State of Rhode Island and Providence Plantations

COASTAL RESOURCES MANAGEMENT COUNCIL
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August 24, 2010

Coastal Resources Management Council
Chairman Michael M. Tikoian
Stedman Government Center- Suite 3
4808 Tower Hill Road
Wakefield, RI 02879-1900

Dear Chairman Tikoian:

Below please find a detailed summary of proposed changes to the following chapters of the Ocean Special Area Management Plan: **Chapter 2, Ecology**; **Chapter 5, Commercial and Recreational Fisheries**; and **Chapter 8, Renewable Energy and Other Offshore Development**. All proposed changes are in response to written comments received during these chapters' respective public comment periods, or in response to feedback received from URI Ocean SAMP researchers who reviewed these chapters. We submit these to you for your review.

Chapter 2, Ecology.

Below please find a summary of proposed changes to **Chapter 2, Ecology**. These proposed changes were made in response to written comments that were received and/or made to the chapter during the 30-day public comment period, which concluded on August 06, 2010, as well as feedback received from URI Ocean SAMP researchers who reviewed this chapter.

Items 1-14 are in response to comments and feedback received from the URI Ocean SAMP avian research team led by Dr. Peter Paton.

1. At the request of the URI Ocean SAMP avian research team, all references to earlier research report versions (specifically Winiarski et al. 2009 and Paton et al. 2010 presentation) was replaced with reference to Paton et al. 2010, the appendix to the Ocean SAMP and most recent and complete version regarding avian research. This change does not in any way change the meaning, context, or potential interpretation of the Ecology Chapter text as presented.

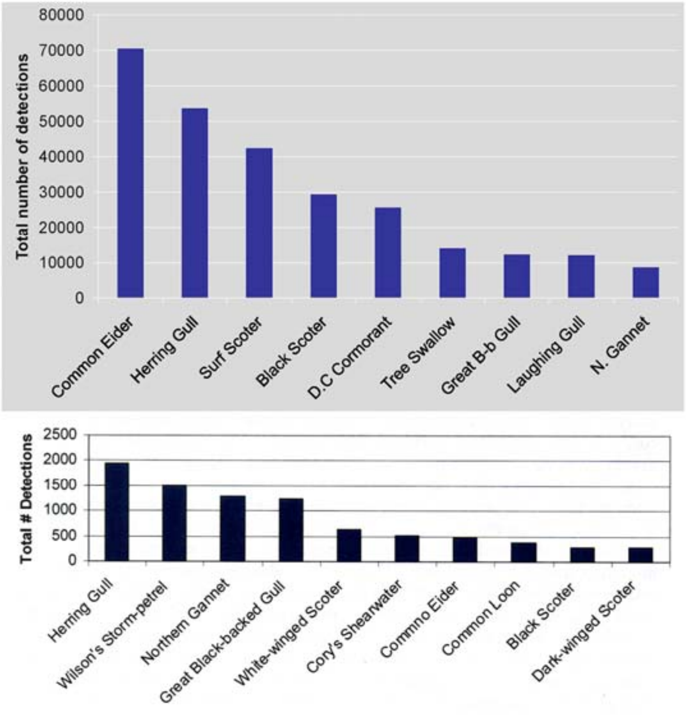
2. **PAGE 103, 250.6., #6**, revised as follows: “Figure 2.38 shows the seasonality of waterbird use in the Ocean SAMP area, according to bird type, and providing greater definition than could be shown in Figure 2.36, which is useful in showing, at the same scale, seasonality of bird use in the Ocean SAMP area. Gull use of the area is year round, while ~~sea ducks~~loons appear to use the Ocean SAMP area as overwintering grounds. Pelagic birds, such as ~~S~~shearwaters, ~~and storm-petrels appear later in the season, probably using~~inhabit the Ocean SAMP area ~~as a feeding ground~~only during the summer. In general, bird life is most diverse and abundant during fall and spring migration, and during winter (Paton et al., 2010).”

3. **Figure 2.37.** Caption revised as follows: “~~Use~~ Potential use of the Ocean SAMP area by diving ducks, ~~showing they mainly utilize shallow-water, nearshore habitats.~~which suggests they forage in waters less than 20 feet deep. Since benthic community composition is not know, this map shows ~~only most used water depth~~potential, not preferred, foraging sites.”

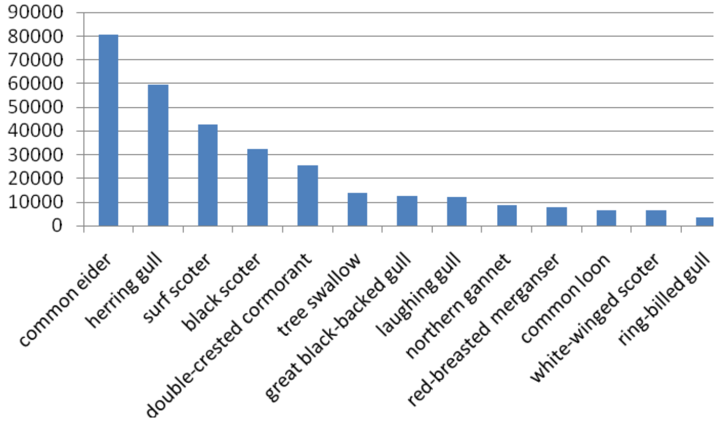
4. **PAGE 106, 250.6., #7.** Revised as follows: “Paton et al. (2010), based on both land-based and ~~boat~~ship-based survey counts, have identified the most common bird species using Ocean SAMP waters (Figure 2.39). Common eider are the most abundant user of nearshore waters, followed by the herring gull and surf scoter. Offshore waters are utilized most heavily by ~~herring gulls~~northern gannets, followed by Wilson’s storm-petrels, ~~northern gannets,~~ and ~~black-backed~~herring gulls. Gulls appear to be one of the major users of Ocean SAMP waters, both inshore and offshore, and throughout the seasons.”

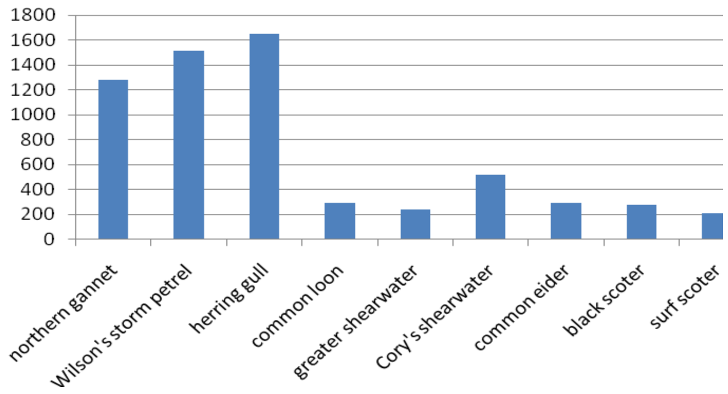
5. **Figure 2.39:** Figure updated with more recent data, as suggested/provided by URI Ocean SAMP avian researchers. Caption revised as follows: “Most abundant waterbirds found nearshore (top panel) and offshore (bottom panel) in the Ocean SAMP area, based on land-based (Jan 2009–Jan 2010) and ~~boat~~ship-based (Mar 2009–Jan 2010) survey counts (from Paton et al. 2010).” Figure revised as follows:

OLD FIGURE 2.39 (DELETED):



NEW FIGURE 2.39 (INSERTED):





6. **PAGE 100, 250.6, #2.** Revised as follows: "~~A variety of water birds utilize the water and air space of the Ocean SAMP region. Waterfowl utilizing Ocean SAMP waters include nearshore species such as geese and ducks, as well as more oceanic species such as shearwaters. Passerines (e.g., songbirds) tend to utilize Ocean SAMP air space during migrations, with Block Island serving as resting, staging or feeding site. Passerines also utilize Block Island for nesting and breeding purposes.~~Bird life throughout the Ocean SAMP area is dynamic, with substantial changes between seasons and years. During summer in some years (e.g., 2009), tens of thousands of pelagic seabirds migrate into the area for several months to feed, while in other years (e.g., 2010) seabirds inhabit more offshore area and are not observed in the Ocean SAMP area. In general, avifauna in the Ocean SAMP area is most abundant during fall and spring migration periods, and during winter. Water depth is an important factor in the spatial distribution of these birds. Gannets and loons for instance, which feed mainly on fish, frequent waters up 45 m in depth, while seaducks primarily forage in Ocean SAMP waters less than 20 m deep."

7. **PAGE 100, 250.6, #1**. Revised as follows: "Birds are an element of the Ocean SAMP area ecology; they are attracted to the area because of temperate climate—many of these birds nest in the Arctic or Antarctic—and for feeding purposes, utilizing the seasonal abundance of fish and invertebrates as an important resource. The impact of avifauna on the overall ecology of the Ocean SAMP area is not well studied and so how bird use shapes benthic invertebrate ecology in shallow waters is not well known and is an area of further possible research."

