

LINKING HABITAT PROTECTION AND MARINE PROTECTED AREA PROGRAMS TO CONSERVE CORAL REEFS AND ASSOCIATED BACK REEF HABITATS

Michelle A. Duval, Douglas N. Rader, and Kenyon C. Lindeman

ABSTRACT

A variety of mechanisms exist at the state, territorial, and federal level in the U.S. to protect habitats critical in the development of reef fish species. The most recently formulated are the Essential Fish Habitat designations in federal waters, in addition to various National Environmental Policy Act-associated and state-level permitting processes, as well as provisions of the Coastal Zone Management Act and National Marine Sanctuaries Act. Similarly, several mechanisms are available to implement marine protected areas, including existing federal National Marine Sanctuary processes and varied Fishery Management Council initiatives under development. Linking habitat management and MPA implementation is critical to developing whole-ecosystem protection to threatened habitats and populations. Spatially explicit science remains key to coordinating such efforts as diverse stressors occur across the shelf from land- and water-based sources. However, fragmentation of jurisdictional authority significantly impacts the ability to institute effective protection. Solutions to this must include: (1) Filling critical personnel shortages at the field staff level, (2) development of integrated regulations for agencies with jurisdiction over marine fisheries, water quality and coastal development, and (3) dedicated money for monitoring and enforcement efforts as a prerequisite to implementation of management regimes.

This publication is part of a series of papers resulting from a scientific workshop held at the Caribbean Marine Research Center (December 2001) to evaluate the importance of back reef systems for supporting biodiversity and productivity of marine ecosystems. Coral reefs can be considered “charismatic macrofauna” of the marine realm, along with marine mammals and sea turtles often known as charismatic megafauna. There is a high level of public awareness regarding coral reefs and the environmental impacts to which they are susceptible. However, most of the popular media has focused public attention on foreereef-associated habitats. Many back reef habitat types – seagrasses, sandy bottoms, hard bottoms, patch reefs, mangroves, channels – do not receive the same level of consideration, although the threats to these areas are also pressing. Back reef habitats provide many important ecosystem functions: serving as sources of primary production, forage areas, critical juvenile nursery habitats, as well as larval settlement areas (Boesch and Turner, 1984; Thayer et al., 1987; Keener et al., 1988; Nelsen et al., 1991; Able and Fahay, 1998). These habitats and their functions are threatened by a suite of stressors that are cross-shelf in nature and include: direct loss from coastal development, non-point source pollution (e.g., increased stormwater runoff from impervious surfaces), alteration of habitat and hydrology from channel dredging, prop scarring in shallow waters, damage from bottom-tending fishing gears (Fonseca et al., 1984; Van Dolah et al., 1987), as well as increased turbidity from all of the above activities. Moreover, the effects of many of these stressors are cumulative in nature and difficult to measure on a case-by-case basis. Back reef systems themselves are also cross-shelf in nature, and are a fundamental component of a continuum between inshore and outer shelf regions. The utilization patterns of many reef fish species reflect the use of multiple habitats that are distributed adjacent to each other (Parrish, 1989; Parker and Mays, 1998).

We examine the potential for linking administrative mechanisms and available scientific information to protect back reef habitats with recent efforts to establish marine protected areas. Both habitat management and protected area design can be aided by similar data, e.g., identification of common developmental and habitat utilization patterns for key species groups (Lindeman et al., 2000). In addition, we attempt to address obstacles to integrated management actions, such as fragmentation of jurisdictional authority, by providing a state-level example of a coordinated, ecosystem approach to protection of marine resources.

HABITAT PROTECTION

A variety of administrative tools exists at federal, regional, state, and local levels which can be employed to provide real protection for reef-associated habitats as well as raise awareness of the need for such protection. Traditionally, most avenues for administrative oversight of marine habitat impacts have been provided through the National Environmental Policy Act (NEPA), the Clean Water Act (CWA, particularly through Section 404), and the Coastal Zone Management Act (CZMA). Through these and additional laws (e.g., the Fish and Wildlife Coordination Act), the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (FWS) have had limited comment authority on federal projects that affect coastal habitats. Authority is limited because ultimately most permitting decisions rest with the U.S. Army Corps of Engineers (ACOE), or with federally approved state CZMA implementing agencies. As ACOE permit denials are extremely rare, the quantity and quality of a number of coastal habitats is increasingly degraded (Odum, 1982; Lindeman, 1997).

