OFFSHORE AQUACULTURE REGULATION UNDER THE MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

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Harvard Law School
Emmett Environmental Law & Policy Clinic

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The Ocean Foundation

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The Emmett Environmental Law and Policy Clinic at Harvard Law School is directed by Wendy B. Jacobs and is dedicated to addressing major environmental issues in the United States and abroad and to providing its students an opportunity to do meaningful, hands-on environmental legal and policy work. Students and clinic staff work on issues such as climate change, pollution reduction, renewable energy, water protection, and smart growth. Staff and students who participated in the preparation of this paper include Shaun A. Goho, Nicole U. Rinke, Erica Boyce (JD '13), and Nikki Baade (JD '12).

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The Ocean Foundation is a unique community foundation with a mission to support, strengthen, and promote those organizations dedicated to reversing the trend of destruction of ocean environments around the world. The Ocean Foundation works with donors who care about our coasts and oceans to provide financial resources to marine conservation initiatives. The Ocean Foundation's Board of Directors is comprised of individuals with significant experience in marine conservation philanthropy, complemented by an expert, professional staff, and a growing international advisory board of scientists, policy makers, educational specialists, and other top experts. Staff contributing to this report include Ocean Foundation President Mark J. Spalding.

Cover Image: Sunset view of an offshore cage in the Gulf of Mexico near an oil rig, available on the NOAA Photo Library website, http://www.photolib.noaa.gov/htmls/fish5210.htm.

Back Cover Image: An example of Pacific threadfin (Moi) inside an offshore cage in Hawaii, available on the NOAA Photo Library website, http://www.photolib.noaa.gov/htmls/fish5228.htm.

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Executive Summary

The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA) regulates fishing in federal waters pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), based on Fishery Management Plans (FMPs) created by Regional Fishery Management Councils. Although the MSA was drafted to regulate the harvest of fish from the wild, NOAA has taken the position that aquaculture is also subject to management under the Act. Only a few existing FMPs specifically address aquaculture, but in practice most FMPs contain limitations on unapproved gear and other requirements that bar the development of aquaculture projects without special authorization. Recently, however, NOAA has issued a national aquaculture policy and indicated that it will issue regulations to implement the first FMP specifically created to provide a regional framework for aquaculture development in federal waters in the Gulf of Mexico and that it will use that FMP as a national model. Therefore, the time is ripe to consider how the MSA may be used to regulate offshore aquaculture.

This paper reviews the application of the MSA to offshore aquaculture. While NOAA's determination that aquaculture is "fishing" under the Act is subject to an ongoing judicial challenge, this analysis assumes that the MSA will continue to apply. Based on this assumption, we recommend that NOAA and the Regional Fishery Management Councils, as appropriate, make the following improvements to ensure that the MSA is deployed most effectively to manage aquaculture and minimize the possibility that aquaculture results in harm to the environment:

1. ***Use FMPs to address environmental impacts not otherwise regulated under federal law, but improve upon the Gulf of Mexico FMP before using it as a model in other regions.*** The MSA may be an important link in protecting the environment from the impacts of offshore aquaculture because it authorizes management measures and permit conditions, such as siting restrictions and habitat protections, that are not adequately addressed by other regulatory programs, such as the Clean Water Act. The Gulf of Mexico Aquaculture FMP demonstrates this broad authority but its exercise of this authority can be improved by requiring mandatory evaluation criteria and permit requirements, including assessment and monitoring procedures and mandatory performance measures. Such mandatory criteria would ensure that FMP provisions are enforceable and provide the basis for the revocation or suspension of permits if facilities are found not to be in compliance. NOAA and the Gulf of Mexico Fishery Management Council should address these

issues before implementing the FMP or using it as a national model.

2. ***Provide direction on and support development of models for setting annual yield for aquaculture.*** Because the MSA was drafted to regulate the harvest of fish from the wild, regulatory guidance is needed on how to interpret its statutory requirements, such as optimal yield determination, for aquaculture. In addition to clarifying how to implement the law, NOAA should continue to support development of scientific models for estimating yield targets for aquaculture and ensure that data generated by aquaculture projects are made available to the public.

3. ***Develop guidance on establishing appropriate management units.*** FMPs are only applicable to organisms included in their defined management units. Currently, Councils must determine on their own whether to manage cultured stocks jointly with wild stocks of the same species or together as one or more multi-species group(s) of cultured organisms. NOAA can fill this gap with guidance on how to define management units to best account for the different environmental impacts associated with different species and production methods.

4. ***Use short term aquaculture permits to ensure that novel facilities and technologies perform well in real-world conditions.*** Untested facilities may not perform as predicted by models, yet under the only aquaculture-specific FMP (the Gulf of Mexico Aquaculture FMP) they are eligible for 10-year permits. Aquaculture FMPs can minimize possible harm by requiring short-term permits for real-world testing of new facility types as a prerequisite to issuance of long-term permits.

5. ***Minimize the adverse impacts of aquaculture on Essential Fish Habitat.*** The MSA requires Councils to minimize the adverse effects of fishing on designated essential fish habitat (EFH) in addition to requiring federal agencies to consult NOAA before permitting other activities that may affect EFH. Most Councils have designated aquaculture as a non-fishing activity—an approach incompatible with management of aquaculture as "fishing" under the MSA. Councils should designate aquaculture as a fishing-related activity for EFH purposes and implement management actions required by the MSA to ensure that it minimizes adverse impacts on EFH. While all federal permits that may affect EFH require consultation with NOAA, Council action to incorporate management measures in FMPs and effectively implement those measures would add a layer of environmental protection beyond that offered by consultation.

Image Source: Kydd Pollock/Marine Photobank

OFFSHORE AQUACULTURE REGULATION UNDER THE MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

Aquaculture is an increasingly important component of the global and United States food systems. Globally, capture fisheries production has stabilized, and future increases are unlikely.[1] As a result, increased seafood demand must largely be met through expansion in the aquaculture sector. Aquaculture production has increased dramatically over the last 40 years and now provides almost half of all seafood consumed globally, but the aquaculture industry in the United States has not participated in this growth.[2] The U.S. government and aquaculture industry are working to stimulate domestic aquaculture production, including by developing open ocean finfish production in federal ocean waters.[3]

A careful evaluation of the laws and regulations governing aquaculture development in the open ocean is required to ensure that aquaculture development occurs in the most sustainable manner. The Magnuson-Stevens Fishery Conservation and Management Act (MSA) governs federal fisheries management and is among the most important laws affecting whether and how aquaculture facilities can be operated in federal ocean waters. This paper reviews the application of the MSA to offshore aquaculture and recommends actions to ensure that the MSA is deployed most effectively to manage aquaculture and minimize the possibility that aquaculture results in harm to the environment.

The MSA directs the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA) to regulate fishing in federal waters based on Fishery Management Plans (FMPs) created by Regional Fishery Management Councils. Although the MSA was drafted to regulate the harvest of fish from the wild, NOAA has taken the position that aquaculture is also subject to management under the Act. Only a few existing FMPs specifically address aquaculture, but in practice most FMPs contain limitations on unapproved gear and other requirements that bar the development of aquaculture projects without special authorization. Recently, however, NOAA has issued a national aquaculture policy and indicated that it will issue regulations to implement the first FMP specifically created to provide a regional framework for aquaculture development in federal waters in the Gulf of

1 FAO, The State of World Fisheries and Aquaculture 2012 7, 12 (2012).

2 *Id.* at 25-26.

3 Waters under exclusive federal jurisdiction extend from the seaward state boundary to the seaward edge of exclusive economic zone (EEZ), which extends to 200 miles from shore. This study focuses on federal fisheries management, which governs fishing in all federal ocean waters and may also apply in state waters. 16 U.S.C. § 1856.

Mexico and that it will use that FMP as a national model. Therefore, the time is ripe to consider how the MSA may be used to regulate offshore aquaculture.

Councils are authorized to manage aquaculture under the MSA because NOAA has determined that aquaculture is "fishing."

The MSA makes NOAA[4] responsible for fisheries management but delegates much of the agency's authority to eight Regional Fishery Management Councils,[5] which manage fishing through the establishment of a Fishery Management Plan (FMP) "for each fishery . . . that requires conservation and management."[6] The MSA requires that FMPs be consistent with ten national standards,[7] and it specifies mandatory and discretionary provisions for inclusion in FMPs.[8] Among other requirements, FMPs contain conservation and management mechanisms "necessary and appropriate for the conservation and management of the fishery to prevent overfishing and rebuild overfished stocks, and to protect, restore, and promote the long-term health and stability of the fishery."[9] These required measures include, but are not limited to, overfishing thresholds, annual catch targets, and optimal

4 Technically, the MSA vests authority in the National Marine Fisheries Service (NMFS). NMFS, also called NOAA Fisheries, is part of NOAA and subject to the authority of both the Secretary of Commerce and NOAA Administrator. For simplicity, this paper refers to "NOAA" in lieu of NMFS.

5 There are eight regional councils: New England, Mid-Atlantic, South Atlantic, Caribbean, Gulf of Mexico, Pacific, North Pacific, and Western Pacific. Council membership is set forth in the Act and includes state and federal government representatives and nominees from the fishing industries or other knowledgeable individuals. 16 U.S.C. § 1852(b). The Councils are advised by a scientific and statistical committee, fishing industry advisory committee, and other advisory panels as necessary, *id*. § 1852(g), and rely on NOAA Regions and Science Centers for "technical or scientific expertise and information." U.S. EPA, Office of Federal Activities, Reviewing Environmental Impact Statements for Fishery Management Plans: Final Guidance 27 (2005), *available at* http://www.epa.gov/compliance/resources/policies/nepa/reviewing-EISs-fishery-management-plans-pg.pdf.

6 16 U.S.C. § 1852(h)(1) (emphasis added). While FMPs are not required for every fishery, they are required "as necessary and appropriate for the conservation and management of [a] fishery," *id*. § 1853(a)(1)(A), which per NOAA regulations includes "overfished fisheries and [] other fisheries where regulation would serve some useful purpose and where the present or future benefits of regulation would justify the costs." 50 C.F.R. § 600.340. The Secretary of Commerce can also formulate FMPs if the Council fails to do so "after a reasonable period of time." 16 U.S.C. § 1854(c). In addition, the Secretary has primary jurisdiction over highly migratory species, even if they are within the geographical area of one of the Councils. *Id*. § 1852(a)(3).

7 16 U.S.C. § 1851(a). NOAA's regulations provide advisory guidelines, based on the National Standards, to assist Councils in developing FMPs that comply with the MSA. *Id*. § 1851(b); 50 C.F.R. §§ 600.305 - 600.355.

8 *Id*. § 1853.