8. **Table 2.12**: updated to more accurately reflect Seasonal Use with new data as provided by the URI Ocean SAMP avian research team, as follows:

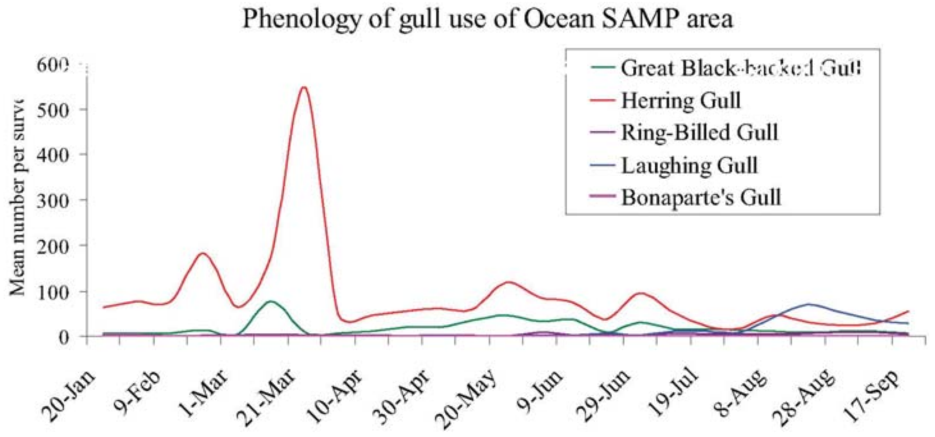
Common Name	Scientific Name	Seasonal Use
Cormorant, Double-crested	*Phalacrocorax auritus*	Mar–Nov
Eider, Common	*Somateria mollissima dresseri*	~~Nov~~Oct–Apr
Gannet, Northern	*Morus bassanus*	Sep–Jun
Gull, Bonaparte's	*Chroicocephalus philadelphia*	
Gull, Great Black-backed	*Larus marinus*	~~Mar–Jul~~All Year

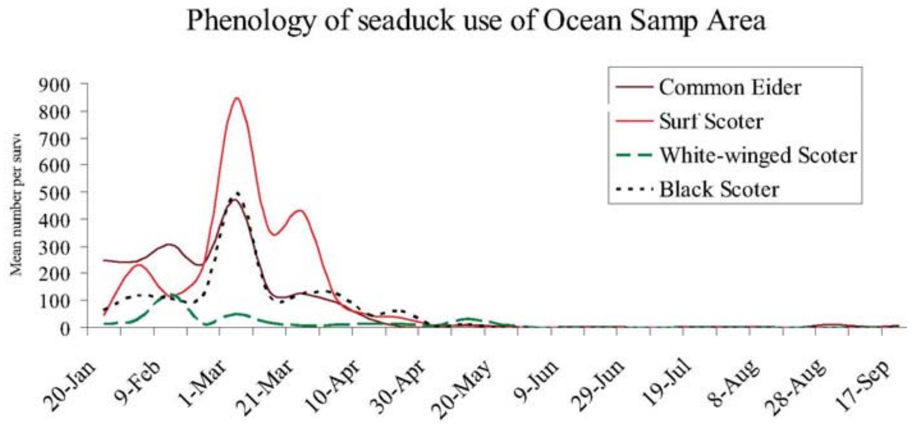
Gull, Herring	*Larus argentatus*	All Year
Gull, Laughing	*Leucophaeus atricilla*	~~Aug~~May–~~Sep~~Nov
Gull, Ring-billed	*Larus delawarensis*	All Year
Loon, Common	*Gavia immer*	~~Nov~~Oct–Jun
Loon, Red-throated	*Gavia stellata*	~~Nov~~Oct–May
Scoter, Black	*Melanitta nigra americana*	~~Dec~~Sep–~~Apr~~may
Scoter, Surf	*Melanitta perspicillata*	~~Dec~~Sep–~~Apr~~may
Scoter, White-winged	*Melanitta deglandi*	~~Jan~~Sep–~~Apr~~May
Shearwater, Cory's	*Calonectris diomedea*	Jun–Aug
Shearwater, Greater	*Puffinus gravis*	Jun–Sep
Shearwater, Manx	*Puffinus puffinus*	May–Aug
Shearwater, Sooty	*Puffinus griseus*	May–Sep
Storm-Petrel, Wilson's	*Oceanites oceanicus*	Jun–Jul
Tern, Black	*Chlidonias niger*	
Tern, Common	*Sterna hirundo*	Apr–Sep
Tern, Forster's	*Sterna forsteri*	
Tern, Least	*Sternula antillarum*	May–Aug
Tern, Roseate	*Sterna dougallii*	Jul–Aug

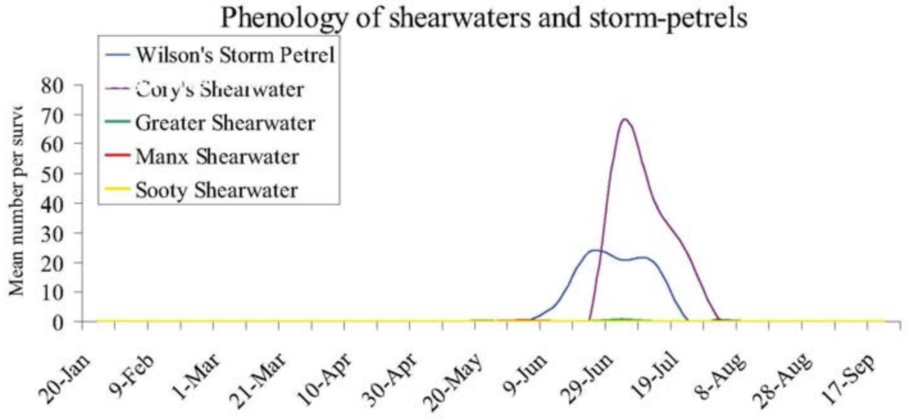
9. **PAGE 102, 250.6, #5**. Revised as follows: "Paton et al. (2010) have found that water depth is an important factor in the spatial distribution of birds in the Ocean SAMP area.~~, b~~Based on a review of the literature, ~~that~~ most sea ducks typically forage in water of 5 to 20 m depth (Figure 2.37) where bivalves and other forage is available. Sea ducks will therefore be largely found in nearshore habitats where water depth allows efficient feeding. Gannets and loons are piscivorous specialists and tend to occur in areas where water depths 30–45 m deep, and <35 m deep, respectively (Paton et al., 2010). Razorbills were consistently found in shallower waters closer to the mainland, common murre primarily in the central regions of the Ocean SAMP area, and dovekies offshore over deeper depths out to the Continental Shelf (Paton et al., 2010). While bathymetry is known for the Ocean SAMP area, benthic community composition is not and therefore preferred/critical waterbird forage areas cannot be readily identified. ~~Paton et al. (2010) also noted a trend of decreasing avian diversity with distance from land, further reinforcing the importance of nearshore habitat for these avian species.~~"

10. **Figure 2.38**. Caption revised as follows: "Figure 2.38. ~~Seasonal use of the Ocean SAMP area by gulls, sea ducks, shearwaters and storm-petrels (from Winiarski et al. 2009).~~ Seasonal use of the Ocean SAMP area by gulls,~~ sea ducks,~~ loons and shearwaters ~~and storm-petrels~~ (from ~~Winiarski~~ Paton et al. ~~2009~~2010)." Figure itself revised as follows:

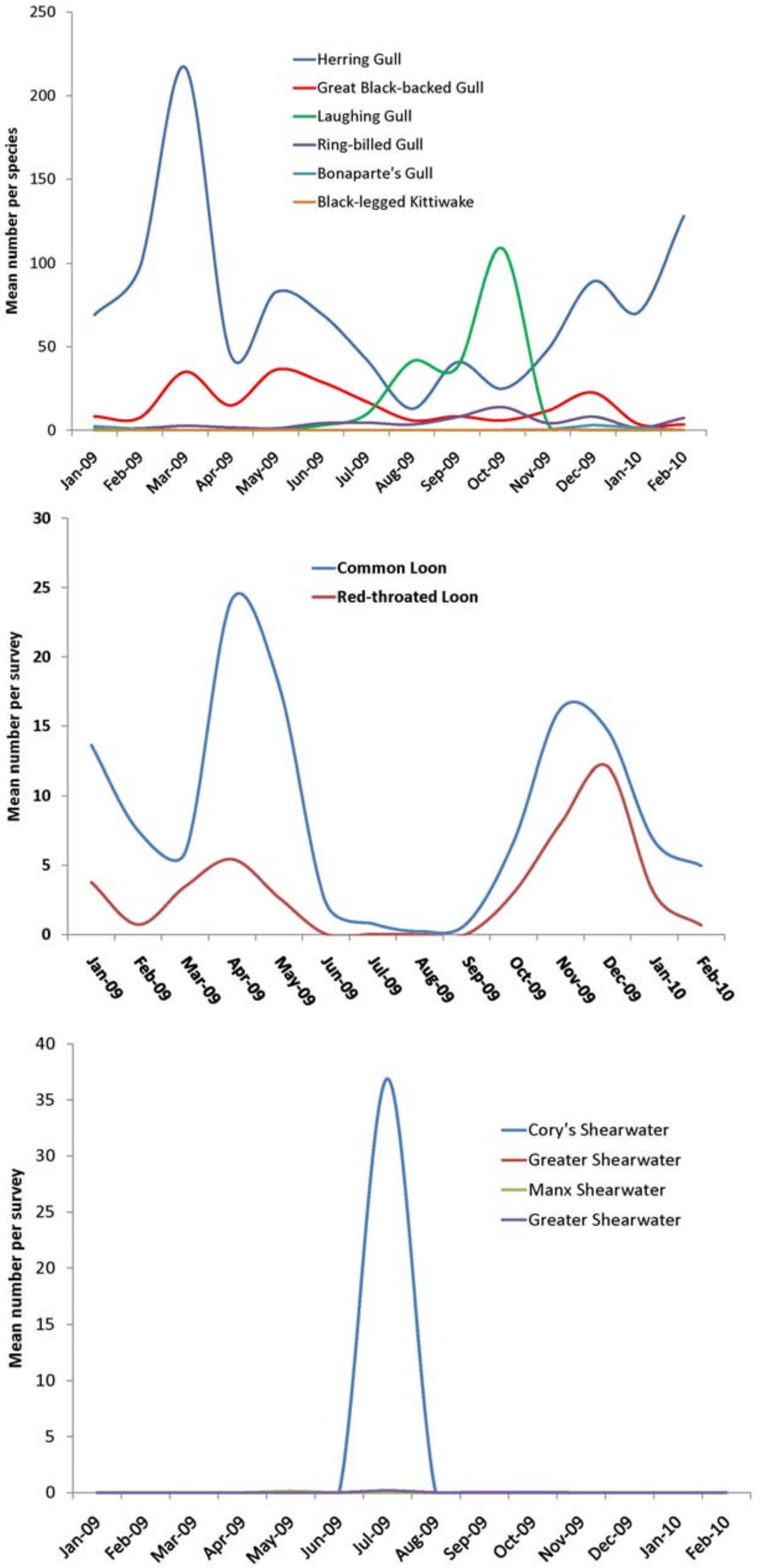
OLD FIGURE 2.38 (DELETED):







NEW FIGURE 2.38 (INSERTED)



11. **PAGE 107, 250.6., #8**. Revised as follows: “Various species of tern are found throughout the Ocean SAMP area during summer months (Paton et al. 209; Paton et al. 2010), ~~and utilize marine waters for foraging purposes~~with more birds in the area during the post-breeding season. For endangered roseate terns, ~~N~~nearly all ~~occurrence~~ observations ~~of tern species however, i~~were~~s~~ over the waters north of Block Island, increasing with nearness to the Rhode Island coastline. ~~Terns~~ Roseate terns do not appear to significantly utilize more open, deeper water areas of Block Island Sound, Rhode Island Sound or the Offshore Ocean SAMP area, although they have been detected roosting on Block Island (Paton et al., 2010). Impact of ~~their~~ tern feeding on fish ecology of the Ocean SAMP area is not known.”