ESSENTIAL FISH HABITAT (EFH).—The most recent opportunity for targeted habitat protection is the Essential Fish Habitat (EFH) provision of the federal 1996 Sustainable Fisheries Act, which reauthorized and amended the Magnuson Act (NOAA, 1996). The mandate to identify and designate EFH recognized and formalized the need to link coastal land management with fishery management. Although councils were given regulatory authority to stop or minimize impacts to EFH from fishing activities, they were not given authority to minimize impacts to EFH from land-based activities. However, consultation opportunities are now encouraged.

In addition, a subset of high-value EFH can be designated as Habitat Areas of Particular Concern (HAPC), designed to protect rare, ecologically important areas that are sensitive to environmental degradation and potentially in danger from the effects of expanded development (NOAA, 1996; SAFMC 1998a,b). Although the HAPC designation is supposed to provide an additional measure of protection, regulatory mechanisms beyond those of EFH do not exist for HAPCs. At a minimum, certain large-scale activities (e.g., offshore oil/gas drilling, sand mining) should be prohibited within all designated HAPCs, either by statute or regulation.

Despite completed and ongoing research to determine the impact of specific gear types on habitat (NEFSC, 2002), the problem of habitat alteration as a result of cumulative and long-term gear impacts (i.e., a shifting baseline condition) is difficult to assess (SAFMC, 1998a) and can be less of an impact in most back reef areas than on deeper fore reefs. No requirement exists for comprehensive protection, or for the development of management plans to achieve that protection. Long term studies on common anthropogenic habitat stressors involving both fishing gear impacts and land-based impacts are badly needed.

When possible these studies need to control for confounding variables and track effects of both direct and indirect perturbations.

The expanded consultation requirements for federal agencies either conducting or permitting projects that may negatively impact EFH theoretically provide another layer of defense against habitat destruction. Although the fishery management councils can comment on non-fishing based federal projects and permits, they have only indirect authority with which to pursue action or mitigation. However, as of June 1999, the NMFS Habitat Conservation Division Southeast Region commented on 3916 projects that were believed to have the potential to adversely impact EFH. Of those, 262 projects resulted in an expanded consultation process between fishery managers and other agency staff. Of the completed expanded consultations, projects have either been denied or modified to protect EFH in ~220 of these cases (A. Mager, NMFS, pers. comm.). Therefore, 5.6% of the 3916 projects showed measurable responses to the EFH issue. It is important to note that the impacts of EFH may be higher in less measurable up-front project modifications, which are designed to avoid expanded EFH consultations.

NATIONAL MARINE SANCTUARIES ACT.—Another tool for habitat protection is the Marine Protection, Research and Sanctuaries Act (i.e., the National Marine Sanctuaries Act) of 1972 (16 U.S.C. § 1431 et. seq.). The Act provides the authority to set aside protection for marine areas, which possess certain ecological, historical, aesthetic, research, and/or educational qualities of national or international significance and for which current state or federal laws do not provide sufficient protection. Although the Act does not contain specific habitat mandates, it does encompass the concepts of habitat protection and restoration within its purposes and policies (16 U.S.C. § 1431(b)). In addition, theoretically prohibited activities within any sanctuary include those resulting in the destruction, loss, or injury of sanctuary resources and are subject to federal enforcement and fines. Similar to the EFH consultation under the Sustainable Fisheries Act, federal agencies are required to consult with the Secretary of Commerce if their actions are likely to affect sanctuary resources. Finally, each sanctuary develops regulations for allowed activities in coordination with other federal, state, and local authorities; the regulations are specific to each sanctuary and can vary greatly in terms of the level of protection afforded.