9 16 U.S.C. § 1853(a)(1). *See also id*. § 1851(a) (requiring as National Standard 1 that FMPs "prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.").

yield for the fishery, as well as measures to minimize the effect of fishing on essential fish habitat.[10] After the Council formally adopts a FMP, NOAA reviews it and, if it approves, formalizes the FMP by issuing regulations.[11]

Offshore aquaculture is subject to management under the MSA if it qualifies as a fishery and if it requires conservation and management. [12] The MSA defines a "fishery," in part, as "one or more stocks of fish which can be treated as a unit for purposes of conservation and management" combined with "any fishing for such stocks."[13] "Stock of fish" is further defined to include a "category of fish capable of management as a unit,"[14] and "fishing" means, in relevant part, the actual or attempted "catching, taking, or harvesting of fish."[15] Based on these definitions, aquaculture can constitute a fishery if cultured organisms can be managed as a unit for conservation and management, and aquaculture is fishing if it involves "catching, taking, or harvesting."

Aquaculture is considered fishing under NOAA's interpretation of the MSA. In a 1993 legal opinion, NOAA's Office of General Counsel concluded that "fishing" includes aquaculture, reasoning that "[u]se of the term harvesting" in the Act's definition of fishing "is particularly significant since it adds an additional concept beyond 'catching' or 'taking'—harvesting connotes the gathering of the crop."[16] In 2011, the General Council's office revisited the question and reached the same conclusion.[17]

10 *Id.* §§ 1853(a)(3), (a)(10), (a)(15).

11 *Id.*§ 1852(a).

12 *Id.* § 1852(h)(1).

13 *Id.*§ 1802(13) (defining "fishery" in full as: "(A) one or more stocks of fish which can be treated as a unit for purposes of conservation and management and which are identified on the basis of geographical, scientific, technical, recreational, and economic characteristics; and (B) any fishing for such stocks").

14 *Id.* § 1802(42). Aquaculture facilities manage cultured organisms as a unit, such that these organisms appear to meet the definition of a stock of fish. "Fish" is also defined and is not limited to wild organisms. *Id.* § 1802 (12) (defining "fish" as "finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds."). As such, it appears that cultured organisms are fish as defined in the MSA.

15 *Id.* § 1802(16).

16 Memorandum from Jay S. Johnson, NOAA Deputy General Counsel, and Margaret F. Hayes, NOAA Assistant General Counsel for Fisheries, to James W. Brennan, NOAA Acting General Counsel (Feb. 7, 1993). In most instances, the MSA applies to the capture of organisms from self-sustaining wild stocks, but in some instances—notably salmon fisheries—the Act is also applied to regulate the harvest of hatchery-bred organisms that are subsequently released into the wild to grow and mature. *See* Charles P. Meacham & John H. Clark, *Pacific Salmon Management – the View from Alaska,* 1 Alaska Fisheries Res. Bull. 1 (1994) (reviewing history of Alaska hatchery system).

17 Memorandum from Constance Sathre to Lois Schiffer (June 9, 2011) ("The [MSA]'s assertion of exclusive fishery management authority over all fish within the [EEZ], its direction to fishery management councils to prepare [FMPs] for any 'fishery' needing conservation and management, together with the statutory definitions of 'fishery' and 'fishing' provide a sound basis for interpreting the Act as providing authority to regulate aquaculture in

NOAA's interpretation of its authority to manage aquaculture is in dispute. In the first judicial decision addressing the issue, a district court recently agreed with NOAA's interpretation and upheld a NOAA permit for an offshore aquaculture project in the Western Pacific.[18] The plaintiffs have appealed this decision to the Ninth Circuit,[19] arguing along with amici, in part, that the legislative history and the difficulty of applying MSA requirements to aquaculture suggest that Congress did not intend "harvesting" to include aquaculture.[20] Pending the outcome of this appeal and potential future cases in other circuits,[21] however, NOAA need not change its current interpretation of aquaculture.

If aquaculture is "fishing," Councils must minimize its effects on Essential Fish Habitat, but only a few councils currently comply with this mandate.

In 1996, Congress amended the MSA to require Councils to include measures in FMPs to identify essential fish habitat ("EFH"), minimize the adverse effects of fishing on that EFH, and identify other actions to conserve and protect the habitat.[22] The MSA also includes consultation requirements: federal agencies must consult with NOAA, and Councils may comment on and make recommendations to NOAA, regarding federal and state agency actions and proposed actions that

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the [EEZ]."). Consistent with this opinion, NOAA also includes aquaculture operations on the List of Fisheries that it must prepare annually pursuant to the Marine Mammal Protection Act. *See, e.g.*, NOAA, List of Fisheries for 2012, 76 Fed. Reg. 73,912 (Nov. 29, 2011); *see also* 16 U.S.C. § 1387 (requiring list of fisheries). While the MMPA defines "fishery" identically to the MSA, *id*. § 1362(16), and NOAA's regulations further define "commercial fishing operation" to include aquaculture. 50 C.F.R. § 229.2. NOAA has relied on this definition in declining to exclude aquaculture from the List of Fisheries. NOAA, *supra* at 73,916.

18 *KAHEA v. Nat'l Marine Fisheries Serv.*, No. CIV. 11-00474 SOM, 2012 WL 1537442 at *9-*10 (D. Haw. Apr. 27, 2012) ("There is no indication that the Council intended to say that everything listed as 'non-fishing' in that section was categorically outside the MSA's broad definition of 'fishing.'").

19 *KAHEA v. Nat'l Marine Fisheries Serv.*, *appeal docketed*, No. 12-16445 (9th Cir. June 22, 2012).

20 Brief for Appellant, *KAHEA v. Nat'l Marine Fisheries Serv.*, *appeal docketed*, No. 12-16445 (9th Cir. June 22, 2012); Brief of Amici Curiae Pac. Coast Fed'n of Fishermen's Ass'ns et al., *KAHEA v. Nat'l Marine Fisheries Serv., appeal docketed*, No. 12-16445 (9th Cir. June 22, 2012), *citing* H.R. Rep. No. 97-549 at 10 (1982), *reprinted in* 1982 U.S.C.C.A.N. 4320; S. Rep. No. 104-276, at 3 (1996), *reprinted in* 1996 U.S.C.C.A.N. 4073 .

21 A case in the D.C. Circuit raised the same issue before it was dismissed as unripe and for lack of standing. *Gulf Restoration Network, Inc. v. Nat'l Marine Fisheries Serv.*, 730 F. Supp. 2d 157 (D.D.C. 2010). This challenge may be re-filed upon issuance of regulations to implement the Gulf of Mexico aquaculture FMP.

22 16 U.S.C. § 1853(a)(7). EFH means "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." *Id*. § 1802(10). When implementing these requirements, Councils must consult NOAA's guidelines, *id*. § 1855(b); 50 C.F.R. § 600.815, which direct Councils to also designate Habitat Areas of Particular Concern ("HAPCs"). 50 C.F.R. § 600.815(a)(8). HAPCs are areas within EFH that are ecologically important, sensitive to environmental degradation, stressed by development activity, or rare; designation results in no additional regulatory protection beyond that for EFH, but activities proposed in HAPCs will be subject to particular scrutiny.

may adversely affect EFH.[23] NOAA must recommend measures whereby the acting agency can conserve EFH,[24] and, when a permit is required as under the Clean Water Act, Rivers and Harbors Act, and other laws,[25] NOAA's recommendations are most often incorporated as "conditions precedent to the granting of the permit."[26]

If aquaculture is "fishing" under the MSA, per NOAA's determination, it is also a "fishing activity" that may affect EFH. However, although every Regional Council has indicated that aquaculture is an activity that may affect EFH, only the New England and the Gulf of Mexico Councils have designated aquaculture as a "fishing" activity and adopted measures in their FMPs to minimize the adverse impacts of aquaculture on EFH.[27] Until the remaining Councils recognize and address this inconsistency, consultation, not management action, will remain the primary aquaculture-related habitat protection flowing from EFH designation in most regions. In practice, aquaculture development proposed in EFH will trigger the consultation requirement as it will alter the physical, chemical, or biological characteristics of protected habitats.

The adverse impacts of offshore aquaculture on EFH can be effectively and simply avoided by relocation. In practice, the Gulf of Mexico aquaculture FMP adopts this approach through its restrictions on aquaculture facility siting, under which it excludes aquaculture projects from certain

23 16 U.S.C. § 1855 (b)(2) - (b)(3); *see also* 50 C.F.R. § 600.920(a)(1). Councils must comment and make recommendations regarding activities that the Council believes are "likely to substantially affect" anadromous fish habitat, including EFH. 16 U.S.C. § 1855(b)(3)(B).

24 50 C.F.R. § 600.920. NOAA must issue recommendations when it receives information or otherwise determines that an activity would adversely affect EFH. *Id*. § 600.920 (i)(5), (k). While the acting agency need not adopt those recommendations, it must provide a written response to the relevant Council within 30 days, detailing its proposed measures in response to the recommendations. 50 C.F.R. § 600.920(k); 600.920(i)(5).

25 *See, e.g.,* U.S. Army Corps of Engineers, Public Notice of Application for Permit, No. POH-2012-00016, at 2-3 (Mar. 12, 2013) (initiating consultation with NOAA after determination that EFH may be adversely affected, as part of review of a Rivers and Harbors Act Section 10 permit application for an anchored aquaculture facility off the coast of Hawaii).

26 Stephen McDaniel, *Essential Fish Habitat: Building a Barrier to Affordable Housing?*, 20 J. Land Use & Envtl. L. 159, 178-179 (2004).

27 New England Fishery Management Council, Final Amendment #11 to the Northeast Multispecies Fishery Management Plan, Amendment #9 to the Atlantic Sea Scallop Fishery Management Plan, Amendment #1 to the Monkfish Fishery Management Plan, Amendment #1 to the Atlantic Salmon Fishery Management Plan, Components of the Proposed Atlantic Herring Fishery Management Plan for Essential Fish Habitat, vol. I 166-178 (1998) (designating aquaculture as a "fishing-related activity" with the potential to affect EFH). South Atlantic Fishery Management Council, Habitat Plan for the South Atlantic Region 295 (1998); Caribbean Fishery Management Council, FEIS For the Generic EFH Amendment to: Spiny Lobster Fishery Management Plan, Queen Conch Fishery Management Plan, Reef Fish Fishery Management Plan, Coral Fishery Management Plan for the U.S. Caribbean 3-165 (2004); Western Pacific Regional Fishery Management Council, Fishery Ecosystem Plan for the Hawaii Archipelago 205 (2009).

EFH areas and provides for case-by-case restrictions on siting in other critical habitats.[28] In regions without specific management measures to protect EFH from the impacts of aquaculture, Councils and NOAA can best protect EFH by recommending during the consultation process that facilities be sited away from sensitive habitat.

Image Source: Kydd Pollock/Marine Photobank

The regulatory status of and requirements on offshore aquaculture depend on the applicability and provisions of existing FMPs. In most cases, notice is required prior to deployment of aquaculture gear.