12. **PAGE 107, 250.6., #9**. Revised as follows:

    “Paton et al. (2010) report the following patterns of avian use of Ocean SAMP area waters~~, based on aerial survey results,~~ for the period of late November 2009 through late February 2010~~l~~:

    “a. Both common and red-throated loons are abundant species during winter months in the Ocean SAMP area, and population estimates suggest this area provides critical wintering habitat for a significant number of loons. Loons were found to be scattered throughout the area, though thinly throughout most of the central portion of Rhode Island Sound. Densest concentrations occurred along the Rhode Island south shore shoreline, around Block Island shoreline, and in the area west of Block Island bordering Montauk Point and the opening to Long Island Sound. ~~Shallower waters appear to be preferred, most likely for foraging purposes~~Waters less than 35 m deep appear to be preferred, though some loons were documented in deeper offshore waters in Rhode Island Sound.

    “b. Scoters and common eider were among the most abundant birds observed using nearshore habitats during with months. They tended to ~~showed~~ concentrat~~e~~~~ions~~ around the west side of Block Island, along the Rhode Island south shore shoreline, and around the Sakonnet shoreline bordering Rhode Island Sound. Few were found over the open waters of Block Island Sound, Rhode Island Sound or the Offshore Ocean SAMP area. Scoter appeared to be most abundant during the November through January time span; eider appeared to use the area throughout the surveyed time span. ~~Shallower waters appear to be preferred, most likely for foraging purposes.~~While research suggests that seaduck primary foraging depth is less than 20 m of water depth, Paton et al. (2010) found seaducks to consistently forage in waters up to 25 m deep in the Ocean SAMP area.

    “c. Alcids (razorbills, dovekies, murres~~, puffines, guillemots~~), winter migrants to the Ocean SAMP area, were found scattered throughout the area, though densest concentrations occurred in deeper waters south of Block Island and throughout the central portions of Rhode Island Sound and south onto the Offshore Ocean SAMP area. ~~Use of Ocean SAMP waters by these types of avifauna appears to be reduced towards late February, and largely for rafting purposes.~~These species exhibited spatial segregation in the Ocean SAMP study area, with razorbills specializing in northern, shallow water sections closer to land, while common murres tened to use the central portions of the Ocean SAMP area. Dovekies were offshore specialists that reached peak densities in southern Ocean SAMP areas, out to the Continental Shelf.

"d. Northern gannets ~~were~~ are a common spring and fall migrant in the Ocean SAMP area. This piscivorous specialist tends to occur in areas where depths exceed 30 m in depth, and were observed scattered throughout the area, though ~~thinly throughout the central and eastern portions of Rhode Island Sound and the inner portions of Block Island Sound. Occurrence in waters north of a line from Montauk Point to Martha's Vineyard was mainly during November/December, with occurrence of this species during January/February largely limited to deeper waters at the southern extent of Block Island and Rhode Island Sound, and over the Offshore Ocean SAMP area~~ their densities peaked approximately 3 miles offshore of Block Island and/or the Rhode Island mainland during fall and winter."

13. At the suggestion of the URI Ocean SAMP avian research team, a new paragraph (250.6., #11) was added as follows: "During land-based surveys, Paton et al. (2010) detected 7 species of raptors and 27 other species of landbirds. However, with the exception of tree swallows, which are diurnal migrants along the coast, very few songbirds or other types of landbirds were detected. During ship-based line transect diurnal surveys, only 8 species of landbirds were detected in Rhode Island's offshore waters (Paton et al. 2010). This is not surprising as most landbirds, particularly songbirds, are nocturnal migrants, and are only effectively monitored by radar. Mizrahi et al. (2010), using a radar unit on Block Island throughout 2009, were not able to separate out landbirds from other species during radar investigations. Based on this radar study, peak flight altitudes of targets ranged between 200-400 m above sea level, with more birds passing over Block Island in the fall than spring. Peak migration appeared to take place from sunset to 5 hours after sunset."

14. New reference added as per correction #14 above: "Mizrahi, D., Fogg, R., Mararian, T., Elia, V., and La Puma,. D. 2010. Radar monitoring of bird and bat movement patterns on Block Island and its coastal waters. Draft interim report. Rhode Island Ocean Special Area Management Plan. University of Rhode Island, Narragansett, RI."

Items 15-27 in response to comments and feedback received from the URI Ocean SAMP circulation research team led by Dr. Codiga and Dr. Ullman.

15. **PAGE 22, 220.1., #3**. At the suggestion of URI Ocean SAMP researchers Codiga and Ullman the following section was amended as follows: "Winds have not been shown to play a major role in driving the long-term circulation patterns observed in Rhode Island Sound or Block Island Sound, though on a seasonal and shorter time frame basis wind can be a significant factor. Summer south westerly winds (e.g., sea breeze), while only half as strong as winter winds, drives upwelling along the coast which appears to help drive the flow of Long Island Sound water towards the shelf and offshore (O'Donnell and Houk in prep). Codiga and Ullman (2010) and Ullman and Codiga (2010) have found that during winter months a weak, non-wind driven upwelling pattern is observed in Rhode Island Sound and in the Offshore

Ocean SAMP area. Westerly summer winds also tend to increase the exchange of water between Block Island Sound and Rhode Island Sound, while winter winds, predominantly from the northwest, promote increased water column mixing rather than increased horizontal exchange (Gay et al. 2004). This mixing may help bring nutrients into the water column for uptake by phytoplankton, perhaps contributing to spring blooms when they occur. Codiga and Aurin (2007) further support the above through direct observations, finding that the volume of water exchanged between Long Island Sound and Block Island Sound was weakest during winter months."

16. New reference added: "Ullman, D.S. and Codiga, D.L. 2010. Characterizing the physical oceanography of coastal waters off Rhode Island: Part 2: New observations of water properties, currents and waves. Final Report for Rhode Island Ocean Special Area Management Plan. Coastal Resources Management Council, Wakefield, RI."

17. **PAGE 27, 230., #6**. At the suggestion of URI Ocean SAMP researchers Codiga and Ullman the following section was amended as follows: "While there have been studies of the physical oceanographic characteristics of the Ocean SAMP area, many of them are geographically limited in their scope and do not portray a picture of how the area functions as a connected, dynamic system. A practical way to proceed at a systems-level scale is through modeling. The physical oceanography of the Ocean SAMP area however is complicated due to complex topography, which makes modeling attempts more challenging. Furthermore, a major challenge will be linking biological/ecological functions to physio-chemical processes to gain an ecosystem-based view of the region as a functional whole. Dr. Changshen Chen (University of Massachusetts Dartmouth; fvcom.smast.umassd.edu/research_projects/NECOFS/index.html) and collaborators have developed the U.S. Northeast Coastal Ocean Forecast System (NECOFS), which contains detailed geometry for Rhode Island Sound and Block Island Sound. Future application of this model to the Ocean SAMP area would assist in better understanding circulation dynamics, and the ecology because biological components can be incorporated into the model to develop an ecosystem-level understanding. ~~Codiga and Ullman (2010) report on many of the physical oceanographic aspects of the Ocean SAMP area that would be of importance to the NECOFS model application.~~Many detailed aspects of physical oceanography in the Ocean SAMP area based on Finite Volume Coastal Ocean Model (FVCOM) hydrodynamic simulations, which underlie NECOFS, have been described by Codiga and Ullman (2010)."

18. **PAGE 28, 230.1., #1 and #2**. At the suggestion of URI Ocean SAMP researchers Codiga and Ullman, the following sections were amended as follows:

    "Wave analysis performed by Spaulding (2007) found that nearly 53% of the waves in the Ocean SAMP area come from three dominant directions: 22% from the south, 19% from the south southwest, and 12% from the south southeast, with average annual wave heights for each direction: 1.09 m (SSE), 1.15 m (S) and 1.29 m (SSW). Asher et al. (2009) are in agreement that the greatest frequency of waves, regardless of size, come from a southerly direction, with a mean wave height of 1.2 m and an extreme height of 8.4 m. Spaulding (2007) estimated probable wave height extremes for 10 year: 6.5–7.0 m; 25 year: 7.5–7.75 m; 50 year: 8.2–8.35 m; 100 year: 8.8–9.0 m frequencies. Asher et al. (2009) also estimated

9.0 m extreme wave height at a 100 year frequency, but noted that the probability of such a wave was not applicable to all Ocean SAMP areas. They found that geography influenced wave height, with waves from the south and the southeast having the greatest potential for larger size, with 10+ m extreme waves possible. Ullman and Codiga (2010) found average wave heights to range from 0.5 m to 2.5 m, with waves of less than 0.5 m occurring for less than a day during winter and up to several days during summer. Asher et al. (2009) found that the moraine stretching between Block Island and Montauk provided a wave damping action, with a net result that extreme wave heights would be 2–3 m less to the west of Block Island (versus to the south or southeast). This may be important ecologically as it tends to create an environment less influenced by disturbance events."

"Average wave heights in the Ocean SAMP area tend to be 1–3 m, and overall, would be expected to have little impact on bottom waters, though surface waters would tend to stay well mixed. Larger waves, generated by winds associated with storms, will have a greater potential to impact the water column, particularly water column stratification. Ullman and Codiga (2010) found waves larger than 2.5 m in height to be associated with strong wind events, generally lasting 3 to 8 days, and being slightly more common during winter. First (1972) found that statistically modeled wave induced bottom velocity should be strong enough, given 97 km hr^{-1} (60 mph) winds, to impact bottom sediments at a depth of about 60 m (e.g., Cox Ledge). From their modeling efforts, First (1972) further determined that wave induced bottom impact in water depths of 60 m should occur 1.5–4.9% of the time between September and November. This suggests that high intensity winds have the potential to mobilize sediment at the surface of the seafloor throughout much of the Ocean SAMP area, reworking sediments and sorting them as described previously (see Section 210). The impact of wave disturbance on the benthic environment of the Ocean SAMP area is not well known."