OTHER REGULATORY TOOLS.—Additional tools available to enhance habitat protection include the federal Coastal Zone Management Act of 1972 (CZMA, 16 U.S.C. § 1451 et. seq.), interstate compacts (e.g., the Atlantic States Marine Fisheries Commission), and state waters special use designations. The CZMA does not establish federal regulations or even a management framework for coastal areas, but rather encourages states to develop their own programs through the use of federal grant monies. However, in order to receive federal approval a state's program must meet several criteria, one of which is inclusion of measures to protect natural resources in the coastal zone, e.g., fish and wildlife and their habitats. A very important component of CZMA is the requirement that all federal activities, which directly affect lands, waters, and natural resources within a state's coastal zone be "consistent" with its management program. This is analogous to consultation under the Sustainable Fisheries Act, and a state may object to the consistency certification or analysis provided by a federal agency. In many cases, the state may choose to suggest measures that would modify the project in a manner that is consistent with the state's coastal management program.

Interstate compacts such as the Atlantic States Marine Fisheries Commission (ASMFC), which is responsible for the development of interstate fishery management plans, have also developed habitat protection policies. While the policies do not require

member states to adopt regulations, they are public documents and are developed and endorsed by the member states. For example, the ASMFC's Submerged Aquatic Vegetation (SAV) policy (ASMFC, 1997) recognizes the importance of SAV as habitat, and has generated further study on fishing gear impacts to SAV. Again, although the ASMFC cannot require the adoption of regulations regarding habitat protection, the awareness that such policies generate among both managers and decision-makers is extremely beneficial to future protection efforts.

Regulations and policies adopted by individual states are also tools for habitat protection. Significant reef-associated habitat resources in the southeastern U.S. are located in state as well as federal waters. Special designations (e.g., primary or secondary nursery areas, outstanding resource waters, etc.) often restrict the types of activities or development, which can occur in these regions. Arguably, impacts to these habitats still occur despite such restrictions.

MARINE PROTECTED AREAS

The efforts to protect marine habitats utilizing the tools outlined above have been paralleled by a growing movement toward the use of marine protected areas (MPAs) to aid in the restoration of depleted fish populations. The term "MPA" is defined by the World Conservation Union (IUCN) as "any area of the intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part of all of the enclosed environment" (IUCN, 1988). There are clearly many levels of protection encompassed by this definition, from "no-take" areas, which allow no consumptive or potentially harmful uses, to "zoned areas" which regulate many different activities at various levels.

MPAs AND FISHERY MANAGEMENT.—The use of MPAs as a fishery management tool has generated much controversy, particularly with regard to the use of no-take MPAs. The type of MPA used for fishery management purposes depends on the management goal, as well as site characteristics; however, there are benefits to the use of no-take MPAs, which should be carefully considered. First, enforcement personnel have indicated that no-take MPAs are easier to enforce than MPAs with restrictions on the use of certain types of gear or harvest of particular species. As a corollary, this scenario is likely to be easier for the fishing community as well, rather than having to keep abreast of multiple regulations for a given area under protection. Second, use of no-take MPAs can reduce user conflicts regarding access to the resource (i.e., nobody is allowed access). Third, no-take MPAs have the benefit of protecting all the habitat characteristics of a given area, and afford some level of protection to not just one or two species, but all that may use it. Finally, use of no-take MPAs in conjunction with traditional fishery management measures could prove to be less costly both economically and ecologically, rather than use of traditional measures alone. Size, bag, and trip limits often have direct economic impacts on the fishing community that could be eased by incorporation of MPAs into a management program.

