Anholt 1999; Fleming et al. 2000; Volpe et al. 2000; Jacobsen et al. 2001; Einum and Fleming 1997; Volpe et al. 2001; McGinnity et al. 2003; Hindar et al. 2006). Damage to farms from storms is one major way that farm raised fish can escape and this challenge will be greater in open ocean environments where currents and storms are stronger than in the sheltered bays where salmon farming is traditionally sited. Recent global data suggest that escapes rates may, in fact, be increasing rather than decreasing, calling into question whether the escape challenge can be solved in conventional or organic production (Kavanaugh et al. 2007).

Risk of Disease and Parasite Amplification and Retransmission from Farmed Fish to Wild Fish

It is well known that intensive fish culture, particularly of non-native species, can and has been involved in the introduction and/or amplification of pathogens and disease in wild fish populations (Sziezko 1974; van Muiswinkel et al. 1999; Blazer and LaPatra 2002). Blazer and LaPatra (2002) identified three types of potential interactions of cultured and wild fish populations in terms of pathogen transmission. First, the importation of exotic

organisms for culture can introduce pathogens to an area. Second, movement of cultured fish (native or non-native) can introduce new pathogens or new strains of pathogens. Finally, intensive fish culture, which can include crowding, poor living conditions, and other stressors, can lead to the amplification of pathogens that already exist in wild populations and their re-transmission between cultured and wild populations.

In recent years, this latter issue has received much attention because of the dramatic consequences of the spread of parasitic sea lice from salmon farms to wild salmon (Hastein and Lindstad 1991; Berland 1993; Tully et al. 1993; Tully and Whelan 1993; Birkeland 1996; Costelloe et al. 1996; Grimnes and Jakobsen 1996; Birkeland and Jakobsen 1997; Bjorn and Finstad 1997; Jacobsen and Gaard 1997; Tingley et al. 1997; MacKenzie et al. 1998; Gargan 2000; Bjorn et al. 2001; Heuch and Mo 2001; Bjorn and Finstad 2002; Butler 2002; Morton et al. 2004; McKibben and Hay 2004; Penston et al. 2004; Krkosek et al. 2005, 2006, 2007; Morton et al. 2005). Perhaps most troubling, a new global analysis of salmon farming impacts on wild salmon identified reductions in survival of 50% or more (per generation) in wild fish in nearly all regions where salmon farming has proliferated compared to regions without salmon farming (Ford and Myers 2008).

Disease outbreaks in other fish grown in open net pens appear to be common as well. For example, yellowtail farmed in the Mediterranean, Japan, and New Zealand have suffered substantial mortalities from monogenean parasites (Wittington et al. 2001; Hutson et al. 2007) However, very little is known about the distribution and frequency of diseases in wild fish populations generally (Blazer and LaPatra 2002). Without a solid understanding of what diseases existed before aquaculture, it is difficult to assess the cumulative impact of open net pen aquaculture systems on disease and parasite incidence in wild populations.

Nutrient and Habitat Impacts from Ongoing Farming Operations

Like other forms of agriculture, aquaculture generates waste that can be released into the environment. By design, wastes from open net pen systems are released untreated directly into nearby bodies of water, and can have severe impacts on the surrounding environment (Gowen et al. 1990; Beveridge 1996; Costa-Pierce 1996). More than half of the total nitrogen and phosphorus fed to fish in commercial farms is released into the surrounding environment (Beveridge 1996; Fernandes et al. 2007). Dissolved nutrients (from excess feed as well as fish excretion) flow freely beyond the farm tenure (Cripps and Kelly 1996) while particulate matter often settles to the bottom where it substantially alters both the chemistry and biodiversity of the farm's benthic habitats (Hargrave et al. 1997; Pohle and Findlay 2001; Sutherland et al. 2001). In Japan, intensive culturing of finfish (including yellowtail) and generation of organic wastes has adversely affected the surrounding environment via deoxygenation (Hirata et al. 1994), outgassing of hydrogen sulfide (Tsutsumi 1995), and blooms of harmful plankton (Yokoyama 2003; Nakamura et al. 1998). In the United States, the Environmental Protection Agency (EPA) identifies several pollutants of concern from aquaculture, including sediments and solids, nutrients, organic compounds and biological oxygen demand, and metals (EPA 2002).

While proponents of moving coastal net pens into offshore environments frequently cite deep water and high flushing rates as reasons for little concern over nutrient pollution in these habitats, emerging science suggests this oversimplification is unjustified. In particular, a detailed study of a commercial scale open ocean aquaculture farm in Hawaii found dramatic changes in benthic species diversity and community structure under and nearby submerged sea cages despite relatively deep water and high current velocity (Lee et al 2006). At a global scale, "dead zones" (regions of low dissolved oxygen driven by excess nutrient input) have grown exponentially since the 1960's and a number of these have been associated with salmon and shrimp farming (Diaz and Rosenberg 2008). These findings are particularly problematic for potential organic fish farming as these types of reductions in biodiversity and ecosystem function are at odds with the basic tenets of organic farming.