19. **PAGE 33, 230.3.1., #6**. At the request of URI Ocean SAMP researchers Codiga and Ullman, the following reference was added to show original source of data; Citation below added to References section of the chapter as well:

"O'Donnell and Houk (in prep) and Kaputa and Olsen (2000) note a strong seasonal signal in temperature at both surface and bottom at a station located northwest of Block Island, and about ¾ of the distance to The Race. Figure 2.11 shows the seasonal peak in water temperature consistently occurs in later summer/early fall (Aug/Sep), with the seasonal low occurring in late winter/early spring (Feb/Mar). During those years where surface and bottom temperatures are nearly identical (e.g., 1996), the water column is most likely well mixed. Conversely, in those years where surface and bottom temperatures are considerably divergent (e.g., 1998), the water column appears not to be well mixed and water column stratification is likely."

"Kaputa, N.P. and Olsen, C.B. 2000. Summer hypoxia monitoring survey '91–'98 data review. Long Island Sound Water Quality Monitoring Program. Connecticut Dept. of Environmental Protection, Hartford, CT."

20. **PAGE 39, 230.3.2., #5**. At the suggestions of URI Ocean SAMP researchers Codiga and Ullman, the following amendment was made; Citation below added to References section as well:

    "During times of low freshwater discharge into Long Island Sound, ~~O'Donnell and Houk (in prep) observed high salinity water intruding into Block Island Sound from the Offshore Ocean SAMP area region at mid-depth in the water column (not shown in Figure 2.14). Intrusions of high salinity water from the shelf such as noted by O'Donnell and Houk, have not been reported previously and are little understood with regard to the frequency of occurrence, and how they relate to other physical forcing factors such as winds and tides.~~Ullman and Codiga (2010) have observed intrusion of high salinity water at about 30 m depth in the water column, finding the characteristics of this water to be consistent with those reported by Linder and Gawarkiewicz (1998) for water found on the inside of the Continental Shelf, about 100 km offshore. The impact of mid-depth, high salinity intrusion events on the ecology of the area has not been studied, but suggests that a strong connection between waters of the Offshore SAMP area Block Island Sound may result during times of low flow from Long Island Sound."

    "Linder, C.A., and Gawarkiewicz, G. 1998. A climatology of the shelfbreak front in the Middle Atlantic Bight. *Journal of Geophysical Research* 103: 18405–18423."

21. **PAGE 40, 230.4., #2**. At the suggestion of URI Ocean SAMP researchers Codiga and Ullman the following amendment was made: "Circulation patterns in Rhode Island and Block Island Sound are influenced by temperature and salinity differences in the water column, tidal ebb and flood, and wind shear. Buoyancy driven circulation—circulation that occurs based on the relationship between water temperature and salinity, which together define the density of water, and the differences in water density both vertically and laterally—makes an important contribution to the mean circulation on seasonal and longer timescales (Codiga and Ullman 2010). Tidal ebb and flood is considered to play an important role in creating turbulence and in mixing the water column, while wind-driven currents play a significant role on timescales of a day to several days, particularly during winter in association with storms, but also in summer due to the diurnal sea breeze. For instance, westerly winds during summer increase the exchange of water between Block Island Sound and Rhode Island Sound in the area between Block Island and the Rhode Island coastline. Winter winds on the other hand, which are predominantly from the northwest and stronger than summer winds, promote water column mixing rather than increased water exchange (Gay et al. 2004). This is further supported by the direct observations of Codiga and Aurin (2007) who found the volume exchange of water between Long Island Sound and Block Island Sound to be weakest during winter months."

22. **Figure 2.15 legend**: amended as per suggestion of Codiga and Ullman comments as follows: "Figure 2.15. Differences in tidal circulation velocities between Rhode Island Sound (RIS) and Block Island Sound (BIS), showing Block Island Sound to be more vigorous and dynamic than Rhode Island Sound. Velocity is greatest over shallow areas and at constricted areas.

Note different scales; this does not allow direct comparison between the two diagrams. [VS=Vineyard Sound; NS=Nantucket Shoals]"

23. **PAGE 42, 230.4., #5**. Text amended to correct an incorrect citation and Figure 2.16 legend text amended to correct an incorrect statement as follows:

"Based upon findings presented previously, and upon results of their own modeling and research, Codiga~~ and Ullman~~ (~~2010~~2009) have developed a schematic that shows circulation transport pathways in Rhode Island Sound and Block Island Sound (Figure 2.16). They find minor interaction between Rhode Island Sound and Narragansett Bay, Buzzards Bay and Vineyard Sound both at surface and at depth. Deep flow from Point Judith, moving westward along the Rhode Island shore and into Block Island Sound is moderate, as are return flows at surface from Block Island Sound into Rhode Island Sound around the north side of Block Island. Moderate flow at the surface (into Block Island Sound) and strong flow at the bottom (into Long Island Sound) is seen through The Race. Moderate flows are seen at depth coming off the Offshore Ocean SAMP area into both Rhode Island Sound and Block Island Sound, with strongest cross-shelf deep flow occurring into Rhode Island Sound along its eastern portion; Codiga~~ and Ullman~~ (~~2010~~2009) concede that there is limited information for this section of Rhode Island Sound, and that further study is needed. Strong surface flows are observed moving water out of both sounds, generally in a southwestward direction parallel to the south shore of Long Island. Surface water transport out of both sounds and south following the coast of Long Island is a major pathway for water in the Ocean SAMP area to move into the Mid-Atlantic Bight ecosystem. "

"Figure 2.16. ~~Modeled~~ Schematic of hypothesized water flow~~, temperature, salinity and density (sigma-t)~~ at surface and at depth in the Ocean SAMP area (from Codiga~~ and Ullman~~ ~~2010~~2009)."

24. **PAGE 42/43, 230.4., #6.** Text amended to correct a statement error and Figure 2.17 legend text amended to correct an incorrect statement as follows:

"While Figure 2.16 shows overall patterns of circulation, Figure 2.17 shows ~~modeled~~ a summary schematic diagram of surface and bottom flows on a seasonal basis, based upon best interpretation of observations and model output. Fall and winter show dominant offshore flow out of Rhode Island Sound, with a reversal during spring and summer months; this reversal could promote inshore transport of larval forms produced during winter/spring spawning events. Block Island Sound shows continuous interchange with all adjacent waterbodies, though the interchange is most vigorous in spring and summer when Long Island Sound influence is the greatest. Interaction between Block Island Sound and Rhode Island Sound in year round, but most intense in spring and summer when freshwater input from Long Island Sound intensifies overall circulation in the Ocean SAMP area."

"Figure 2.17. ~~Hypothesized annual water flow volumes at both surface and at depth~~Schematic summary, based on observations and model outputs, of currents and hydrography in the Ocean SAMP area; size of arrow indicates magnitude of the flow (from

Codiga and Ullman 2010). Histogram inserts show detail of temperature, salinity and density at various sites."

25. **PAGE 44, 230.4.1., #2**. Text amended to correct a wrong citation and improve the text; citation corrected in references section as follows:

> "Upon leaving The Race, shallow flow tends southwestward towards the opening to Block Island Sound between Montauk Point and Block Island, with a peak flow of 10–25 cm s^{-1} (Figures 2.15 and 2.16; Ullman and Codiga 2004). This flow is deflected westward along the south shore of Long Island by the Coriolis force, where it moves southward to mingle with southern waters of the Mid-Atlantic Bight ecosystem. This flow is seasonally stratified; strongly so during late spring and early summer due to estuarine flow driven by freshwater input to Long Island Sound. During the spring freshet (e.g., snow melt plus spring rains) this flow is significant, and is referred to as a "jet" which can be detected 5 km south of Montauk Point (Ullman and Codiga 2004). Codiga (~~in prep~~2009) hypothesized reports an annual mean volume flow out of Block Island Sound at surface of 24,000 m^3 sec^{-1} onto the Offshore Ocean SAMP area, with a bottom water return from the Shelf into Block Island Sound of 10,000 m^3 sec^{-1}."

"Codiga, D.L. ~~in prep~~2009. Circulation in Block Island Sound, Rhode Island Sound, and Adjacent Waters, with Emphasis on Subsurface Flows. In: *Sound Connections: The Science of Rhode Island & Block Island Sounds. Proceedings of the 7th Annual Ronald C. Baird Sea Grant Science Symposium.* Rhode Island Sea Grant, Narragansett, RI. October 2008. http://seagrantadm.gso.uri.edu/Baird_08/Abstracts/codiga.pdf"

26. **PAGE 45, 230.4.1., #3**. New references added as per suggestion of URI Ocean SAMP researcher Dan Codiga; citations added to reference section as follows:

> "A sharply delineated boundary, or sharp gradient (e.g., a front), is observed south of Block Island where lower salinity estuarine waters meet saltier continental shelf waters (Edwards et al. 2004; Ullman and Cornillon 2001). The front may represent the outer boundary of estuarine influence from Long Island Sound on the Offshore Ocean SAMP area (Ullman and Codiga 2004; Ullman and Cornillon 2001). The front is readily noted by a temperature discontinuity, and is seasonal in its nature. Figure 2.17 shows the seasonality of the front; offshore in winter then moving north and intensifying in spring with a strong presence off Block Island during summer months. During summer, the front is strongly set and is often observed to extend from the region northeast of Block Island southwestward, 15–20 km southeast of Montauk Point (Figure 2.19; Edwards et al. 2004; Kirincich and Hebert 2005; Codiga 2005). The influence of this front on the ecology of the sounds is not well known. However, fronts are areas of high biological activity due to nutrient mixing across water masses, which stimulates increased primary production (Mann and Lazier 2006); increased primary production often leads to increased secondary production (Munk et al. 1995). Commercial and recreational fishermen actively seek out the location of the front to help locate specific species and/or areas of greater fish abundance, suggesting the front either

acts as an area of food concentration, or as an area of thermal refuge, or both. Roff and Evans (2002) note that distinct, special oceanographic processes that occur at local scales (e.g., a front) create distinctive habitat that is attractive to fish. Worm et al. (2005) correlated sea surface temperature gradients to increased tuna and billfish diversity. Further description of the ecological importance of oceanic fronts can be found in Mann and Lazier (1996)."