Interest in utilizing MPAs as a fishery management tool is particularly strong in the southeastern U.S. and Caribbean, where many commercially and recreationally important species use reef or back reef type habitats during development (Sedberry and Van Dolah, 1984; Parker and Mays, 1998; Ley et al., 1999). In particular, the South Atlantic Fishery Management Council has considered the use of protected areas for some time

(Table 1) and the initial scoping document (Plan Development Team, 1990) remains a fundamental guide to MPA rationale. Most of the Council's managed species are slow growing, late to mature, and have a reproductive capacity that increases with age. Several are sequential hermaphrodites, spending the first portion of their lives as females before becoming males in response to social cues. Many aggregate at known sites to spawn and are extremely vulnerable to fishing pressure during that time. Reef fish also exist in mixed associations within several habitat types (Rooker and Dennis, 1991). These characteristics can make successful implementation of traditional fishery management measures for a single species difficult (Plan Development Team, 1990).

All three of the federal fishery management councils with reef fish resources (South Atlantic, Gulf of Mexico, and Caribbean) manage them as multispecies complexes under single management plans: the South Atlantic Snapper Grouper plan (SAFMC 1983a,c), and separate Reef Fish plans for the Gulf (GMFMC, 1984) and Caribbean (CMFC, 1985). Designing management measures, which will have the desired effect upon a single species, could in some instances result in unintended consequences on other species within the complex. Both scientists and managers have suggested that the use of MPAs, in conjunction with traditional management measures, may be necessary for the restoration and future management of several reef fish species (Plan Development Team, 1990; Allison et al., 1998; Johnson et al., 1999).

Establishment of MPAs through the authority of the federal fishery management council is a mechanism that is still under development. The authority is contained within the Magnuson-Stevens Act as a discretionary provision under the development of fishery management plans. The legal justification for such action is provided by the Act's national standards as well as the requirement to minimize fishing-related impacts to EFH. Admittedly, there is a limit to the actions that the councils can take, as they only have the direct authority to manage fishing. The South Atlantic Fishery Management Council first formally explored the opportunity to utilize MPAs as a management tool in 1990 (Table 1), at the recommendation of the Snapper Grouper Plan Development Team (PDT). The Council's effort generated resistance within the fishing community and was sidelined for several years. However, the Council had previously established the Oculina Bank restricted use zone in 1983 through the Coral Fishery Management Plan; this area can be considered the first MPA established under the Council's jurisdiction (Table 1).

In 1998, the SAMFC decided to reexamine the issue of MPAs as a management tool for its reef fish (Snapper Grouper) complex and created an MPA Committee and Advisory Panel. The Advisory Panel consists of representatives from both commercial and recreational fishing interests, conservation organizations, the diving community, and education and outreach specialists, and was tasked with (1) providing an opinion statement to the Council regarding the utility of MPAs in the South Atlantic, and (2) developing a set of criteria with which to evaluate any potential sites. The Council conducted several rounds of public scoping with regard to the two issues described above (Table 1). As a result of the scoping meetings, the Council decided to move forward with identifying a list of potential sites which would protect members of the deep water grouper complex (warsaw grouper, snowy grouper, speckled hind, yellowedge grouper, misty grouper, all tilefish species) and is currently pursuing an MPA design that would allow some pelagic trolling while prohibiting bottom fishing.

EXECUTIVE ORDER ON MPAS.—Other processes exist which have brought attention to the utility of marine protected areas, namely the Executive Order on Marine Protected Areas issued by President Clinton in May 2000, and the National Marine Sanctuaries

Table 1. Historical overview of consideration of MPA use by South Atlantic Fishery Management Council (SAFMC). FMP = Fishery Management Plan; HAPC = Habitat Area of Particular Concern; PDT = Plan Development Team.

Year	Council action
1983	Oculina Banks protected area under Coral FMP; further restrictions implemented as listed in remainder of table.
1990	Snapper Grouper PDT recommends MPAs as management tool.
1992	SAFMC conducts public scoping regarding MPAs; concept receives little support from fishing public.
1994	Oculina Banks HAPC becomes Experimental Oculina Research Reserve; closed to bottom fishing and anchoring for 10 yrs.
1995	Scientific Review Panel concludes properly designed MPAs can be effective tool in conjunction w/other management measures.
1997	SAFMC faces possibility of severe reductions in allowable catch after passing of SFA; concept of MPAs resurfaces.
1998	SAFMC engages in scientific fact-finding process using MPA Advisory Panel.
1999	MPA Advisory Panel unanimously recommends use of MPAs as management tool for snapper grouper stocks.
2000	SAFMC solicits stakeholder input through informal presentations and formal scoping; Council votes to move forward with use of MPAs.
2001	Council conducts scoping to solicit site recommendations from public regarding potential MPAs.
2002	Council conducts another round of public scoping regarding list of potential sites; conducts outreach workshops to communicate science to fishing community.