While NOAA's interpretation currently authorizes the Councils to manage aquaculture, few have done so explicitly. As a result, the regulatory status of offshore aquaculture depends on the provisions of existing FMPs. Aquaculture projects that seek to produce managed species must comply with existing FMP restrictions, which may proscribe aquaculture. In addition, most aquaculture projects, regardless of species, will require prior notice before they can be deployed.

28 Gulf of Mexico Fishery Management Council, Fishery Management Plan for Regulating Offshore Marine Aquaculture in the Gulf of Mexico 351 (2009) [hereinafter Gulf Aquaculture FMP].

Many aquaculture projects propose to use native species that are already under management because they are well suited to the environment, have existing commercial markets, and are less likely to cause environmental harm should they escape. By including these species in a managed stock under an FMP, the relevant Council (or NOAA, for highly migratory species) has already determined that conservation or management of these species is required. However, few Councils have considered aquaculture when defining management units or establishing management measures for them. Consequently, existing FMPs intended to ensure wild stock sustainability may include restrictions and measures that make little sense when applied to aquaculture or prohibit fishing for managed stocks using gear that is not explicitly approved.[29] Producers will need to comply with existing FMP requirements—and in some cases may not be able proceed unless a Council acts to explicitly exclude farmed fish from the management unit or provide for management measures specific to aquaculture gear.

In some cases, aquaculture projects have sought to use species not currently managed by a Council or NOAA, such as species managed under state law rather than federal law.[30] Aquaculture FMPs—including the Gulf of Mexico Aquaculture FMP—may prohibit the culture of non-managed species, and NOAA's guidance for aquaculture in federal waters calls for exclusive use of native or naturalized species in most cases.[31] However, projects using non-managed species may not be subject to existing Council management. If a Council seeks to manage these projects, it must determine that the project involves a stock of fish requiring conservation or management or that aquaculture—whether of a single species or as a category—is a fishery that requires management.[32] In the absence of management action, the MSA will not prevent such aquaculture projects from proceeding after the producer has provided the required advance notice.

29 For example, Northeast FMPs create presumptions that fish found on a fishing vessel that do not meet regulatory standards (e.g. are below the minimum size) were caught in violation of the FMP. *See, e.g.* 50 C.F.R. § 648.14(k)(17) (presumption for minimum size in Northeast multispecies fishery). While the Atlantic salmon FMP specifies that evidence that fish were harvested from an aquaculture enterprise is sufficient to rebut this presumption, 50 C.F.R. § 648.40, none of the other presumptions so provide. As a result, possession of fish from aquaculture operations that are below the minimum size (which may be desirable from a marketing standpoint) or that do not conform to other requirements would be prohibited. Memorandum from Jay S. Johnson and Margaret F. Hayes, *supra* note 16, at 3.

30 *See, e.g.,* Hubs-Seaworld Research Institute, Offshore Aquaculture Demonstration Project (undated) (on file with author) (proposing to culture striped bass approximately 5 miles from the coast of California).

31 NOAA, Marine Aquaculture Policy 9 (2011), *available at* http://www.nmfs.noaa.gov/aquaculture/docs/policy/noaa_aquaculture_policy_2011.pdf.

32 16 U.S.C. § 1852(h).

Regardless of whether an aquaculture project uses managed or non-managed species, producers generally must notify the relevant Council before engaging in offshore aquaculture. The MSA requires NOAA to publish a list of all fisheries under Council or NOAA authority (including both FMP-managed and non-FMP fisheries), as well as all fishing gear used in each fishery.[33] Fishers must provide 90 days' advance written notice to the applicable Council or NOAA (for highly migratory species) before engaging in a fishery or employing gear that is not on the list.[34] After receiving notice, NOAA can issue emergency regulations prohibiting, for a limited time, a fishing activity that is not otherwise covered by a FMP.[35] The emergency regulations provide time for the Council to develop or modify a FMP if the new gear or fishery requires management.

The current list of fisheries and gear does not include any aquaculture fisheries other than live rock aquaculture, nor is aquaculture gear listed as an approved gear type.[36] However, NOAA's proposed regulations to implement the Gulf of Mexico Aquaculture FMP (discussed in more detail below) will add "offshore aquaculture" as a fishery and "cages and net pens" as gear in that fishery to the list of authorized fisheries and gear.[37] Under these regulations, producers would not need to notify the Gulf of Mexico Council prior to deploying those gear types in the Gulf of Mexico, provided that they comply with other provisions of the Aquaculture FMP. However, producers would still be required to notify the Council or NOAA before deploying other aquaculture gear types in the Gulf of Mexico or any aquaculture gear in existing fisheries in other regions. In addition, producers seeking to culture non-managed species would be required to notify the Council or NOAA.

When a Council manages aquaculture production, difficult questions arise about how that management should be structured, including whether to manage cultured fish jointly with wild fish of the same species or manage all or a subset of cultured species as part of the same management unit (excluding wild fish). Joint management of wild and cultured organisms of the same species is problematic in many cases. Cultured and wild organisms may be genetically or physically distinct; for

33 *Id.*§ 1855(a)(1).

34 16 U.S.C. § 1855(a)(3); 50 C.F.R. § 600.747 (guidelines and procedures for determining new fisheries and gear).

35 16 U.S.C. §§ 1855(c) (emergency regulations by the Secretary of Commerce may remain in effect for at most one year, except in response to a public health emergency or an oil spill); 1855(a)(5) (Councils may request that the Secretary issue emergency regulations in response to a notice).

36 50 C.F.R. § 600.725(v). In some cases, aquaculture producers may seek to use approved gear, such as dredges to recover seeded shellfish, for a new purpose. Notice is unlikely to be required for these gear types, although FMPs will likely regulate their use.

37 NOAA, Proposed Regulations to Amend 50 CFR parts 600 and 622, at 2 (pre-publication regulations deemed "necessary and appropriate" by Gulf of Mexico Council in February 2013) (on file with author) [hereinafter "Proposed Regulations"].

example, cultured Atlantic salmon are selectively bred (and genetically modified salmon, while not proposed for offshore use to date, have additional differences from wild fish) and do not depend upon a continued supply of wild broodstock or directly affect wild stock biomass (unless they escape).[38] Other production models for other species do require wild broodstock, release cultured stocks into the wild, or otherwise directly affect wild stock biomass—such models, most notably "ranching," in which cultured stocks are obtained by capture of wild organisms—are more suited to joint management.

Defining a single management unit for all cultured species in a region is a simple solution to the wild/cultured stock problem but may cause other concerns. For example, the Gulf of Mexico Council addressed the limited nexus between wild and cultured stocks by creating a new aquaculture FMP, which is discussed in detail below. The FMP defines a management unit that includes all cultured organisms from species under federal management—but not wild stocks. This management unit may not effectively address the different environmental implications associated with disparate species and production systems; for example, spiny lobster production may require collection of seed stock from the wild, while finfish like red snapper can be bred in hatcheries. In general, finfish and shellfish production differences—such as feed use, culture methods, effluent discharge, and reproduction—raise different environmental concerns and are likely to require different management strategies to avoid harm.

It may be possible to address these issues within a single management unit by crafting separate management measures by species or production system. Nonetheless, careful management unit definition is warranted to ensure contextually sensitive regulation both of wild and cultured stocks and of different species and production systems used in aquaculture. Councils and NOAA enjoy substantial discretion in defining management units: the MSA's definition of "stock of fish" includes any "category of fish" that can be managed as a unit and makes no reference to species, gear, or other variables. As a result, Councils can create joint or separate units for wild and cultured stocks and can jointly or separately manage different species or facilities used for aquaculture production.[39]

38 Aquaculture facilities will affect wild biomass in other ways, such as by acting as a fish aggregation device or attracting predators. As discussed below, the MSA allows Councils and NOAA to address these impacts, but these management measures may not be relevant on a species-by-species basis.

39 *Oregon Trollers Ass'n v. Gutierrez*, 452 F.3d 1104, 1117 (9th Cir. 2006) (upholding NOAA's authority to separately manage hatchery and wild stocks of salmon because these stocks can be managed as separate units).

Most current FMPs prohibit aquaculture without special authorization.

Once the applicability of a FMP has been established, the next step is to determine what management measures the FMP requires for an aquaculture project to proceed. In practice, most current FMPs prohibit aquaculture projects due to prohibitions on fishing with unapproved gear types, annual catch limits for the managed species, limits on the number of permits available, or other reasons. As a result, existing FMPs will generally prevent offshore aquaculture development unless NOAA issues the proposed operator a special permit or the applicable Council amends the relevant FMP.

NOAA has used two types of special permits to authorize short-term pilot aquaculture projects that would otherwise be prohibited. In 1997, NOAA issued an exempted fishing permit ("EFP") to SeaFish Mariculture, authorizing a pilot project to cultivate red drum (Sciaenops ocellatus) in cages suspended from a disused fossil fuel platform in the Gulf of Mexico. EFPs are one-year, renewable permits authorized under the MSA that allow their holders to use otherwise-prohibited methods to harvest managed species for a few specific reasons, including "limited testing."[40] Without the EFP, the project would have violated the prohibition on directed commercial harvest of red drum contained in the Gulf of Mexico red drum FMP.[41] In 2011, NOAA issued a second type of permit, authorizing Kona Blue Water Farms to culture Seriola riviolana in untethered pods near Hawaii for one year.[42] NOAA issued the "Special Coral Reef Ecosystem Fishing Permit" (SCREFP) in reliance on the Western Pacific Council's Hawaii FMP,[43] which allows the agency to permit take of managed coral reef

40 50 C.F.R. § 600.745(b)(1) (allowing EFP issuance for "limited testing, public display, data collection, exploratory fishing, compensation fishing, conservation engineering, health and safety surveys, environmental cleanup, and/or hazard removal purposes").

41 Red Drum Fishery and Reef Fish Resources of the Gulf of Mexico, 62 Fed. Reg. 37034 (July 10, 1997) (indicating intent to approve EFP); Gulf of Mexico Fishery Management Council, Economic Impacts of Gulf Aquaculture Amendment 10 (undated), *available at* http://www.gulfcouncil.org/Beta/GMFMCWeb/Aquaculture/Economic%20Effects%20of%20Gulf%20Aquaculture%20Amendment.doc (reviewing history of SeaFish project); Gulf of Mexico Fishery Management Council, Final Secretarial Fishery Management Plan Regulatory Impact Review Regulatory Flexibility Analysis for the Red Drum Fishery of the Gulf of Mexico (1986) (indicating commercial red drum fishing prohibited).

42 NOAA, Proposed Issuance of a Permit to Authorize the Culture and Harvest of a Managed Coral Reef Fish Species (*Seriola rivoliana*) in Federal Waters West of the Island of Hawaii, State of Hawaii 37-38 (2011), *available at* http://www.fpir.noaa.gov/SFD/pdfs/EA%20&%20FONSI%20Kona%20Blue%20%282011-07-06%29.pdf.