"Codiga, D.L. 2005. Interplay of wind forcing and buoyant discharge off Montauk Point: seasonal changes to velocity structure and a coastal front. Journal of Physical Oceanography 35: 1068–1085."

"Kirincich, A. and Hebert, D. 2005. The structure of the coastal density front at the outflow of Long Island Sound in spring 2002. *Continental Shelf Research* 25: 1097–1114."

27. **PAGE 47, 230.4.2., #6.** Text amended as per suggestion of URI Ocean SAMP researcher Dan Codiga as follows: "Kincaid et al. (2003) also found a distinct, significant flow during summer time in the eastern portion of Rhode Island Sound that moved to the west, and then southwest, following the coast of Rhode Island (Figure 2.20). Riley (1952) noted a similar westward flow into Block Island Sound between Point Judith and Block Island, as have Codiga and Ullman (2010). During winter months this flow continued, but at a much diminished rate. Kincaid et al. (2003) suggest that a seasonal cyclonic gyre exists in Rhode Island Sound, and that this gyre has significant influence upon dynamic exchange with Narragansett Bay. ~~However, Codiga and Ullman (2010) point out that reports of a gyre in Rhode Island Sound are consistent with reports of flow around the periphery of the sound, but that there is no evidence that the flow is closed to form a distinct gyre as originally noted by Cook (1966). This is an area where further research is needed to improve understanding of circulation in Rhode Island Sound.~~While a cyclonc gyre the size of Rhode Island Sound is consistent with flow counterclockwise around its periphery, the analysis of model output by Codiga and Ullman (2010), and of current observations in Ullman and Codiga (2010), have both demonstrated that along the southern edge of Rhode Island Sound the flow is westward, which contradicts the idea that flow closes in a distinct gyre as originally suggested by Cook (1966)."

28. **PAGE 80; 250.3**. New #1 added to address a comment submitted by the Conservation Law Foundation and to reflect feedback from the URI Ocean SAMP fish habitat research team led by Dr. Jeremy Collie and summarized in Malek et al.(2010); #2 altered to clarify and further address same comment; reference to Chapter 3 also inserted; Malek et al. (2010) reference inserted into Literature Cited as well, as follows:

"There is a diverse and dynamic fish community in Ocean SAMP area waters, as recent work by Malek et al. (2010) suggests: Rhode Island Sound was found to have greater fish abundance and higher fish biomass than Block Island Sound, which corroborates a similar finding by Nixon et al. (2010) who suggest this to be so because Rhode Island Sound appears to have higher primary productivity than does Block Island Sound. Malek et al.

(2010) also find that Block Island Sound has greater fish community diversity than does Rhode Island Sound.~~but~~ Malek et al. (2010) further found that a community of larger, more evenly distributed fish are found at depth, while shallow waters contain more diverse communities of smaller fish. Finally, Malek et al. (2010) found a strong relationship between benthic habitat complexity and demersal fish community diversity, with complex habitats containing greater fish diversity. In considering fish community ecology in the Ocean SAMP area, it must be recognized that this community has been manipulated, and perhaps ecologically altered, by commercial and recreational fisheries practices that have taken place historically. It is therefore not fully possible to determine what fish community make up may have been in the past relative to what we see at present. "

"~~the~~ The structure of the fish community in the Ocean SAMP area has undergone recent major change from a community dominated by demersal (near bottom) species to one dominated by pelagic (water column) species (Collie et al. 2008). A corresponding trend towards fish species with a preference for warmer water temperatures suggests that broad-scale warming trends may be a significant driving force of this fundamental ecosystem level change. These shifts are noted not only for commercially harvested species, but for species of non-commercial value as well. More research is needed to understand how other ecosystem variables outside of water temperature are being altered over time, and how the Ocean SAMP ecosystem at large is responding (see also Chapter 3, Section 330.1)."

"Malek, A., Collie, J., LaFrance, M., and King, J. 2010. Fisheries ecology and benthic habitat in Rhode Island and Block Island Sounds. Technical Report #14 of the Ocean Special Area Management Plan. Rhode Island Coastal Resources Management Council, Wakefield, RI."

29. **PAGE 18, 210., #6:** amended to address a comment submitted by Conservation Law Foundation regarding a speculative statement as follows: "While the basic overall geology of the Ocean SAMP area can be considered to be static, the actual local, physical, benthic environment found on the bottom is not. Sediments and bottom features are continually subjected to physical forces that alter their characteristics, and their location on the seafloor. Upwelling and downwelling currents, the orbital motion of waves, and unidirectional lateral flows all act upon and alter bottom features. Likewise channels, bottom topographic high points, and other bathometric features will influence as well as create these flows and currents. The flows and currents promote the transport of sand-sized materials and the migration of large bedforms such as dunes, sand ripples and sand waves, across the bottom. The sorting, movement, and placement of seafloor sediments that occurs during these processes creates a patchwork of habitats ranging from fine silts to gravelly areas to boulder fields (Figure 2.4; and see Figures 2.25 and 2.26). The diversity of physical habitats is a powerful influence on benthic ecological make up, determining what species will reside in what habitats in the bottom community; most often, the greater the structural physical diversity of an environment, the greater the biotic diversity of that ecosystem (Eriksson et al. 2006). Since these ecological "shaping" processes are ongoing, the bottom community of the Ocean SAMP area is in a constant state of flux as habitat

patches are altered or destroyed, moved or recreated along the bottom. The benthic community of the Ocean SAMP area ~~is~~ could therefore be expected to be composed of organisms that can withstand, and perhaps even thrive in an ever changing physical benthic environment. "

30. **PAGE 20, 210, #7:** amended to address a comment submitted by Conservation Law Foundation regarding a speculative statement, as follows: "In recent side scan sonar surveys of portions of Rhode Island Sound (Figure 2.4), McMullen et al. (2008) found a mosaic of sedimentary environments that are the result of erosion and sediment transport, deposition and sorting, and reworking, with large areas comprised of transitory coarse-grained materials. Boulders were found scattered throughout the study area, though there were areas where concentrations of boulders existed, and which create areas of increased habitat complexity which would promote higher species diversity. Depositional areas where sediments were sorted and reworked tended to be found along channels and bathymetric high points. A preponderance of commercial fish trawl marks in depositional areas suggests ~~a preference for this environment by~~an abundance of commercially important demersal fish species in these habitat/environment types. This in turn suggests a highly productive benthic community which is providing a rich food source. McMullen et al. (2008) found sand waves to be a predominant feature, and infer they are a result of coarse-grained bedload transport as was noted previously in this section. These features highlight the glacial origins of the area, and the stability of various features, for example glacial till, but also the transitory nature of other features, such as sand waves. Both bottom types—transitory and stable—are important characteristics in defining benthic habitat, and the types of organisms that will thrive there."

31. **PAGE 70, 250.2., #3, #4, #5, #6** amended to address comments submitted by the Conservation Law Foundation and in response to feedback received from the URI Ocean SAMP benthic habitat research team led by Dr. John King and summarized in LaFrance at al. (2010). Reference added to Literature Cited. See as follows:

    "(3) Benthic communities in the Ocean SAMP area are largely dominated by various species of benthic, tube-dwelling amphipods (LaFrance et al. 2010). The bivalve *Nucula*, as well as various species of polychaetes, mysids and cumaceans, fill out benthic community species composition. Rhode Island Sound and Block Island Sound share many species, but ~~directed experimental work needs to be done to test for differences in dominant species and overall community make up between these two ecosystems~~research survey work by LaFrance et al. (2010) suggests that benthic habitat in Block Island Sound is more variable than in Rhode Island Sound, and that Block Island Sound is more diverse (11 phyla and 156 genera vs. 8 phyla and 75 genera, respectively). LaFrance et al. (2010) suggest that fundamental differences in habitat make up and utilization exists between Block Island Sound and Rhode Island Sound, though they admit their present findings cover only a small section of each of these large ecosystems. Further ~~S~~such research ~~would also~~will provide ~~input to~~greater understanding of sediment type–species relationships, which at present are only tenuously known. Having this information would greatly assist in a better understanding of the ecology of the region, and could be a start towards the development of ground-truthed benthic habitat maps for the Ocean SAMP area."

"(4) Several contemporary side-scan surveys have been made in Rhode Island Sound in relation to dredged materials site monitoring (Battelle 2003c), and also independently by the U.S. Geological Survey (McMullen et al. 2007; 2008). There was also a survey that was conducted in the western portion of Block Island Sound (Poppe et al. 2006), and very recent benthic surveys of small portions of Block Island Sound and Rhode Island Sound by LaFrance et al. (2010). These side-scan surveys reveal high resolution details of the sedimentary patch structure of the sea floor in Rhode Island Sound and Block Island Sound. This benthic patch structure is quite complex and comprised of a variety of topographic features shaped by the dynamic sedimentary environments (erosional, sorting and reworking, and transport, see Section 210; LaFrance et al. 2010). The biologic sampling and field ground-truthing needed to correlate side-scan imaging to benthic habitat types and probable species assemblages has ~~not been undertaken~~only recently begun, but ~~would~~ will provide a very useful ecological assessment and resource management tool as it is conducted and results are released."