Act. The former is really an informational umbrella; it does not authorize any federal agency to create MPAs. Rather, it directs agencies within the Interior and Commerce departments to develop a national “framework” for MPAs with the input of an appointed national advisory committee. It establishes a national MPA research center, as well as an administrative headquarters that is tasked with completing a national inventory of MPAs and developing a website for dissemination of information to the public. The most important component of the Executive Order is the definition it establishes for “marine protected area”, which is “any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part of all of the natural and cultural resources therein.” This broad definition is very similar to that of the IUCN and includes national wildlife refuges, national marine sanctuaries, as well as other areas where consumptive uses are allowed. Although the Executive Order does not provide a mechanism to establish marine protected areas, it does raise the awareness of the public, managers, and decision-makers of the need to protect certain areas of the marine environment and to establish a coordinated plan for doing so.

NATIONAL MARINE SANCTUARIES ACT.—The National Marine Sanctuaries Act provides a mechanism to designate geographic areas to acknowledge their national significance, provided they meet several biological and/or cultural criteria. As stated previously, the regulations pursuant to the act do not restrict activities within sanctuaries as a matter of course. Any restrictions must be developed in cooperation with federal, state, and local agencies that may hold jurisdiction in the area. The successful designation of no-take MPAs within the Dry Tortugas followed just such a multi-stakeholder process; although lengthy, all input was carefully considered and the outcome endorsed by all participants. The key is that sanctuary designation can be the first step toward a closer examination

of marine resources, threats to those resources, and the best means to protect and sustain them for the future. Management plan revisions under the National Marine Sanctuaries Act are currently underway at the Channel Islands, Gray's Reef, and Stellwagen Banks National Marine Sanctuaries; several of the options under consideration involve measures, which would restrict activities in order to enhance protection of sanctuary resources.

FORGING LINKS: THE NEED AND THE PROBLEM

THE PROBLEMS.—Forming linkages between habitat protection and MPA initiatives to protect the biology and ecology of reef species and habitats is necessary to the success of both efforts. However, it is made complicated by fragmentation of jurisdictional authority. At both the national and state level, different agencies carry different yet overlapping mandates, which affect the management of marine resources (Fig. 1). The chemical characteristics of water – the medium in which organisms live and breathe – are rarely managed within the same agency as living marine resources. This is also true of coastal development – which impacts both water quality and bottom habitat. At the federal level, NMFS is responsible for the review and implementation of the fishery management plans that the councils are charged with developing. Yet, both the South Atlantic and Gulf of Mexico Fishery Management Councils, and to a lesser extent the Caribbean Fishery Management Council, have jurisdiction over the same species—which can sometimes result in conflicting management schemes. The Environmental Protection Agency (EPA) administers the Clean Water Act, much of which is delegated to the states for execution. Implementation of Section 404 of the Clean Water Act, which regulates the disposal of dredged material in waters of the U.S., is administered by the Army Corps of Engineers, which permits a wide array of projects affecting reef systems, often in very problematic manners (Lindeman, 1997; Peterson et al., 2000). Finally, coastal development has no associated federal regulations under the CZMA and is instead regulated at the state and local level; the result is varying sets of rules, despite the guidelines that CZMA provides in order for states to receive federal approval, and therefore federal money, for their coastal management programs.