Impacts on Predator Populations

By their very design, open net pen farming systems result in large numbers of fish, held at high density, in close proximity to a range of natural predators including seabirds, large pelagic predators (such as sharks) and marine mammals including seals and sea lions. In salmon farming, a range of techniques are commonly used to reduce the impact of predators on stocks of farmed fish. These include deploying predator nets outside of containment nets or using underwater acoustic deterrent devices to keep marine mammals at bay. These techniques, while generally successful at reducing losses of farmed fish, can have dramatic unintended consequences for the predators themselves including alteration of natural behavior and the entanglement and subsequent drowning of large numbers of these air-breathing mammals (Morton and Symonds 2002; Wursig and Gailey 2002; CBC News 2007).

In open ocean environments, very little is known about the potential impacts of fish farms on predators and other wildlife but experience with farmed salmon suggests this will be an important concern. Limited evidence suggest that sharks and other large pelagic predators are attracted to submerged net pens and can tear holes in nets with resultant fish escapes (NOAA 2005). Predators that have become habituated to the presence of net pens, and hence a threat to human safety, have been killed (Lucas 2006). Should this practice become commonplace as the U.S. industry expands, this could put already vulnerable shark populations (Stevens et al. 2000; Baum et al. 2003; Myers and Ottensmeyer 2005) at further risk. Finally, submerged net pens and their associated mooring lines could pose entanglement risks to whales and other cetaceans, whose migration routes or foraging behavior bring them in close proximity to fish farms (Upton et al. 2007). All these challenges exist for open net pen farms that might be considered for organic production. Clearly, the types of predator impacts cited above are inconsistent with generally accepted notions of organic farming.

Impacts of Drug and Chemical Use

Like the agriculture and terrestrial livestock industries, aquaculture routinely uses a variety of chemicals for multiple purposes, including promoting growth and preventing disease. These can include antibiotics, pesticides, fungcides, antifoulants, vitamin supplements and spawning hormones (Tacon and Forster 2000). In some aquaculture

systems, use of antibiotics has been shown to result in bacterial resistance in aquaculture environments and influence antibiotic resistance in humans (Kerry et al. 1996; Saptoka et al. 2008). Along with antibiotics, pesticides are frequently used to control sea lice levels on farmed salmon (Roth 2000). Applied either in feeds or in bath treatments, the residues of these chemicals are known to be harmful to other marine life, most notably young life stages of shrimp and lobster (Abgrall et al. 2000; Grant 2002).

Heavy reliance on chemical treatments can result in residues in wild and farmed fish alike (Sapkota et al. 2008). Le and Munekage (2004) found antiobiotic residues in shrimp ponds and Samuelson et al. (1992) discovered residues in wild finfish near aquaculture facilities in Norway. Furthermore, organic waste from open net pen farms has been shown to increase bioavailability of mercury in bottom sediments, resulting in more highly contaminated wild fish near fish farms (Dubruyn et al. 2006). Environmental contaminants in fish feed (most notably PCBs, dioxins, and other organohalogens) also result in potentially unsafe concentrations of these probable human carcinogens in high trophic-level farmed fish (Easton et al. 2002; Hites et al. 2004; Hayward et al. 2004, 2007; Ikonomou et al. 2006; Rawn et al. 2006; Shaw et al. 2006) with recommendations for limited consumption to avoid deleterious health effects (Foran et al. 2005). These are the same types of fish that are being considered for certification under proposed USDA organic standards.

To complicate matters even further, there is a connection between oil rigs and agents that may influence human health. A 1996 MMS study found a connection between oil rigs and elevated mercury levels in surrounding sediments and wild fish in the Gulf of Mexico (Raines et al. 2002) associated with drilling muds. Recently, Villareal et al (2007) found evidence for expansion of a toxic alga responsible for ciguatera poisoning in the Gulf of Mexico. These authors conclude that favorable habitat offered by oil rigs has allowed a range expansion of this species and they thus caution against using these structures for fisheries enhancement and aquaculture.

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APPENDIX B: Natural Diets of Some Commonly Farmed Fish

Common Name	Genus and Species	Diet
Catfish, Channel	*Ictalurus punctatus*	Small fish, crustaceans (e.g. crayfish), clams, snails, aquatic insects and small mammals
Bass, Striped	*Morone saxatilis*	Larvae – zooplankton Juveniles – small shrimps and other crustaceans, annelid worms, insects Adults – invertebrates (squids, crabs, sea worms, amphipods) and wide variety of fish (alewives, herring, smelt, eels, flounders, mumichogs, rock gunnels, sand lance, silver hake, silversides
Salmon, Atlantic	*Salmo salar*	Juveniles – aquatic insects, mollusks, crustaceans and fish Sub Adults – squids, shrimp and fish Larger Adults – herring, alewives, smelts, capelin, small mackerel, sand lance, small cod
Tilapia	*Oreochromis niloticus*	Phytoplankton, benthic algae
Trout, Rainbow	*Oncorhynchus mykiss*	Juveniles – zooplankton Adults – aquatic and terrestrial insects, mollusks, crustaceans, fish eggs, minnows, and other small fishing including trout
Tuna, Bluefin	*Thunnus thynnus*	Squid, red crabs and small schooling fish (anchovies, sauries and hakes)

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