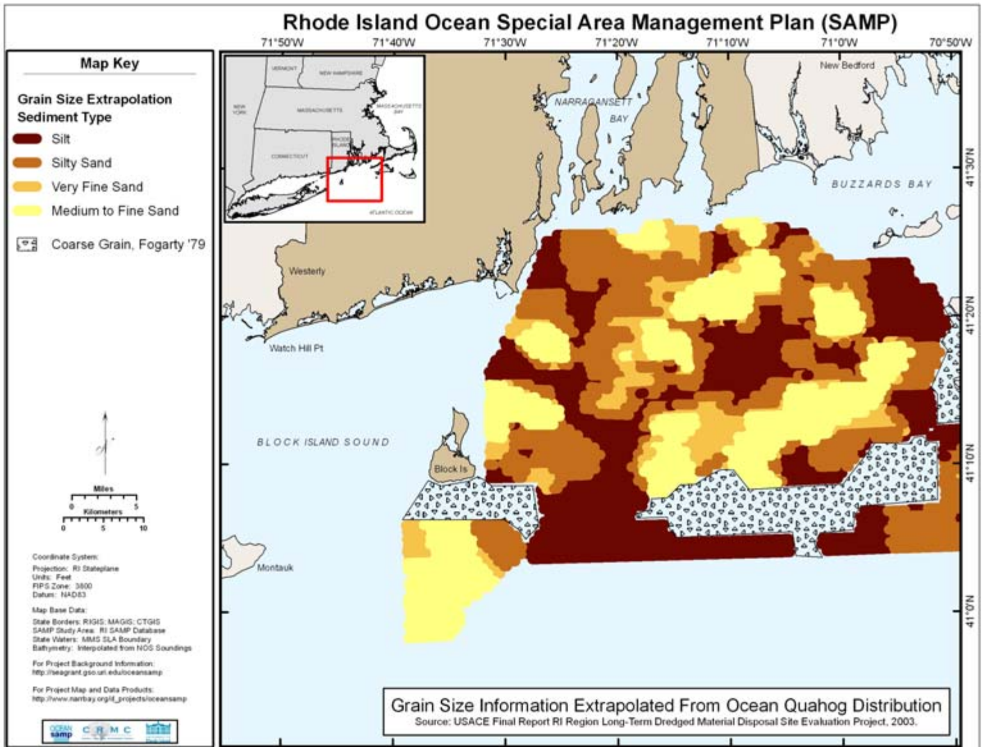
"(5) Based on observed benthic change between surveys completed in 1991 and 1994, Driscoll (1996) suggested that anthropogenic effects have greater impact on reworking benthic surface sediments in Block Island Sound than large storms after finding an increase in the distribution and density of trawl door scars caused by fishing gear dragged across the seafloor in their survey area. Fishing can have local impacts on habitat as well as more wide-spread impacts on species biodiversity due to re-suspension of particulates, chemical impacts causing changes in nutrient cycling, and biological impacts from changes in species composition (DeAlteris et al. 2000). Of interest to note is that the dominant benthic invertebrates of the Ocean SAMP area—tube-dwelling, amplescid amphipods—appear to do well in disturbed areas; it is unclear if fishing activity that disturbs the bottom is having either a positive or negative impact, if any, on these species. LaFrance et al. (2010) found that benthic habitat areas comprised of highly mobile sediments tended to have low diversity and low abundances, suggesting that organisms found in these habitat types must be able to withstand repeated disturbance events. This is an area were further study is needed to better determine the impacts, both positive and/or negative, of disturbance events, both natural and of anthropogenic origin, on benthic communities and the ecosystem as a whole."

"(6) Maps of benthic habitat can be an important element in understanding ecosystem dynamics, but are challenging to develop. While various classification schemes have been proposed, most existing schemes are based on physical factors such as bathymetry, sediment grain size, sediment texture and/or topographic features. LaFrance et al. (2010) provide a summary description of the various approaches to mapping benthic habitats, their pluses and minuses, and limitations. Regardless of the scheme, the intent is to assist in the identification of habitats of key importance to the ecosystem, and to guide both future research efforts as well as management initiatives. Several proxy maps have been developed for use in considering the ecology of Rhode Island and/or Block Island Sounds using sediment composition, and most recently "surface roughness," a basic measure, interpreted from sidescan sonar imaging, of the unevenness of the seafloor bottom topography."

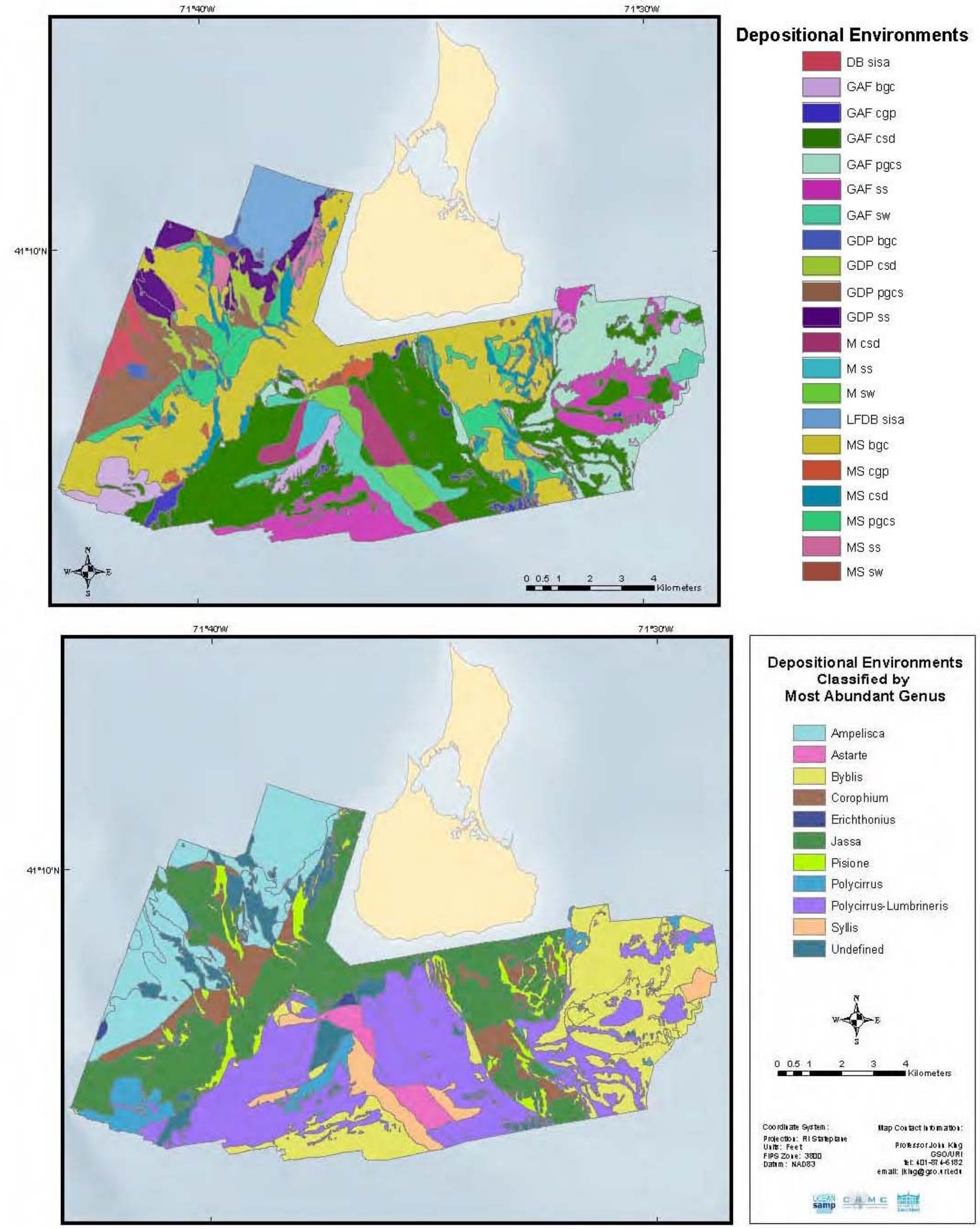
"LaFrance, M., Shumchenia, E., King, J., Pockalny, R., Oakley, B., Pratt, S., and Boothroyd, J. 2010. Benthic habitat distribution and subsurface geology of selected sites from the Rhode Island Ocean Special Area Management Study Area. Technical Report #4. Rhode Island Coastal Resources Management Council, Wakefield, RI."

32. **Figure 2.25:** amended in response to in response to feedback received from the URI Ocean SAMP benthic habitat research team led by Dr. John King and summarized in LaFrance at al. (2010). Legend amended as follows: "Figure 2.25. ~~Grain size distribution in Rhode Island Sound as extrapolated from ocean quahog distribution (Fogarty 1979).~~ Benthic geological environments (top) and genus defined benthic geological environments (bottom) in a select portion of Block Island Sound (LaFrance et al. 2010). Top panel key: DB=Depositional Basin; GAF=Alluvial Fan; GDP=Glacial Delta Plain; M=Moraine; MS=Moraine Shelf; LFDB=Lake Floor/Depositional Basin; sisa=silty sand; bgc=boulder gravel concentrations; cgp=cobble gravel pavement; csd=coarse sand with small dunes; pgcs=pebble gravel coarse sand; ss=sheet sand; sw=sand waves." Figure replaced with two (2) new images provided by URI researchers LaFrance et al. (2010) as follows:

OLD FIGURE 2.25 (DELETED):



NEW FIGURE 2.25 (INSERTED):



33. **Page 71, 250.2., #7:** rewritten to reflect new Figure 2.25, in response to feedback received from the URI Ocean SAMP benthic habitat research team led by Dr. John King and summarized in LaFrance at al. (2010), as follows: “Figure 2.25 shows ~~bottom sediment~~

~~distribution interpreted from ocean quahog distribution data in Rhode Island Sound, and benthic habitat can sometimes be inferred based on preferences of species found in the area for specific sediment types~~benthic geological environments, and genus-defined benthic geological environments, as interpreted from side scan imagery, sub-bottom profile imagery, sediment samples, and underwater video surveys reported by LaFrance et al. (2010). Zajac (in prep) developed a first order compilation of benthic species–sediment type relationships (Table 2.7) based on the published literature. There appears to be basic agreement in distribution of some types, for example *Byblis* (bottom panel) in coarse sand and gravel areas (top panel), while for others, *Ampelisca* for example, the agreement is less clear~~, and this could be related to Figure 2.25 as a first approximation of benthic species distribution in Rhode Island Sound~~. ~~Without groundtruthing however, such an exercise should be considered only guidance for further research, and no implications should be assumed. Given the broad distribution of silt, silty-sand, and fine sand in Rhode Island Sound, it is not surprising that ampleliscid amphipods, which appear to prefer these sediment types, are the most broadly distributed benthic invertebrate.~~ Further mapping such as that conducted by LaFrance et al. (2010) will help to better define the benthic environment of the Ocean SAMP area, and may allow for comparison to past surveys that may have accurately identified the geographic location of sample sites. The survey results of LaFrance et al. (2010) are in general agreement with past survey findings that tube-dwelling amphipods are the most abundant benthic organism. LaFrance et al. (2010) suggest that the large mats created by tube-dwelling amphipods are valuable benthic habitat that provides a positive influence on the benthic ecosystem."