43 Technically, the Western Pacific Council management plans are Fishery Ecosystem Plans (FEPs), not FMPs. The Councils adopted these FEPs in 2010 based on a recommendation from NOAA's Ecosystem Principles Advisory Panel, which was created to recommend steps for moving toward ecosystem based fisheries management. *See* Ecosystem Principles Advisory Panel, Ecosystem-Based Fishery Management: A Report to Congress (1998); Western Pacific Regional Fishery Management Council, *Fishery Plans, Policies, Reports*, http://wpcouncil.org/fishery-plans-policies-reports/ (last visited June 7, 2013).

species with new gear not expressly listed in the management plan.[44]

When it has granted special permits, NOAA has imposed only limited conditions on aquaculture producers, in part due to environmental assessments that have indicated that the environmental impacts of these pilot projects will be minimal, particularly when native organisms are used.[45] For example, although the Kona Blue permit contained conditions restricting the length of the permit, species in use, stocking densities, gear, and project area, it did not require systematic data collection or disclosure and its few substantive environmental conditions were vague.[46] In the absence of such conditions, special permits represent a missed opportunity to generate data to support future policymaking or permitting efforts.

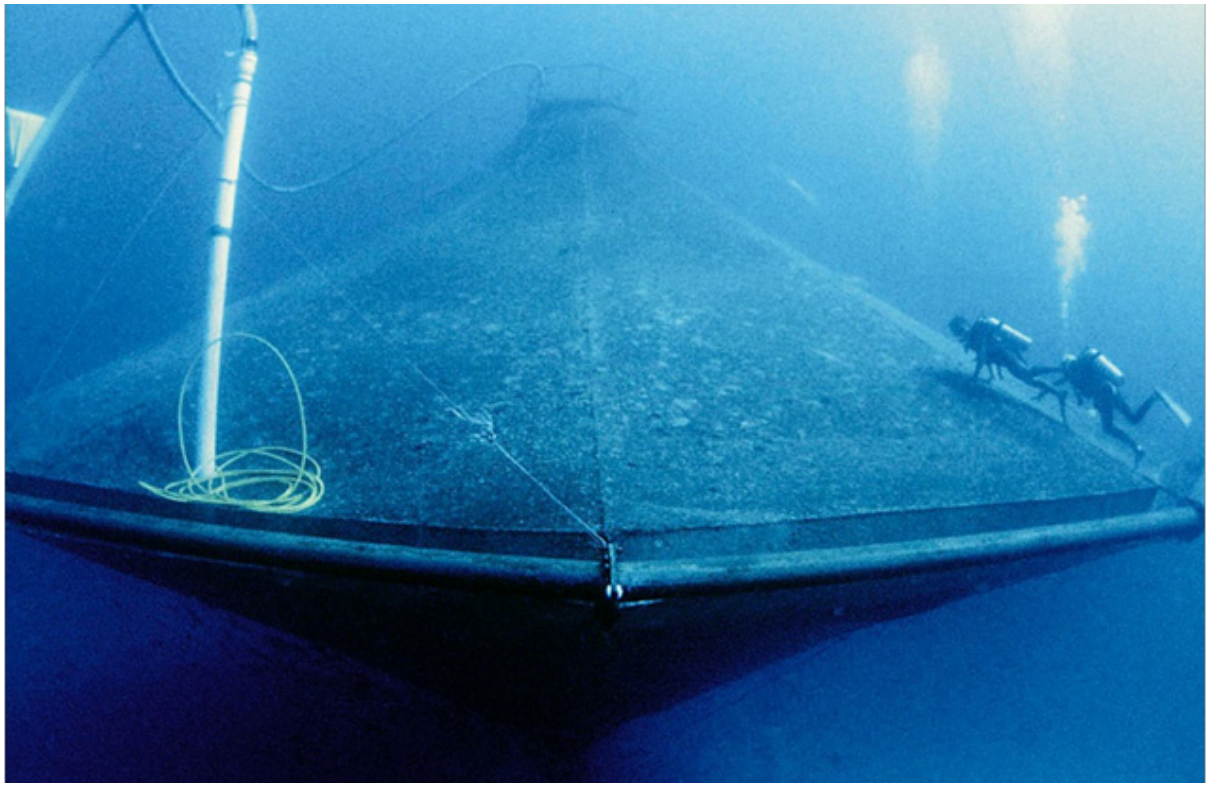

Image: NOAA Photo Library website, http://www.photolib.noaa.gov/htmls/fish5214.htm

44 50 C.F.R. § 665.224(a).

45 *See e.g.*, NOAA, Finding of No Significant Impact, Issuance of a Permit to Authorize the Culture and Harvest of a Managed Coral Reef Fish Species *(Seriola rivoliana)* in Federal Waters off the West Coast of the Island of Hawaii, State of Hawaii (July 6, 2011), *available at* http://www.fpir.noaa.gov/SFD/pdfs/EA%20&%20FONSI%20Kona%20Blue%20%282011-07-06%29.pdf.

46 NOAA, Special Coral Reef Ecosystem Fishing Permit, WP-CRSP-01 (2011), *available at* http://www.fpir.noaa.gov/SFD/pdfs/Permit%20WPCRSP01%20Kona%20Blue%20Water%20Farms%20%282011-07-08%29.pdf. For example, the permit disallowed the use of prophylactic antibiotics *unless authorized by veterinary personnel*—an exception that swallows the rule.

Councils are developing aquaculture-specific management approaches under the MSA.

Special permits enable pilot aquaculture projects, but certainty and comprehensive management over long time frames are needed for investment and environmental protection in this sector. Several Councils have taken steps toward providing for longer-term projects by adopting aquaculture policies describing goals for aquaculture management, incorporating aquaculture management measures into existing FMPs, and creating aquaculture-specific FMPs. This section describes the structure and implementation of these provisions, which will drive the development of offshore aquaculture in affected regions and provide models for national expansion of aquaculture management.

Western Pacific

The Western Pacific Council is considering how to manage aquaculture, but has yet to take binding final action. In March 2007, the Council adopted an advisory aquaculture policy to encourage aquaculture projects to comply with a set of substantive guidelines covering a range of environmental issues, including the use of non-native species, water pollution, and siting.[47] The Council subsequently recommended permitting and reporting for aquaculture facilities[48] and considered four options to implement this recommendation.[49] Based on interest in deployment of offshore net pens and cages for marine finfish production, the Council is now developing an amendment to its Fishery Ecosystem Plans (used in the region in lieu of FMPs) that would allow aquaculture in federal waters upon a positive review by the Council and completion of the environmental impact assessment (EIS) or environmental assessment (EA) required by the National Environmental Policy Act (NEPA).[50] Until it completes these amendments, the Council will not directly manage aquaculture except to the

47 The policy was revised in October 2009. Western Pacific Regional Fishery Management Council, Aquaculture Policy 1 (2009), *available at* http://www.wpcouncil.org/documents/Final%20Council%20Aquaculture%20Policy.pdf. Among other criteria, the guidelines: give priority to the culture of native species; discourage development in sensitive areas; suggest that operations be sited to minimize use conflicts and respect cultural fishing grounds; suggest that projects be designed to minimize effluent discharges and water pollution from feeds; and emphasize the importance of environmental monitoring and the establishment of emergency plans. *Id*.

48 Western Pacific Regional Fishery Management Council, 148th Council Meeting: Synopsis of Action Item Issues 6 (2010), *available at* http://www.wpcouncil.org/councilmtgs/148/148th%20CM%20action%20items%20synopsis.pdf (summarizing prior Council actions); Western Pacific Regional Fishery Management Council, Draft Minutes of the 148th Meeting of the Western Pacific Regional Fishery Management Council 31-32 (2010).

49 Western Pacific Regional Fishery Management Council, Minutes of the 151st Meeting of the Western Pacific Regional Fishery Management Council 67-68 (2011). The four options are: (1) no action; (2) establish a control date after which participation in aquaculture would not be guaranteed; (3) establish a limited entry program to control the number of participants and impose other restrictions; and (4) recommend an environmental monitoring program. *Id*.

50 Personal communications with Alan Everson and Josh DeMello (Apr. 2013).

extent that projects are subject to existing management plans.[51]

New England

The New England Council developed a formal approach to aquaculture management after reviewing the SeaStead project, which proposed to culture sea scallops 12 miles off Martha's Vineyard for a five-year period.[52] The project was not permissible under the existing scallop FMP, but the Council decided to amend the FMP rather than rely on an Exempted Fishing Permit. Following a two-year process, completed in 1997, the Council amended the FMP to authorize harvest by SeaStead vessels and to exclude non-project fishing vessels from the project area.[53]

Based on its experience with SeaStead, the Council decided to clarify what aquaculture projects it would support and to streamline the permitting process. It first adopted and implemented an aquaculture policy under which aquaculture projects "should present acceptable biological, social, and economic impacts" and should "be compatible with the long term ability of the area to support ecologically significant flora and fauna."[54] Later, the Council also modified its FMPs to expedite future aquaculture projects:[55] while previously the Council was required to carry out a formal plan amendment to authorize aquaculture, the current regulations allow the Council to amend FMPs to facilitate aquaculture projects through the abbreviated "framework adjustment" process.[56]

51 Memorandum from Kitty M. Simonds, Executive Director, Western Pacific Regional Fishery Management Council, to Interested Parties 5 (May 27, 2011), *available at* http://www.wpcouncil.org/councilmtgs/151/151%20CM%20Action%20Item%20Summary.pdf (in the absence of Council action, "offshore aquaculture would continue to be open to everyone and environmental responsibilities would remain with existing agencies").

52 Biliana Cicin-Sain et al., Development of a Policy Framework for Offshore Marine Aquaculture in the 3-200 Mile U.S. Ocean Zone 50-53 (2005).

53 *Id.*

54 New England Fishery Management Council, Aquaculture Policy 3 (1997); Memorandum from Chad Demarest to New England Fishery Management Council Members 14, 18 (Sept. 2, 2005), *available at* http://www.nefmc.org/ecosystems/05Sep02_NEFMCwhitepaper.pdf.

55 50 C.F.R. §§ 648.41 (Atlantic salmon), 648.55 (scallop); 648.206 (multispecies groundfish, herring), 648.237 (spiny dogfish). The aquaculture framework adjustment process was built into FMP amendments needed to comply with the Sustainable Fisheries Act rather than through omnibus action. *See* Amendment 9 to the Northeast Multispecies (Groundfish) Management Plan, Vol. I 5 (1998) (explaining Council decision process). As a result, the specific provisions governing the framework adjustment process differ among managed stocks.