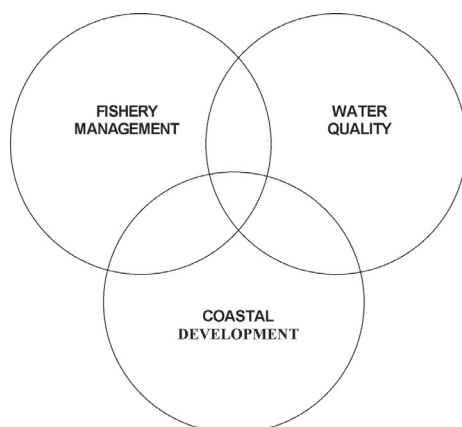


Figure 1. Differing agencies with responsibility for the management of fishery resources, water quality, and coastal development often have separate administrative mandates, but effective ecosystem management requires active involvement of all three administrative categories.

Not surprisingly, this separation of jurisdiction often continues at the state government level. In North Carolina, for example, the Division of Marine Fisheries, Division of Coastal Management, and Division of Water Quality are all housed within the Department of Environment and Natural Resources, yet operate under different state mandates. This does not imply that no communication takes place between the divisions; interagency permit review does occur. However, projects are often not elevated before a sister agency prior to permits being issued; a more coordinated approach to development and habitat protection within the state's coastal region is necessary.

THE NEEDS.—Given the practical limitations on both staff and budgetary resources at all levels of government, it is difficult to consider the indirect or unintended impacts of management decisions on resources not directly within an agency's purview. Proactive, interagency coordination would streamline the permit review process while in all likelihood providing increased protection to marine habitats. In order for this to succeed, a comprehensive and upfront, i.e., "pre-permitting" evaluation of cumulative impacts – before they are allowed to occur – is necessary. The current approach to environmental impact analysis is one in which impacts are assessed ad hoc on a project-by-project basis, and only within the geographic boundaries of the project. Rarely do they consider the cumulative effects of repeated habitat modification (Odum, 1982; Vestal and Rieser, 1995), as in large beach dredging projects that routinely bury EFH-HAPC (Lindeman and Snyder, 1999). Unfortunately, this results in the permitting of many small impacts, which appear benign on an individual basis, but collectively constitute serious and permanent impact. Furthermore, this type of analysis allows for the piecemealing of large projects that might otherwise not receive permit approval without significant mitigation. Advance analysis of an allowable level of impact to marine resources would greatly inform the permitting process and subsequent mitigation efforts, as well as improve interagency communication. Unfortunately, habitat databases are often limited in scope, and subject to repeated review for permitting considerations. Both this and the "case-by-case" method of impact review promote an institutional policy whereby inadequate information regarding cumulative impacts is equated with no impact.

IMPROVING THE SYSTEM

As Congress considers reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) and the U.S. Coral Reef Task Force continues its work, there is both a need and an opportunity for improving the current matrix of marine habitat protection mechanisms. At the federal level, this includes promoting an ecosystem level of management, rather than traditional species-by-species management. Although difficult to define, this approach recognizes the importance of species interactions, the value of a species to the ecosystem as a whole, and the need to conserve biodiversity. Only recently have the federal fishery management councils taken small, yet painful, steps toward the planning and implementation of such an approach. The extensive research undertaken by many of the councils with regard to designation of EFH, while incomplete, provides an ideal foundation for pursuing an ecosystem-based approach.

However, for the above approach to be successful, several changes in the current legislative and regulatory structure are necessary: (1) Modify National Standard One of the MSFCMA to reflect that resource conservation and achievement of optimum yield may be somewhat conflicting mandates that can only be mediated appropriately through the