34. **Page 74, 250.2., #8**: amended in response to feedback received from the URI Ocean SAMP benthic habitat research team led by Dr. John King and summarized in LaFrance at al. (2010), and URI Ocean SAMP fish habitat research team led by Dr. John King and Jeremy Collie and summarized in Malek et al. (2010). Malek et al. (2010) also inserted into Literature Cited. See as follows:

"Habitat diversity promotes species diversity—the more complexity a habitat contains the greater the number of species the habitat can generally support (Eriksson et al. 2006). A potential proxy for habitat complexity in marine benthic ecosystems could be surface roughness. The presumption is that the rougher the bottom, the greater the vertical complexity, which could be equated with the promotion of increased species diversity. King and Collie (2010) have developed a first-order interpretation of bottom roughness from sidescan sonar images for the Ocean SAMP area (Figure 2.26). Until further interpretation accompanied by groundtruthing occurs, increased surface roughness, as shown in Figure 2.26, should be considered only as providing the potential for habitat that promotes increased species diversity and/or abundance. ~~Furthermore, species correlations to "roughness patterns" cannot be assigned. While only a first, rough approximation, areas of high surface roughness appear to generally correspond to glacial moraines; these areas are often hot spots for commercial and recreational fishing activity, which while not necessarily suggesting increased diversity, does suggest highly productive areas of the Ocean SAMP area seafloor, and that the moraines are important fish habitat.~~Initial findings by LaFrance et al. (2010) suggest that the relationship between surface roughness and habitat diversity appears to vary according to the scale at which surveys are conducted and the accompanying statistical routines used to interpret the relationship. ~~Further research would be needed to elucidate why these areas attract fish—is it food, shelter, current flow, or otherwise?~~They find that a relationship does exist between surface roughness and habitat diversity, though it is clear that further research needs to be conducted, at appropriate scales, to elucidate how this relationship relates to species abundances and uses of the various benthic habitats in the broader Ocean SAMP area. Malek et al. (2010) also found a trend towards greater habitat complexity, but only for Block Island Sound, based on acoustically derived surface roughness interpretation, but again suggesting that more research is needed to further verify and build upon these findings."

"Malek, A., Collie, J., LaFrance, M., and King, J. 2010. Fisheries ecology and benthic habitat in Rhode Island and Block Island Sounds. Technical Report #14 of the Ocean Special Area Management Plan. Rhode Island Coastal Resources Management Council, Wakefield, RI."

35. **Page 77, 250.2.1., #4:** amended in response to feedback received from the URI Ocean SAMP benthic habitat research team led by Dr. John King and summarized in LaFrance at al. (2010). Added (f) as follows: "(f) LaFrance et al. (2010) found that in samples from both Block Island Sound and Rhode Island Sound that small surface burrowing polycheates of the genus *Lumbrineris* where the most broadly distributed, followed by small surface burrowing amphipds of the genus *Unciola* and large deep burrowing polycheates of the genus *Glycera*. With regards to abundance, LaFrance et al. (2010) found the tube-swelling amphipod genus *Ampelisca* to be the most abundant, followed by *Leptocheirus*, also a tube-dwelling amphipod."

36. **Page 80, 250.3., #4**: amended in response to feedback received from the URI Ocean SAMP fisheries research team led by Dr. Jeremy Collie and summarized in Bohaboy et al. (2010); reference inserted into Literature Cited as well. See as follows:

"Circulation and salinity play a role in fish species distribution and abundance. For instance, Merriman and Sclar (1952) noted a correlation between salinity in Block Island Sound and years of heavy spawning for at least certain species of fish. In one year of their survey the salinity in Block Island Sound was 2‰ higher than in other years, which corresponded to being a year during which a heavy spawn was noted. Similar heavy spawning was not seen in other years when salinities tended to be lower. Merriman and Sclar (1952) found that precipitation and runoff were both lower during the year of high salinity/heavy spawning. Three years later they noted an increase in the catch of weakfish (a species with high reproductive success during the high salinity event), again suggesting correlation between these events. Merriman and Sclar (1952) noted however, that there were not enough data to make correlations with a large degree of certainty, though they did suggest causality. Bohaboy et al. (2010) find that season is a strong determinant of both fish diversity and fish abundance in the Ocean SAMP area, with fall having greater numbers of fish present than during spring. "

"Bohaboy, E., Malek, A., and Collie, J. 2010. Baseline characterization: data sources, methods and results. Appendix A to Chapter 5: Commercial and Recreational Fisheries. Ocean SAMP. Rhode Island Coastal Resources Management Council, Wakefield, RI."

37. **Page 55, 250.1., #1**: amended in response to feedback received from the URI Ocean SAMP ecology research team led by Dr. Scott Nixon and summarized in Nixon et al. (2010); reference added to Literature Cited as well. See as follows:

> "There appear to be correlations between phytoplankton species composition in Narragansett Bay and Rhode Island Sound, though more work is needed to prove and clarify that correlation, as well as to research trends for species shifts over time. Recent findings of Nixon et al. (2010) suggest that surface waters of Rhode Island Sound contain more phytoplankton than those of Block Island Sound, though in summer when the water column is stratified this relationship appears not to hold; this pattern does not hold for primary production (see 250.1.1). Primary production is seasonal in the Ocean SAMP area, and production values are generally similar to though slightly lower than those of adjacent areas, which agrees with findings of Nixon et al. (2010). As is noted for Narragansett Bay, Rhode Island Sound appears to be experiencing a less consistent winter–spring phytoplankton bloom, though again more research is needed to verify and clarify this observation, and define its importance to the overall ecology of the area. Nixon et al. (2010) have found evidence for a fall bloom in Ocean SAMP waters, a bloom which was not seen to occur in Narragansett Bay. Zooplankton species composition was found to be seasonal, and heavily influenced by change in salinity and/or temperature in the water column; distinct species changes were noted in warm vs. cool years, dry vs. wet years. Influx of the ctenophore *M. leidyi* had significant impact on the zooplankton community of Narragansett Bay, though similar study has not been conducted in Rhode Island Sound so it is unclear if similar interaction is occurring. Differences between Rhode Island Sound and Block Island Sound regarding zooplankton control of phytoplankton stocks was suggested, but has not been studied in a comparative sense, nor is it known if ctenophore outbreaks have influenced zooplankton–phytoplankton interactions in Rhode Island or Block Island Sound. Very preliminary comparison (Deevey 1952a,b; Kane 2007) suggests zooplankton dominant species have not changed over the past 50 to 60 years, nor has the seasonality of at least some dominant species. Rigorous analysis however, needs to be undertaken before this can be stated with any degree of surety."

"Nixon, S., Granger, S., Oviatt, C., Fields, L., and Mercer, J. 2010. Spatial and temporal variability of surface chlorophyll, primary production, and benthic metabolism in Rhode Island and Block Island Sounds. Technical Report #9 for the Ocean Special Area Management Plan. Rhode Island Coastal Resources Management Council, Wakefield, RI."

38. **Page 57, 250.1.1., #5**: amended in response to feedback received from the URI Ocean SAMP ecology research team led by Dr. Scott Nixon and summarized in Nixon et al. (2010) as follows: "Hyde (in prep), using ocean color remote sensing data, estimated phytoplankton average annual biomass and productivity for the past 10 years for the Rhode Island Sound

and Block Island Sound area as 1.07 mg m^{-3}. Primary production estimates for the Ocean SAMP area ranged from 143 to 204 g C m^{-2} d^{-1} and were comparable to, though slightly lower than, primary production measurements for nearby regions (Table 2.3). Sampling at four stations in Rhode Island Sound found chlorophyll *a* concentrations of 6 to 9 µg l^{-1} (U.S. Army Corps 2002), which is comparable to those noted by Staker and Bruno (1977) for Block Island Sound. They are also consistent with oceanic systems and slightly lower than an average estimate of phytoplankton production on continental shelves (Mann 2000), and are consistent with Hydes' assessment. Nixon et al. (2010) found that chlorophyll concentrations above 4.5 µg l^{-1} were unusual but more common in Rhode Island Sound than in Block Island Sound, with most common concentrations ranging between 0.5 and 1.0 µg l^{-1}. For Rhode Island Sound, Nixon et al. (2010) found production over the span of October 2009 to April 2010 to be between 86 and 91 gC m^{-2} d^{-1}, and 87 gC m^{-2} d^{-1}for Block Island Sound. Figure 2.22 shows annual phytoplankton growth (via chlorophyll *a*) in the Ocean SAMP area over a decadal span of time. While there is year-to-year variability, a general trend of increased production closer to shore is apparent. Nearshore waters will be shallower, better mixed, closer to nutrient sources, and warmer than offshore waters, all factors which promote increased productivity. No trend over time is visibly apparent from this time series data set, though statistical analyses are lacking to make any further judgment."

39. **Page 82, 250.3., #12**: amended in response to feedback from URI Ocean SAMP fisheries research team led by Dr. Jeremy Collie and summarized in Bohaboy et al. (2010), as follows: "Brown (in prep) characterizes the major demersal (e.g., living near but not necessarily on the bottom) and pelagic fish and invertebrates as residents or migrants of the Ocean SAMP area (Figure 2.27). The majority of the pelagic species are seasonal users of the area, with most of those arriving during spring and leaving during the fall. Relatively few major species are resident in the Ocean SAMP area. This suggests that the overall fish community of the Ocean SAMP area largely follows a seasonal cycle of abundance. These findings are corroborated by recent research by Bohaboy et al. (2010) in the Ocean SAMP area. Water temperature and food availability are no doubt major elements in shaping fish abundance patterns, both of which also exhibit strong seasonality. In general terms, early spring sees the start of a major influx of migratory species to the area, reaching a maxima in later summer then declining throughout the fall season. This pattern is similar to those noted for zooplankton and ichthyoplankton communities."

40. **Section 270.1, Policy 1**: technical revisions to make language consistent with subcommittee- approved version in Chapter 11, Policies of the Ocean SAMP, as follows: "The Council recognizes that the ~~primary guiding policy for the Ocean SAMP is to protect and where possible restore and enhance natural resources and ensure that~~preservation and restoration of ecological systems shall be the primary guiding principle upon which environmental alteration of coastal resources will be measured. I~~i~~mpacts from future activities ~~are~~ shall be avoided and, if they are unavoidable, ~~are~~ minimized and mitigated~~ so they are acceptable to the scientific community and the people of Rhode Island~~."