56 Framework adjustment provides an expedited process for the Council to respond to offshore aquaculture proposals, but the process is limited to certain types of plan amendments and requires the Council to develop the substance of any adjustments on a case-by-case basis. Framework adjustment can only be used to change existing management measures—imposition of new measures to manage aquaculture would require the Council to follow the full plan amendment process. To carry out a framework adjustment, a Council must consider the changes during at least two hearings, accept public comment, and recommend action to NOAA; NOAA in turn may reject the recommendation or propose its adoption by proposed or final rule, as appropriate. *See, e.g.,* 50

The New England Council has not applied its aquaculture policy or framework adjustment process to date because few industry proponents have proposed projects requiring an FMP amendment.[57] As a result, the effectiveness of the framework adjustment process is unknown, as are the substantive conditions that the Council may impose to ensure compliance with its aquaculture policy.

Gulf of Mexico

In January 2009, the Gulf of Mexico Council issued an Aquaculture FMP to cover all aquaculture for managed species other than corals and shrimp in waters under its jurisdiction. However, NOAA declined to either approve or deny the FMP.[58] As a result, while the FMP was deemed effective by the lapse of time without NOAA action, it has no practical effect unless and until NOAA adopts implementing regulations.[59] NOAA has now completed its national aquaculture policy and has indicated that it will soon issue those regulations.[60] Provided that the regulations hold up under legal challenge,[61] it will also use the Gulf FMP as a national model.[62] As a result, the FMP's structure and provisions are good indicators of the likely shape of future regulatory development.

C.F.R. § 648.41.

57 Email Interview, Patricia Fiorelli, Public Affairs Officer, New England Fishery Management Council (Oct. 31, 2011).

58 Letter from James Balsiger, Acting Assistant Administrator for Fisheries, NOAA, to Dr. Robert Shipp, Chairman, Gulf of Mexico Fishery Management Council 1 (Sept. 3, 2009), *available at* http://sero.nmfs.noaa.gov/sf/pdfs/Letter%20to%20the%20Gulf%20Council%20Regarding%20Aquaculture.pdf. NOAA declined to affirmatively approve the FMP because "offshore aquaculture activities should be governed by a comprehensive national policy rather than by regional regulatory frameworks," but also determined that it could viably reject the FMP only by determining—contrary to current policy—that the MSA does not authorize aquaculture management. *Id.* at 2.

59 A FMP is deemed effective if the Secretary fails to act on it within 30 days after closure of the public comment period, 16 U.S.C. § 1854(a)(3), but the regulations do not gain the force of law until affirmatively approved, *id.* § 1854(b). A FMP does not enter into force until NOAA has reviewed it for compliance with the MSA and promulgated implementing regulations. *Id.* §§ 1854(a)(3) (Secretary approval of FMPs); 1854(b)(3) (Secretary approval of regulations).

60 Michael Rubino, Moving Forward: Implementing the NOAA and DOC Aquaculture Policies (Sept. 19, 2012) (presentation), *available at* https://arkadinoneplace-nm.adobeconnect.com/_a1008264557/p82cm0d5xec/?launcher=false&fcsContent=true&pbMode=normal.

61 Environmental organizations have already challenged the Gulf Council's aquaculture FMP in court, alleging both that the MSA does not apply to aquaculture and that the FMP does not meet the substantive requirements of the MSA. *See* Complaint for Declaratory and Injunctive Relief, *Gulf Restoration Network, Inc. v. National Marine Fisheries Service*, No. 1:09-cv-01883 (D.D.C. Oct. 2, 2009); Complaint for Declaratory and Injunctive Relief, *Ocean Conservancy v. National Marine Fisheries Service*, No. 1:09-cv-01884 (D.D.C. Oct. 2, 2009). This case was dismissed without prejudice on standing and ripeness grounds. *Gulf Restoration Network, Inc. v. National Marine Fisheries Service*, 730 F. Supp. 2d 157, 167 (D.D.C. 2010). Issuance of regulations would cure these limitations and may prompt renewal of this suit.

62 Rubino, *supra* note 60.

Under the FMP, prospective producers of any eligible species must apply for and obtain a 10-year NOAA Fisheries Gulf Aquaculture Permit (renewable every five years thereafter) prior to conducting aquaculture in federal waters of the Gulf of Mexico. To allow for innovation in facility design, the Gulf of Mexico FMP requires NOAA to evaluate each proposed aquaculture system on a case-by-case basis instead of identifying a set of allowable aquaculture systems or practices.[63] Permit applications must include certain information to allow NOAA to determine "potential risks to essential fish habitat, endangered or threatened marine species, marine mammals, wild fish or invertebrate stocks, public health, or safety."[64] Once issued, permits would allow their holders to deploy or operate an offshore aquaculture facility, sell cultured fish, harvest wild live broodstock, and possess or transport cultured fish or invertebrates. Specific management measures included in the FMP to control production amounts and methods are discussed in more detail in the following sections.

Recognizing the substantial economic and environmental uncertainties it faced when creating the aquaculture FMP, the Gulf Council created an adaptive management structure to identify needed changes. An Aquaculture Advisory Panel (AAP) will meet at least biannually to evaluate the aquaculture program and recommend changes to the FMP.[65] The panel will determine whether aquaculture is adversely affecting the condition and status of wild stocks, marine mammals, protected resources, EFH, other resources managed by the Council and NOAA, or Gulf of Mexico fishing communities. Based on its findings, it will recommend whether the Council should amend the FMP's yield targets and management measures (including monitoring, recordkeeping and recording, siting, allowable aquaculture systems, or other measures) to avoid or mitigate these impacts.[66] If the Council agrees, it will then use the framework adjustment process to make the recommended modifications.

63 Gulf Aquaculture FMP, *supra* note 28, at 61-62.

64 *Id. at* 62.

65 The AAP is composed of Council staff, NOAA Fisheries Service biologists and social scientists, Scientific and Statistical Committee members, Socioeconomic Panel members, and other state, university or private scientists with expertise related to aquaculture.

66 Gulf Aquaculture FMP, *supra* note 28, at 95-98. The public will have opportunities to comment on the AAPs recommended changes.

The MSA's yield target requirements are difficult to apply to aquaculture FMPs and as implemented may allow environmental harm to occur.

The MSA requires each FMP to include, among other elements, provisions to determine how many fish can be removed from the stock each year without undermining the long-term sustainability of the fishery.[67] More specifically, each FMP must "assess and specify the . . . optimal yield from the fishery"[68] and "establish a mechanism for specifying annual catch limits . . . such that overfishing does not occur."[69] These provisions work in concert to prevent overfishing—optimum yield (OY) must be set below the maximum sustainable long-term average catch for the stock,[70] such that setting annual catch limits (ACLs) at or below OY, on average, should prevent stock depletion.[71]

As the Gulf Council has noted, the definitions and methodologies for determining yield and catch targets under the MSA were developed for capture fisheries and cannot be directly applied to aquaculture.[72] However, the concepts remain relevant—overfishing is "a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis."[73] In aquaculture, as in capture fisheries, there is a maximum production level above which the sector's long-term health would be undermined or other social, economic, or ecological harm would occur.[74] Although scientific uncertainty prevents meaningful determination of relevant

67 16 U.S.C. § 1853(a).

68 *Id.* § 1853(a)(3).

69 *Id.* § 1853(a)(15).

70 OY is maximum sustainable yield (MSY), reduced by any relevant social, economic, or ecological factors, to provide the greatest overall benefit to the Nation with respect to food production, recreation and ecosystem protection. 16 U.S.C. § 1802(33); 50 C.F.R. § 600.310(b)(2). MSY, in turn, is defined in NOAA's regulations (but not the MSA itself) as the largest long-term average catch or yield for the stock, based on mortality rate and stock size under prevailing ecological, environmental, and technological conditions and catch distribution. 50 C.F.R. § 600.310(e)(1)(i)(A).

71 OY and ACLs are not explicitly linked in the statute. In addition, ACLs, as an annual measure, may exceed the long-term average yield in some years but not when averaged over multiple years.

72 Gulf Aquaculture FMP, *supra* note 28, at 88 ("Many [MSA] legal requirements do not fit well or are difficult to satisfy with respect to aquaculture, thereby making them seem less useful or even unnecessary. This is particularly true for yield targets and stock status parameters around which management of wild fisheries is based. Regardless, they are legal requirements, and until additional legal authority specifically suited for management of at sea aquaculture operations is established, all such requirements must be satisfied.").

73 16 U.S.C. § 1802(34).

74 For example, OY could correspond to the level of production above which increased production would not increase average yield from aquaculture (e.g., as a result of increased disease outbreaks) or other managed stocks (e.g., as a result of disease transmission from farmed to wild fish), or would cause harm to other resources. 50 C.F.R. § 600.310(e)(1)(iv) ("The MSY for a stock is influenced by its interactions with other stocks in its ecosystem and these interactions may shift as multiple stocks in an ecosystem are fished. These ecological conditions

metrics in the near term, successful implementation of OY and ACL concepts will be crucial in the long term if aquaculture is to be managed under the MSA to ensure that offshore aquaculture development does not exceed the ecological carrying capacity of marine ecosystems.

Because of a lack of relevant data and because of the poor methodological fit between aquaculture and OY determination, the Gulf of Mexico Council initially set OY as the expected production from all aquaculture facilities in the Gulf. Specifically, the Council estimated that initial production would be 64 million pounds per year and used this value as a proxy for OY.[75] While initial yield targets were based on purely economic factors, the FMP's framework adjustment process anticipates OY revisions "if the [AAP] determines aquaculture is adversely affecting wild stocks, stock complexes, marine mammals, protected resources, essential and critical habitat, fishing communities, or other resources managed by the Council or NOAA."[76] The AAP will determine whether aquaculture is causing environmental impacts "based on data collected via the ongoing monitoring . . . of permitted operations. If there is a reasonable basis to tie aquaculture operations to adverse environmental impacts, which are in turn resulting in reduced abundance (depletion) of wild stocks, action will be taken by the Council and NOAA."[77] Conversely, the AAP can recommend that the Council increase OY in the absence of scientific evidence of adverse environmental impacts.[78]

In the absence of a biological model for MSY determination for offshore aquaculture, it is not surprising that the Gulf Council's initial yield targets are based on expected production rather than environmental considerations. While the Gulf Council selected an initial target that it believes is precautionary, the AAP's mandate appears to anticipate limits on production only after harm has

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should be taken into account, to the extent possible, when specifying MSY.").

75 Gulf Aquaculture FMP, *supra* note 28, at 88. This initial MSY estimate is considered short term until "more is known about the number and size of operations, potential environmental impacts resulting from aquaculture, economic sustainability of aquaculture, and the production capacity of various marine aquaculture systems." *Id.* at 89. If planned production levels exceed OY, then the Council will initiate a review of the aquaculture program and may subsequently restrict or limit new permits.

The Council set OY equal to MSY rather than reducing it, reasoning that "[s]ince aquaculture is essentially a farming operation, all animals cultured are intended for harvest," and "there is no need to leave cultured animals in offshore aquaculture grow-out systems to support future generations." *Id.* at 89. This proxy selection implies that the Council has construed production as a measure of reproductive potential, albeit one based on economic rather than biological constraints. The Council also determined that overfishing thresholds are irrelevant because all fish are harvested from aquaculture facilities. This view of the role of overfishing thresholds differs from that expressed in this study.