use of ecosystem-based approaches; (2) Enhance the use and development of multispecies models; although several councils have multispecies management plans, the impact of conservation and management measures are still typically assessed using single-species models; (3) Expand and standardize the national assessment and monitoring program to be comprehensive in its coverage, including both exploited and unexploited species. Components (habitat mapping, life history characterizations, ecosystem response) of such a program exist in every region of the country, yet are limited in geographic scope. There is ample opportunity to partner with research universities, as well as state-level natural resource agencies. An example of this is the Atlantic Coastal Cooperative Statistics Program (ACCSP), which is a joint effort among the ASMFC, the three fishery management councils with jurisdiction on the Atlantic coast, NMFS and various state agencies. Also, the comprehensive reef-mapping program undertaken by the U.S. Coral Reef Task Force is an example of a habitat mapping initiative that can be expanded and linked to other mapping efforts. Dedicated funding for such monitoring programs needs to be a prerequisite of any management effort; and (4) Finally, a method of addressing personnel shortages at the permit review and field staff level is absolutely critical; although advances in technology can aid management efforts, meaningful changes in management cannot occur without adequate on-the-ground staff to implement and oversee them.

CASE STUDY: COASTAL HABITAT PROTECTION PLANS.—One example of interagency integration at the state level is occurring in North Carolina. In 1997, the state of North Carolina passed a Fisheries Reform Act which included a mandate to the North Carolina Marine Fisheries Commission (which oversees the regulation and harvest of living marine resources) to develop an integrated Coastal Habitat Protection Plan (CHPP) in cooperation with the Environmental Management Commission (which oversees water quality permitting and regulations) and Coastal Resources Commission (which oversees development within the state's coastal zone). The goal of the plan is the "long term enhancement" of the value of coastal habitats to coastal fisheries. All three of the above rulemaking commissions must approve the plans and ensure that their actions and rules are consistent with the plan recommendations. The law also requires that the plans be reviewed and updated every 5 yrs. Although the Division of Marine Fisheries is the lead agency, the Plan Development Team consists of staff from the state divisions of Water Quality, Coastal Management, Marine Fisheries, the Wildlife Resources Commission (regulates inland fisheries and game), as well as the U.S. Fish and Wildlife Service and the National Marine Fisheries Service. This level of coordination is unique for a state-based planning effort.

The plan is also being subdivided into detailed geographic management units that reflect the boundaries of the state's major coastal river basins, with the exception of separate management units for the sounds, the estuaries in the southern part of the state, and the "coastal ocean" —which includes the state's barrier island system and ocean-facing beaches. The first iteration of the plan includes a Background Document, which contains general information common to all management units, and the main CHPP, which includes specific management recommendations and issues of concern for each of the geographic subunits. The plan development process includes several phases of internal review (Fig. 2), including review by a six-member committee (Intercommission Review Committee) that is composed of two members of each of the three rulemaking commissions before being approved for public comment. After public input, the plans are revised before being sent to each of the full commissions for approval.