76 *Id*. at 97. The Council may raise or lower OY "based on the extent and magnitude of any adverse environmental and economic impacts that may result from the existing aquaculture management regime." *Id*. at 90.

77 *Id*. at 91.

78 *Id*. at 97.

occurred and is causally connected to aquaculture—a reactive model that runs counter to the MSA's focus on preventing, rather than responding to, overfishing. For this and other reasons, stakeholders have suggested that the Gulf Council's approach is legally questionable.[79]

An aquaculture yield model based on biological variables and supported by robust data collection and modeling will be needed if MSY is to prevent, rather than respond to, adverse environmental impacts arising from offshore aquaculture production. Scientific uncertainty on the individual and cumulative impacts of offshore aquaculture complicates implementation of a proactive approach to determining yield targets, but development of such a model will be crucial to development of a sustainable offshore aquaculture industry over the long term.

The MSA authorizes a variety of management measures that can mitigate the environmental impacts of aquaculture.

The MSA gives Councils discretion to apply a variety of management measures to achieve OY while preventing overfishing. Management measures may include but are not limited to permitting requirements, area and gear restrictions, limited access programs, observer programs, and measures to conserve non-target species and habitats.[80] As described above, for most existing FMPs for capture fisheries, these measures prohibit aquaculture development in practice. However, when created and applied with aquaculture in mind (as in the Gulf aquaculture FMP), MSA management measures can also allow development while minimizing the environmental impacts of aquaculture facilities and enabling the collection of information needed to determine their individual and cumulative impacts and effects on wild fisheries.

The Gulf of Mexico aquaculture FMP is the sole extant example of how Councils can deploy management measures to address impacts that may arise from offshore aquaculture. Gulf aquaculture permits require the use of NOAA-approved facilities, species, and locations and require their holders to comply with operational practices, including but not limited to hatchery and broodstock handling, monitoring, assurance bonding for equipment removal, and recordkeeping and reporting. These requirements are summarized below and in Table 1, supplemented where relevant to indicate how the New England Council has approached particular issues.

79 *See* Food and Water Watch, Comments to NOAA re: Final Fishery Management Plan for Regulating Offshore Marine Aquaculture in the Gulf of Mexico 45-46 (Aug. 3, 2009) (criticizing OY as unrelated to MSY and MSY as outside the definitions in both the FMP and NOAA regulations: "Instead of defining MSY based on some other measure, such as the ecological carrying capacity to sustain aquaculture, which might fall within these definitions, the plan offers an MSY that is at best arbitrary and, at worst, simply the size of the aquaculture industry that the Council wishes to promote.").

80 16 U.S.C. § 1853(b).

TABLE 1. MANAGEMENT MEASURES IN GULF OF MEXICO AQUACULTURE FMP

Impact	Protections included as preferred alternatives in Aquaculture FMP (Action number)
Use of non-native organisms	• NOAA will allow culture of only native species managed by the Council, except shrimp and corals (4) • Applicant must certify all-native broodstock, harvested from or progeny of the same population where the facility is located and certify no GMO or transgenic organisms (2) • Applicant must provide hatchery certification that broodstock are tagged or marked; operator must ensure genetic material is collected and submitted for each individual (2) • Operator must provide copies of hatchery permits from which juveniles are collected (8)
Escapes	• NOAA will conduct case-by-case analysis of each system based on structural integrity; potential risks to essential fish habitat, endangered or threatened marine species, marine mammals, wild fish or invertebrate stocks, public health, or safety (5) • Applicant must provide emergency disaster plan and maintain at least one tracking device on each aquaculture system (2) • Operator must notify NOAA of major escapement, including the cause of escapement and actions being taken to address the escapement (8)
Discharge of feed, waste, and other pollutants	• Applicant must provide a copy of applicable NPDES permit (2) • Operator must comply with applicable monitoring and reporting requirements in NPDES permit and FMP, including baseline and ongoing monitoring (see siting) (2,6) • Operator must keep purchase invoices for feed on file for three years (8)
Fish health and use of antibiotics and parasiticides	• Operator must ensure drugs, pesticides, and biologics comply with FDA, EPA, USDA regulations (2) • Applicant must certify a contractual arrangement with aquatic animal health expert; operator must provide certificate that cultured animals are free of reportable pathogens (2) • Operator must report all findings of reportable pathogens (including actions taken to address the episode). NOAA may order the removal of infected organisms (8)
Predator interactions	• Operator must inspect facilities and report entanglements or interactions with marine mammals, protected species, and migratory birds. Reports must include cause of entanglement or interaction and actions taken to prevent future episodes (2,8)
Interaction with capture fishing	• Operator must land finfish whole with heads and fins intact and spiny lobsters whole with tail intact between 6 am and 6 pm local time (2) • NOAA must establish a restricted access zone around facility corresponding to an approved Army Corps of Engineers permit (7) • Operator cannot possess wild organisms except authorized broodstock within facility's restricted access zone or aboard transport or service vessels, vehicles, or aircraft, which must stow fishing gear when transporting cultured organisms (2) • Operator must submit sales records and maintain records of fish introduced and removed from each system; records must be maintained for at least three years (8) • Operator must notify NOAA of broodstock collection and 72 hours before transport of juveniles from hatchery, harvest of individuals, and landing of cultured fish; harvested individuals require a bill of sale when transported for landing (8)
Siting and habitat protection	• NOAA will prohibit facilities in marine protected areas and marine reserves, HAPCs, Special Management Zones, and permitted artificial reef areas (6) • Army Corps of Engineers Section 10 permit required pursuant to Rivers and Harbors Act • Applicant must conduct baseline assessment and ongoing monitoring of facility site, including water quality, in accordance with NOAA guidance and procedures to be developed (6) • NOAA will prohibit facilities within 1.6 nautical miles of another facility and sites must be twice as large as combined area of pens/cages to allow for fallowing and rotation (but fallowing and rotation not required) (6) • RA will evaluate other siting criteria on a case-by-case basis (6)

Use of non-native organisms

Unlike the New England Council's framework adjustment approach, which applies only to species already under management,[81] the Gulf Aquaculture FMP explicitly identifies organisms that are—and those that are not—eligible for culture. The FMP allows aquaculture of all species native to the Gulf and managed by the Council, except corals and shrimp, so long as they are not transgenic or genetically modified.[82] Allowable aquaculture species will include coastal migratory pelagic fish, Gulf reef fish, red drum, and spiny lobster,[83] but species managed by state agencies—most notably including oysters and other shellfish—will not be eligible for culture in federal waters. This approach allows the Gulf Council to avoid the case-by-case review of species eligibility required in New England.

Escapes

Escaped organisms from aquaculture facilities may interbreed or compete with wild stocks. To address this risk, applications for Gulf Aquaculture permits must include engineering analyses or computer and physical oceanographic model results documenting the ability of the proposed facilities to withstand physical stresses, such as hurricanes.[84] When reviewing applications, NOAA may consider both facility resilience and other factors, including the types of materials used in the facility and accessibility of the facility for maintenance and repair, which may also affect escape risk, and it can place conditions on or deny permits as a result of this analysis.[85]

While case-by-case review will reduce escape risk, even NOAA-approved facilities are likely to experience some escapes. Permittees must notify NOAA Fisheries of any major escapement and its causes and must detail actions being taken to prevent future escapements.[86] The FMP, however, does

81 As discussed previously, projects proposing to use species managed under existing FMPs that allow framework adjustments for aquaculture will enjoy an expedited review and approval process, but nothing in the New England fishery regulations limits aquaculture production only to managed species; as a result, projects using non-native species would be allowed to proceed after the requisite notice, unless NOAA issues emergency regulations to block them. *See supra* note 56 and associated text.

82 Gulf Aquaculture FMP, *supra* note 28, at 56. The Council has also requested that NOAA develop regulations to allow for the aquaculture of highly migratory species regulated by the Highly Migratory Species (HMS) division of NOAA Fisheries Service.

83 Proposed Regulations, at § 622.51 (f) (p.26), *citing* 50 C.F.R. § 622.2 (defining coastal migratory pelagic fish); 50 C.F.R. Part 622, App. A (listing species of Gulf reef fish).

84 Gulf Aquaculture FMP, *supra* note 28, at 63; Proposed Regulations at §622.51 (b)(1)(ii)(I).

85 Gulf Aquaculture FMP, *supra* note 28, at 63; Proposed Regulations at 622.51 (e).

86 Gulf Aquaculture FMP, *supra* note 28, at 77-78; Proposed Regulations § 622.51(h)(1)(i)(B). A major escapement is defined as 10 percent of cultured organisms from a single aquaculture system (i.e., a single cage or pen) within a 24-hour period, 5 percent or more cumulative escapes from all systems within a facility within a 24-hour period, or 10 percent or more cumulative escapes from all systems within a 30-day period. *Id.*

not require that applicants provide a plan for minimizing escapes, nor does it require that facilities employ technologies designed to minimize escapes or that cultured fish be tagged or tracked to provide an opportunity to learn more about interactions that may occur between wild and farmed fish upon escape.

The Gulf FMP also includes measures to minimize differences between wild and cultured stocks of the same species, thereby reducing the potential harm that may result from escapes. Broodstock used to produce juveniles must be from the U.S. waters of the Gulf of Mexico and from the same population or sub-population where the aquaculture facility is located.[87] The plan also includes a number of requirements related to hatchery practices (e.g., individual marking or tagging of all broodstock and certification that the genetic material is collected and submitted for each brood animal).[88] However, the FMP does not require that wild individuals be captured and used as broodstock for each spawning event. The plan also does not require an operator to develop a genetics policy, nor does it require that the application describe the breeding program to be employed in the hatchery. Rather, "[a]ny specific requirements pertaining to frequency of broodstock collection and broodstock disposition after spawning would be based on relevant aquaculture regulations imposed by the various Gulf States."[89] Some state laws may include provisions that limit deliberate (through selective breeding of cultured individuals) or passive (through genetic drift) divergence of cultured individuals from the wild stock. In the absence of effective state restrictions, however, genetic divergences could occur that result in adverse effects on wild stocks when substantial escapements occur.

Discharge of Feed, Wastes, and Other Pollutants

The Gulf FMP requires permit holders to comply with monitoring requirements both before and after permit issuance to "ensure facilities are operating properly and not causing unacceptable impacts to the physical, biological, and ecological environments."[90] The specifics of this monitoring are not set out in the FMP or proposed regulations, but instead will be issued as NOAA guidance.[91] In addition, the FMP requires applicants to conduct baseline assessments of proposed sites before permit issuance, again following guidelines to be issued by NOAA.[92] Permit holders must also allow

87 Proposed Regulations § 622.51 (b)(1)(ii)(N).

88 *Id.; see also id.* § 622.51 (g)(4).

89 Gulf Aquaculture FMP, *supra* note 28, at J-11.

90 *Id*. at 54.

91 *Id.*; Proposed Regulations § 622.51 (g)(8).

92 Required monitoring may include diver and video surveys, measurement of hydrographic conditions, collection and analysis of benthic sediments, and measurement of water quality characteristics. Gulf Aquaculture FMP, *supra* note 28, at 65; Proposed Regulations § 622.51 (b)(1)(ii)(E).

NOAA employees or approved third parties to inspect facilities for compliance, and the FMP indicates that inspections—including site visits—will occur at least annually.[93] NOAA's proposed regulations presented to the Council, however, do not require annual inspection.

The MSA can provide an important supplement to other regulatory programs addressing water quality. Permits issued by the Army Corps of Engineers (e.g., Rivers and Harbors Act Section 10 permits) and Environmental Protection Agency (EPA) (e.g., NPDES permits) will require producers to comply with monitoring and reporting requirements, and the FMP regulations will mandate compliance with these requirements.[94] While these permits play the leading role in protecting water quality, they are not complete solutions for offshore aquaculture. For example, while state permitting authorities, relying on state law, often impose numeric standards in discharge permits for aquaculture facilities in state waters, EPA's Effluent Limitation Guidelines for aquaculture do not include numeric standards. Unless and until EPA develops numeric ELGs for offshore aquaculture, as recommended elsewhere,[95] the MSA will continue to provide independent authority that Councils can deploy in FMPs to fill this and other gaps. As always, however, the effectiveness of this additional authority will depend on its implementation.

While the Gulf FMP's monitoring and inspection requirements are important, their final implications have yet to be determined in practice because the FMP does not detail baseline assessment or monitoring criteria. Instead, it indicates that the baseline assessment and monitoring procedures and guidance will be developed in consultation with the Army Corps of Engineers, EPA, and other federal agencies. It is therefore difficult to determine whether the monitoring criteria will be sufficient to detect and address environmental impacts, or if NOAA will be authorized to amend permits to address those impacts if they are detected, unless the impacts result from permit violations.[96] While the FMP authorizes remedial actions short of permit modification to avoid or mitigate adverse impacts, these remedial actions authorize only removal of cultured organisms due to pathogen

93 Gulf Aquaculture FMP, *supra* note 28, at 44, 51; Proposed Regulations at § 622.51 (g)(17).

94 Proposed Regulations § 622.51 (g)(8).

95 Harvard Law School Emmett Environmental Law & Policy Clinic, Environmental Law Institute & The Ocean Foundation, *Offshore Aquaculture Regulation Under the Clean Water Act* (2012).

96 The proposed regulations provide for permit revocation, suspension, or modification only in response to permit violations. Proposed Regulations § 622.51 (b)(4)(viii), *citing* 15 C.F.R. Part 904, Subpart D (Permit Sanctions and Denials). Subpart D "sets forth procedures governing the suspension, revocation, modification, and denial of permits for reasons relating to enforcement" of the MSA and other laws implemented by NOAA. 15 C.F.R. § 904.300. While Subpart D does not preclude permit denial or sanction for other reasons (such as environmental protection), the proposed regulations do not provide for modification of permits other than by reference to Subpart D.

outbreaks and genetic issues—and not action in response to other environmental impacts.[97]

Robust monitoring and reporting requirements and expanded remedial authority are needed for offshore aquaculture to ensure that management decisions are based on the most complete and up-to-date information and that NOAA can engage in adaptive management. Under the Gulf Aquaculture FMP in particular, the Advisory Panel will rely on monitoring information to recommend modifications to the FMP. In addition, to the maximum extent allowed by statute, monitoring and reporting data should be made publicly available rather than treated as confidential business information. Because neither the AAP itself nor NOAA is likely to have sufficient internal capacity to fully analyze or synthesize these data, public analysis and input will improve the effectiveness of the Advisory Panel process.

Image: NOAA Photo Library website, http://www.photolib.noaa.gov/htmls/fish5288.htm

Fish health

Cultured organisms may harbor diseases and parasites and may transfer them into the wild. To prevent disease outbreaks, the plan requires applicants to submit a health certificate before stocking fingerlings in a facility and to certify that they have established a contractual arrangement with an

97 Proposed Regulations § 622.51 (k).

aquatic animal health expert—both requirements that may not be available under other regulatory programs for facilities located in federal waters.[98] In addition, operators must report all findings or suspected findings of certain reportable pathogens. Operators must also ensure that the drugs, pesticides, and biologics they use comply with FDA, EPA, and USDA regulations.

Predator Interactions

The Gulf Aquaculture FMP expands on restrictions on predator interactions provided in other laws, including the Endangered Species Act, Migratory Bird Treaty Act, and Marine Mammal Protection Act. Operators must inspect facilities, and they must report entanglements or other interactions with marine mammals, protected species, and migratory birds. Reports must include details of the interaction (e.g., date and location, species involved, and number of mortalities) as well as the cause of the event and actions being taken to prevent future interactions. The FMP, however, does not require that applicants provide a plan for minimizing interactions, nor does it require that facilities employ technologies designed to minimize interactions. However, some such protections may be included as conditions to permits under other regulatory programs, such as incidental take permits.

Capture fishing near aquaculture facilities

It is possible that aquaculture operators could use their operations as cover for illegal fishing for wild stocks. To protect against this risk, the Gulf FMP requires that operators land cultured fish between 6 am and 6 pm with heads and fins intact, prohibits their possession of wild fish other than broodstock within a restricted access zone around the facility, and prohibits the transport of wild fish other than broodstock in operators' vessels or vehicles.[99] These protections include some, but not all, of the requirements to land fish under other Gulf of Mexico FMPs, such as the reef fish Individual Fishery Quota program.[100] More complete traceability requirements could be implemented to more effectively separate cultured and wild fish and ensure that aquaculture operators do not land wild-caught fish.

The FMP also includes measures to address fishing by non-operators near aquaculture facilities. Because aquaculture facilities act as fish aggregation sites, other fishermen may want to set their gear near these facilities, which could lead to user conflicts and damage to facilities. The Gulf FMP therefore prohibits other fishermen from fishing in or transiting through restricted access zones around aquaculture facilities—a limitation that also protects against the transfer of wild caught fish

98 Gulf Aquaculture FMP, *supra* note 28, at 43.

99 *Id. at* 44.

100 *See* 50 C.F.R. § 622.16 (b)(3) (requiring prior notice of landing, restricting landing times, prohibiting vessel-to-vessel transfer of fish, and requiring the use of approved landing sites, among other conditions, in order to increase enforceability of the reef fish individual fishery quota system).

into aquaculture facilities to circumvent catch limits.[101] The Gulf Council's exclusive area provisions echo the New England Council's earlier decision, in the context of the SeaStead project, to prohibit commercial scallop vessels from harvesting the cultured organisms in the aquaculture project area.

Siting and Habitat Protection

One of the main concerns related to stationary offshore aquaculture facilities is the risk that the projects may individually or cumulatively degrade local habitat as a consequence of discharges and other habitat modifications. To minimize this risk, the Gulf FMP's required case-by-case analysis of proposed aquaculture systems includes consideration of habitat interactions, and many of the FMP's environmental protections are built around facility siting decisions. Facilities will be prohibited in specific types of designated protected areas;[102] in other areas, NOAA will evaluate facility siting on a permit-by-permit basis and will develop criteria for making these decisions.[103] Sites may be evaluated for their impact on essential fish habitat, endangered species or threatened marine species, important commercial and recreational fishing grounds, depth and current speeds, substrate types, frequency of harmful algal blooms or hypoxia at the site, and marine mammal migratory pathways.[104] However, these criteria are not mandatory—and while NOAA may deny permits to proposed facilities that would cause harm to the local habitat, it is not required to do so.

The FMP also includes limits on density. To limit local and cumulative pollution, facilities must be located 1.6 nautical miles apart and must be twice as large as the total area encompassed by the total area of pens/cages to allow for fallowing and rotation of systems.[105] However, the plan does not require fallowing or rotation of systems within the facility.

Conclusions

The Gulf of Mexico Aquaculture FMP contains management measures intended to address most environmental impacts expected to be associated with offshore aquaculture development. As such, the FMP shows that the MSA allows wide latitude for measures intended to protect the

101 Gulf Aquaculture FMP, *supra* note 28, at 77-81. The restricted access zone will correspond to the coordinates on the permit issued by the Army Corps of Engineers pursuant to the Rivers and Harbors Act.

102 *Id. at* 65-66 (prohibiting aquaculture in marine protected areas and marine reserves, Habitat Areas of Particular Concern, Special Management Zones, permitted artificial reef areas, and coral areas); Proposed Regulations § 622.51 (c)(1) ("No aquaculture facility may be sited in the Gulf EEZ within a marine protected area, marine reserve, Habitat Area of Particular Concern, Special Management Zone, permitted artificial reef area . . . or a coral area").

103 Proposed Regulations § 622.51 (c)(4).

104 *Id.;* Gulf Aquaculture FMP, *supra* note 28, at 65-66.

105 Gulf Aquaculture FMP, *supra* note 28, at 65-66.; Proposed Regulations §§ 622.51 (c)(2) - (c)(3).

environment—including for impacts that are not addressed adequately by other regulatory programs. At the same time, the MSA does not require Councils to adopt all these measures, and substantial work will be needed to implement and enforce the measures that are included in the FMP. In some areas, the FMP can be strengthened to more effectively protect the environment. Taken as a whole, the Gulf Aquaculture FMP suggests that the MSA may be a vital element of the regulatory landscape for offshore aquaculture, but that the details of FMP development and implementation will largely determine its effectiveness.

CONCLUSIONS AND RECOMMENDATIONS

Aquaculture rests uncomfortably within the MSA framework, which was primarily intended to conserve, restore, and ensure the ongoing sustainability of capture fisheries. Nonetheless, NOAA has determined that the MSA's definition of "fishing" includes aquaculture, and Councils have begun applying the law to aquaculture. The only federal court to consider the question has upheld this interpretation, but the issue will arise again both on appeal and in any subsequent litigation arising from issuance of the regulations for the Gulf FMP or from other aquaculture management actions. The courts will eventually resolve this issue, but unless and until they determine that the MSA provides no jurisdiction over aquaculture, NOAA and the Councils will continue to apply the MSA to offshore aquaculture in federal ocean waters.[106]

The MSA provides a variety of management tools that NOAA and the Councils can deploy to minimize the adverse environmental impact of offshore aquaculture development. A few Councils have begun to apply these tools, and NOAA has indicated it intends to use the Gulf of Mexico Council's approach as a national model. However, current application of the MSA to aquaculture can and should be improved and clarified to ensure that offshore aquaculture does not result in environmental degradation. We recommend that NOAA and the Councils, as appropriate, make the following improvements to ensure that the MSA is deployed most effectively to manage aquaculture and minimize the possibility that aquaculture results in harm to the environment.