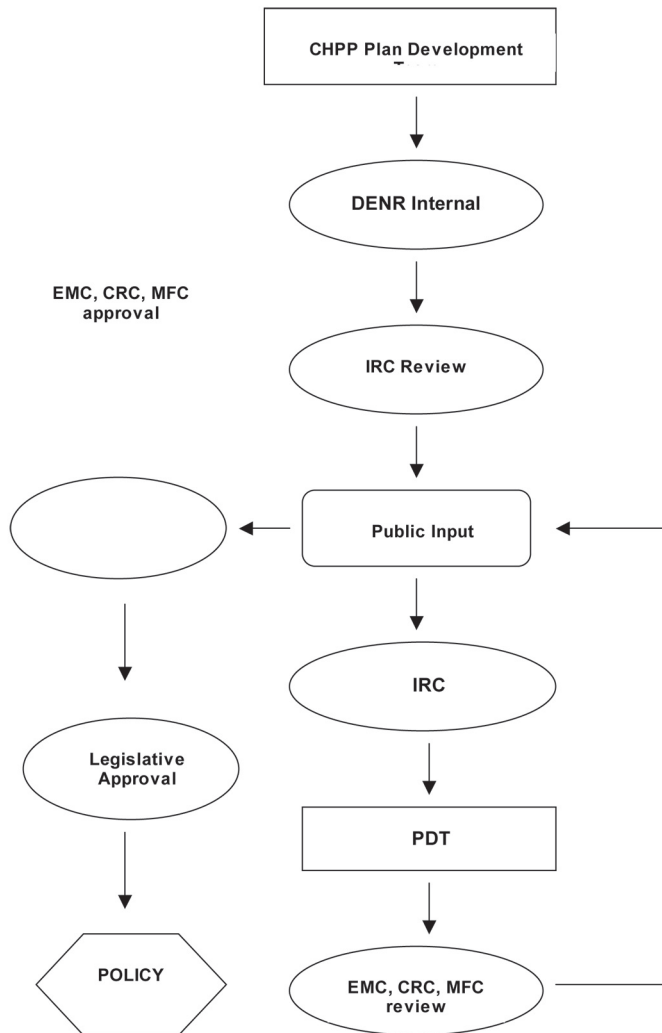


Figure 2. Coastal Habitat Protection Plan (CHPP) process under development in North Carolina. CHPPs are subject to multiple reviews from the parent agency (North Carolina Department of Environment and Natural Resources = DENR). Two rounds of public scoping will be conducted to ensure public participation. EMC = Environmental Management Commission; CRC = Coastal Resources Commission; MFC = Marine Fisheries Commission; IRC = Intercommission Review Committee.

We are unaware of any other state planning effort as comprehensive and integrative in scope as North Carolina's CHPP initiative. Habitat protection will be achieved using all of the tools available to coastal management, fishery management, and water quality management; success lies in the mandated adoption of similar regulations by all three rulemaking commissions. Although it would prove logistically challenging to extrapolate this model to a federal level, the merits are obvious and it could certainly be employed on a regional basis. This plan, when completed, will be coordinated with the SAFMC Habitat Plan and the MPA process under development.

CONCLUSIONS

Both the biological and administrative needs to link habitat protection initiatives with marine protected area processes are evident. The habitat utilization patterns of the many species in the South Atlantic and Caribbean are cross-shelf in nature and can involve sequential use of both vegetation and reef structures with development (Claro and Garcia-Arteaga, 1993; Ley et al., 1999); likewise, anthropogenic impacts can be spread across wide arrays of habitats. Indirect and direct responses to stressors, therefore, can occur during several ontogenetic stages within many interacting species. Although population level effects of these cascades can be difficult to measure, they can undermine feeding, growth, and reproductive processes in important manners. Therefore, administrative processes that integrate fisheries, MPAs, and other habitat protection efforts are needed.

As described previously, both habitat protection and MPA initiatives have the common goal of sustainable management of coastal resources – integration of these processes can effectively combine tools used for coastal land management, water quality management, and fishery management. There are obvious places where procedural links can be forged. First, the massive data collection and synthesis efforts of the Councils with regard to EFH provide a substantial framework within which scientifically sound MPA design can be pursued. Second, as the gaps in EFH data are filled, Councils are better able to determine HAPC locations – another logical platform from which to construct MPAs, particularly when attributes like spawning aggregations are emphasized (SAFMC, 1998 <a,b?>; Lindeman et al., 2000). Similarly, several National Marine Sanctuary initiatives are primary models of no-take MPAs. An example is the successful multiyear development of the Tortugas Ecological Reserve no-take marine reserve within the broader Florida Keys National Marine Sanctuary. Building upon information and mechanisms already available will reduce the time and effort (and therefore money) needed to ensure that the most scientifically valid and effective means of protection are being employed (Coleman et al., 1999). Finally, it must be reiterated that success in any of the above areas is critically dependent upon the filling of significant staff shortages, dedicated sources of funding for monitoring and enforcement, and development of integrated regulations among resource agencies at all levels of government.

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ADDRESSES: (D.N.R.) *Environmental Defense, 2500 Blue Ridge Rd., Suite 330, Raleigh, North Carolina 27607.* (K.C.L.) *Environmental Defense, Miami Field Office, 14630 SW 144 Terrace, Miami, Florida 33186.* CORRESPONDING AUTHOR: (M.A.D.) *Environmental Defense, 2500 Blue Ridge Rd., Suite 330, Raleigh, North Carolina 27607.*