1. **Aquaculture FMPs can address environmental impacts not otherwise regulated under federal law, but the Gulf FMP should be improved before being used as a model in other regions.**

The MSA authorizes Councils to include a wide array of management measures and permit conditions in aquaculture-specific FMPs. In some cases, the FMP provisions address impacts that are not directly or comprehensively regulated by other regulatory programs. The Gulf FMP demonstrates the breadth of Council discretion, as it includes provisions intended to minimize habitat damage (e.g., ecological monitoring, siting criteria, financial assurance for equipment removal when production

106 If it chooses to reauthorize the MSA, Congress could also provide regulatory certainty by amending the statute to clarify whether the MSA applies to aquaculture. Should it so act, the amendments could also delineate proper application of the Act in this context—including how to set overfishing thresholds and yield targets for aquaculture. However, the barriers to congressional action are high, and past efforts to craft offshore aquaculture legislation (whether to manage or prohibit aquaculture in the EEZ) have not overcome these hurdles to date. *See, e.g.,* National Sustainable Offshore Aquaculture Act of 2011, H.R. 2373, 112th Cong. (2011) (to establish a federal management framework for offshore aquaculture); H.R. 753, 113th Cong. (2013) (to prohibit authorization of commercial finfish aquaculture in the EEZ).

ends), restrict species under cultivation (e.g., prohibition on the use of non-native species), and avoid impacts to wild stocks (e.g., restricted areas outlawing other fishing near aquaculture facilities), among other measures (see Table 1). Such provisions fill a critical gap in the current regulatory structure for offshore aquaculture and should be included in future FMPs created or amended to manage aquaculture.

Nevertheless, the Gulf Aquaculture FMP can be improved by incorporating more mandatory requirements, providing more specificity for required actions, and providing for remedial action to alter permit provisions in response to environmental impacts. For example, while the FMP requires applicants to monitor and assess proposed sites and outlines discretionary criteria for NOAA's case-by-case facility evaluations, it does not detail procedures and guidelines for required monitoring or NOAA's evaluations or require NOAA to evaluate the listed criteria when making permit decisions. Similarly, the FMP requires operators to report major escapements and any entanglements or interactions with marine mammals, protected species, and migratory birds (among other reporting requirements), but applicants can obtain permits without providing plans to minimize escapes or interactions, and they are not required to use the best available technology in facility design to minimize escapes and bycatch. In addition, the FMP authorizes remedial action only for pathogen outbreaks and genetic issues.

The FMP could be improved by requiring mandatory evaluation criteria and permit requirements, including assessment and monitoring procedures and mandatory performance measures. More mandatory criteria could in turn ensure that these provisions are enforceable and provide the basis for the modification, revocation, or suspension of permits if facilities are found to cause environmental harm. With these and other improvements, the FMP can play an important role in ensuring that offshore aquaculture development does not cause environmental harm.

2. **NOAA should provide direction on setting OY and ACLs for aquaculture, support development of aquaculture models, and ensure that adequate data are collected and made publicly available.**

Determination of meaningful OY and ACLs is a substantial but important challenge if Councils are to apply the MSA to offshore aquaculture, as these determinations are both required by the MSA and are critical to preventing overfishing. However, NOAA's current guidance and models for assessing and designating OY and ACLs were designed for capture fisheries and cannot be directly applied to aquaculture. For example, the Gulf Council determined that overfishing is irrelevant to aquaculture and set OY and MSY based on economic indicia rather than ecological data. This approach is understandable, given the lack of available scientific information on offshore aquaculture, but it also fails to establish a meaningful upper bound on aquaculture production in the region and therefore is

in tension with the MSA's focus on preventing, rather than responding to, overfishing.

Councils need specific guidance on how to set overfishing thresholds and yield targets for aquaculture based on ecological criteria, rather than production amounts, as directed by the MSA. While Congress could address this issue, a more realistic approach would call upon NOAA to amend its guidance to clarify how Councils should consider and apply these concepts in the aquaculture context.

Development of effective methodological tools for determining OY and ACLs for aquaculture—and the data needed to use those tools—is critical if overfishing thresholds and yield targets are to meaningfully cap total production. In capture fisheries, these metrics are based on a well-developed stock assessment and modeling process, but similar models for aquaculture do not yet exist, and the models that do exist (such as for effluent discharges) are not comprehensive.[107] More sophisticated tools are urgently needed. To its credit, NOAA has focused on developing aquaculture models in participation with other agencies.[108] These efforts should continue, with a focus on characterizing cumulative impacts and the relationship of offshore aquaculture and ecological carrying capacity.

Models are not useful or relevant unless supported by adequate data. Unless remedied, the current lack of scientific information on the individual and cumulative impacts of offshore aquaculture production will prevent Councils from meaningfully estimating OY or ACLs. The Gulf FMP outlines a process that, if implemented, would be a good start towards increasing data availability by requiring baseline and ongoing monitoring of aquaculture sites and a process for using these data to update management measures. Provided that NOAA issues meaningful guidelines and includes permit conditions that effectively implement the monitoring and reporting criteria, future permit systems should include similar requirements for robust and transparent data generation and reporting. However, permit-specific requirements alone will not provide sufficient data to enable understanding or modeling of the cumulative impacts of offshore aquaculture. In collaboration with other agencies, NOAA should identify what additional information may be needed to supplement site-specific data and identify how it can be obtained.

Data generation is crucial not only for determining yield targets, but also for determining whether adverse impacts are occurring. Under the Gulf FMP, the AAP bears primary responsibility for reviewing planned production levels relative to OY, determining if aquaculture is adversely affecting wild stocks and other marine resources, and recommending changes to OY and management

107 *See* NOAA, Modeling the Environmental Effects of Marine Fish Cage Culture: Summary of a Workshop to Assess Model Application, Capacity, and Validation Needs (Mar. 2012) (discussing existing models).

108 *Id.*

measures based on its findings. To carry out these duties, the AAP (and similar panels that may be created in other regions) will need to rely on scientific evidence created and synthesized not only by NOAA staff but also by outside investigators. If data generated by monitoring of aquaculture facilities are not publicly available, then the Gulf FMP's system for both OY determination and identifying harm associated with aquaculture development will be significantly undermined. To forestall this outcome, Councils should explicitly provide in FMPs that all generated data are publicly available and not confidential.

3. NOAA guidance is needed to assist Councils in establishing appropriate management units for cultured and wild stocks.

Councils considering managing offshore aquaculture must determine whether to jointly manage cultured and wild stocks and/or whether to jointly manage some or all cultured stocks (excluding wild fish). Few FMPs currently mention cultured organisms in defining managed stocks, so these organisms are by default included in the stocks of the same species when managed by FMPs. The Gulf Council alone has created a separate management unit for cultured stocks, which applies to all cultured organisms—including both shellfish and finfish.

In determining whether wild and cultured stocks should be managed together or whether different species of cultured organisms should be jointly managed, Councils must consider variables such as species and production methods. For example, aquaculture based on harvest of wild organisms for broodstock (and ranching in particular) directly impacts wild stock biomass, while closed life cycle production may not—although it may indirectly cause other impacts to wild stocks due to spatial conflict, feed sourcing, or other reasons. Similarly, shellfish and finfish production involve substantially different impacts, and combining the two in a single management unit may result in over- or under-regulation of production and unanticipated environmental outcomes, unless Councils are careful to create different management measures and production limits for each species in the management unit.

NOAA should provide additional guidance to Councils on how to apply their substantial discretion to select appropriate management units. NOAA can assist by developing guidance on how to define management units in light of aquaculture—including what variables to consider (e.g., species, production method), how to balance those variables, and any other considerations that may influence the management unit determination. Whether NOAA's guidance takes the form of a policy document or a formal amendment to its MSA regulations, provision of this information would assist Councils, most of which do not have substantial experience with aquaculture, in navigating the issues surrounding management unit determination.

4. Councils should require short term aquaculture permits for novel facility technologies to ensure that they perform well in real-world conditions.

The Gulf of Mexico FMP provides for 10-year renewable aquaculture permits—a reasonable length for facilities with a proven track record, but too long for novel, untested facilities. Systems that have not yet been tested under actual ocean conditions may not live up to expectations, regardless of model results, and factors such as feed efficiency may differ from expectations in ocean environments. As a result, issuance of long-term permits for new, untested systems is risky.

Instead, NOAA should initially issue only short-term permits for novel offshore aquaculture operations without a track record of operational safety. Such short-term permits could help Councils promote innovation in system design, while allowing real-life testing of systems that can supplement the computer modeling and desktop analysis required in the FMP to determine the safety of new and innovative systems. For example, Kampachi Farms, the successor to Kona Blue Water Farms, has proposed to shift from a free-floating to an anchored design based on experience gleaned through its Special Coral Reef Ecosystem Permit.[109] Short-term permits are ideal vehicles for such facility testing and improvement and should precede the issuance of long-term permits for novel technologies or practices. Upon successful deployment, these permits could be renewed until the technology has met standards for performance or they could be converted into long-term permits. At the same time, NOAA could decline to extend permits for underperforming or unsafe facilities—whereas operators could redeploy those facilities if pre-approved for a long-term permit. This is particularly important as the FMP appears not to provide authority for permit revocation or modification except in the case of noncompliance, even if permitted activity is leading to documented environmental impacts.

NOAA and the Councils could implement short-term permitting in two ways. NOAA can currently issue EFPs for aquaculture without specific Council action, as it did in the Gulf of Mexico SeaFish Mariculture case. Alternatively, Councils can follow the lead of the Western Pacific Council by limiting the term of permits issued under more targeted special permit programs in existing FMPs. And finally, Councils can provide for short-term, experimental permit programs in new FMPs or FMP provisions that they develop for aquaculture in particular.

109 *See* U.S. Army Corps of Engineers, *supra* note 25 (application for new permit outlining anchored model).

5. **Councils must classify aquaculture as a fishing-related activity that may affect EFH and take action to minimize its adverse impacts on that habitat.**

While every Council has determined that aquaculture may affect EFH, only New England and the Gulf of Mexico have classified aquaculture as a fishing-related activity that may affect EFH—the remaining Councils have designated aquaculture as non-fishing activity. Designation of aquaculture as non-fishing activity is contrary to NOAA's determination that aquaculture is fishing under the MSA. Councils are legally obligated to follow the example set in the Gulf of Mexico and New England and classify aquaculture as a fishing-related activity that may affect EFH and to identify measures to minimize its adverse impacts on EFH. Councils must take care to ensure those measures are effective to minimize adverse impacts; if adequately implemented, incorporation of these measures in FMPs and associated permits adds a layer of environmental protection beyond that offered by consultation. Councils can effectively and efficiently minimize aquaculture's effects on EFH by prohibiting aquaculture facilities from permanently or temporarily locating in or near EFH and other protected areas.

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