41. **Section 270.1, Policy 3**: technical revisions to make language consistent with subcommittee-approved version in Chapter 11, Policies of the Ocean SAMP, as follows: "The Council recognizes that while all fish habitat is important, spawning and nursery areas are especially critical in providing shelter for these species during the most vulnerable stages of their life cycles. The Council will ensure that impacts ~~from~~ to these ~~essential fish~~sensitive habitats are avoided and, if they are unavoidable, are minimized and mitigated~~, especially for habitats that are used by recognized Threatened and Endangered finfish per the Endangered Species Act (16 U.S.C. 1531 *et. seq.*)~~. In addition, the Council will give consideration to habitat used by ~~as well as finfish listed as "~~Species of Concern~~"~~ as defined by the NMFS Office of Protected Resources."

42. **Section 270.1, Policy 4**: technical revisions to make language consistent with subcommittee-approved version in Chapter 11, Policies of the Ocean SAMP, as follows: "Because the Ocean SAMP is located at the convergence of two eco-regions and therefore more susceptible to change, the Council will ~~employ the precautionary principle to~~ carefully ~~managing~~ manage this area, especially as it relates to the projected effects of global climate change on this rich ecosystem."

43. **Section 270.2, Regulatory Standard 1**: technical revisions to make language consistent with subcommittee-approved version in Chapter 11, Policies of the Ocean SAMP, as follows: "The Council designates the Ocean SAMP sea duck foraging habitat ~~(Chapter 8, Figure 39)~~ in water depths less than or equal to 20 meters [65.6 feet] as depicted in Figure 11.7 in Chapter 11, The Policies of the Ocean SAMP, as Areas Designated for Preservation due to their ecological value and the significant role these foraging habitats play ~~on for these~~to avian species, and existing evidence suggesting the potential for permanent habitat loss as a result of offshore wind energy development. For further information on Areas Designated for Preservation, see Chapter 11, The Policies of the Ocean SAMP. ~~Current research indicates that there may be a permanent loss of foraging habitat for these species thus the Council shall prohibit any Large-Scale Offshore Development, mining and extraction of minerals, or other development that has been found to be in conflict with the intent and purpose of an Area Designated for Preservation.~~"

44. **Section 270.2, Regulatory Standard 2**: technical revisions to make language consistent with subcommittee-approved version in Chapter 11, Policies of the Ocean SAMP, as follows: "Glacial moraines are important habitat areas for fish because of their relative structural permanence and structural complexity. The Council also recognizes that because glacial moraines contain valuable fish habitats they are also important to commercial and recreational fishermen. Accordingly, ~~Due to there high habitat value~~, the Council shall designate glacial moraines as identified in figures 11.3 and 11.4 in Chapter 11, The Policies of the Ocean SAMP, as Areas of Particular Concern. For further information on Areas of Particular Concern, see Chapter 11, The Policies of the Ocean SAMP. ~~Applicants for Offshore Development shall avoid Areas of Particular Concern within the Ocean SAMP area. Avoidance shall be the primary goal for these areas. Any Large-scale, Small-scale, or Other Offshore Development, as required, that cannot avoid these Areas of Particular Concern~~

~~shall be required to minimize to the greatest extent possible any impact, and as necessary, mitigate any significant impact to these resources. The applicant shall be required to demonstrate why these areas cannot be avoided or why no oth~~er alternatives are available."

45. **Section 270.2, Regulatory Standard 4**: technical revisions to refer to appropriate sections of Ocean SAMP document, as follows: "Biological resource assessments shall be conducted according to the procedures outlined in Section ~~860~~ 1160.5 of ~~the Renewable Energy Chapter~~Chapter 11, The Policies of the Ocean SAMP, and detailed in the Site Assessment Plan and the Construction and Operation Plan sections."

46. **Section 270.2, Regulatory Standard 5**: technical revisions to make language consistent with subcommittee-approved version in Chapter 11, Policies of the Ocean SAMP, as follows: "The Council ~~and~~ in coordination with the Joint Agency Working Group, as described in Chapter 11, The Policies of the Ocean SAMP, shall determine requirements for ~~establish~~ monitoring ~~protocols~~ prior to, during and post-construction ~~to evaluate the consequences of decisions and adapt management to the monitoring results~~. Specific biological monitoring requirements shall be determined on a project by project basis and may include but are not limited to the monitoring of:
    a. Coastal processes and physical oceanography
    b. Underwater noise
    c. Benthic ecology
    d. Avian species
    e. Marine mammals
    f. Sea turtles
    g. Fish and fish habitat

~~The applicant shall provide the Council will a monitoring report scheduled by the Council.~~"

Chapter 5, Commercial and Recreational Fisheries.

Below please find one proposed change to **Chapter 5: Commercial and Recreational Fisheries** in response to written comments that were received during this chapter's second 30-day public comment period, which ended on August 12, 2010.

(1) We propose amending General Policy #2, in section 560.1, p. 150, as follows, in response to the Conservation Law Foundation's request that we add policy language explaining how CRMC will work to protect priority habitat areas as follows:

> "The Council recognizes that finfish, shellfish, and crustacean resources and related fishing activities are managed by a host of different agencies and regulatory bodies which have jurisdiction over different species and/or different parts of the SAMP area. Entities involved in managing fish and fisheries within the SAMP area include, but are not limited to, the Atlantic States Marine Fisheries Commission, the RI Department of Environmental Management, the RI Marine Fisheries Council, the NOAA National Marine Fisheries Service, the New England Fishery Management Council, and the Mid-Atlantic Fishery Management Council. The Council recognizes the jurisdiction of these organizations in fishery management and will work with these entities to protect fisheries resources. The Council will also work in coordination with these entities to protect priority habitat areas."

Chapter 8, Renewable Energy and Other Offshore Development

Below please find a list of proposed changes to **Chapter 8, Renewable Energy and Other Offshore Development**, in response to comments received during the 30-day formal public comment period from July 12th, 2010 to August 12th, 2010. The proposed changes are as follows:

(1) We propose modifying Section 800: Introduction paragraph 1 (pg. 8) to make the language consistent with how this particular Ocean SAMP objective is stated in the Chapter 1, Introduction as follows:

“One of the objectives of the Ocean SAMP is to encourage marine-based economic development that ~~meets~~ considers the aspirations of local communities, and is consistent with and complementary to the state’s overall economic development, social, and environmental needs and goals.”

(2) We also recommend adding the following language to Section 800: Introduction as paragraphs 3, 4 and 5 (pg. 8) in responses to comments from Caroline Karp. These paragraphs are proposed to clarify the objectives of this chapter, CRMC’s authority over energy facility planning, and emphasize to the reader that this chapter does not focus on any particular proposed project. Adding the text below is in response to comments received suggesting clarification on CRMC’s authority with respect to energy facility siting and numerous comments submitted referencing particular proposed projects, such as Deepwater Wind’s proposed project. The addition of these paragraphs helps to define the scope of the chapter and how it relates to the authority of the CRMC. The proposed change is shown below:

“The objectives of this chapter are to: (1) provide an overview of renewable energy resources, and existing statutes, standards and initiatives in Rhode Island; (2) identify what offshore renewable resources in the Ocean SAMP area have the potential for utility-scale energy generation; (3) describe utility-scale offshore wind energy technology and stages of development; (4) identify areas within the Ocean SAMP area with the greatest potential to support utility-scale development; (5) delineate a Renewable Energy Zone within state waters of the Ocean SAMP; (6) summarize the current understanding of the potential economic and environmental effects of offshore renewable energy and; (7) outline CRMC policies and regulatory standards for offshore renewable energy and other offshore development in the Ocean SAMP area.

CRMC’s authority to plan for the future of energy facilities in the coastal zone is defined in the CRMC’s 1978 Energy Amendments, which apply federal regulations governing approved coastal management programs (15 CFR 923 *et. seq.*). As stated in the 1978 Energy Amendments, the CRMC is required to identify and develop a planning process for energy facilities that are likely to be located in, or which may significantly affect, the coastal zone. This planning process must include procedures for assessing the suitability of sites for energy development, as well as policies and techniques to manage energy facilities and their anticipated impacts. The Ocean SAMP has been developed consistent with this authority.

This chapter is not meant to be a state energy plan, as such plans are developed by the Rhode Island Statewide Planning Program and the Office of Energy Resources. Furthermore, this chapter does not focus on any one particular proposed project; rather it examines the potential for offshore renewable energy as one future use of the Ocean SAMP area. Any specific offshore renewable energy project will be examined specifically during the application process, outlined in Section 860. Moreover, the environmental impacts of any proposed offshore renewable energy project will be reviewed and evaluated under the National Environmental Policy Act (NEPA)."

(3) We suggest adding a sentence to the end of Section 850.1 Avoided Air Emissions, paragraph 3 (pg. 91) in response to comments from Caroline Karp suggesting that the carbon footprint of offshore renewable energy facilities be discussed within the chapter. The proposed change is shown below:

> "The process of siting, constructing, and decommissioning an offshore renewable energy project of any kind would entail some adverse impacts to air quality through the emission of carbon dioxide and conventional pollutants. Construction activity in the offshore environment would require the use of fossil fuel-powered equipment that will result in a certain level of air emissions from activities including pile installation, scour protection installation, cable laying, support structure and turbine installation, and other activities required for the development of a wind farm. During the pre-construction and installation stages, there would be some air emissions in the Ocean SAMP area from fossil fuel fired mobile sources such as ships, cranes, pile drivers and other equipment. Decommissioning would also result in some air emissions from the activities involved in the removal of the wind turbines, although emissions from decommissioning would be lower than those involved in construction (MMS 2009a). The size of an offshore renewable energy facility's carbon footprint will vary depending on the project, as the carbon footprint of a facility depends on project specific factors (e.g. size, location, technology, installation techniques, etc.)"

(4) We suggest adding a sentence to the end of Section 850.2 Coastal Processes and Physical Oceanography, paragraph 2 (pg. 93) based on comments from NOAA National Marine Fisheries Service recommending we clarify that the potential localized effects around wind turbines will vary depending on site-specific conditions. The proposed change is shown below:

> "The potential effect of offshore renewable energy structures in the water column on currents and tides have been examined using modeling techniques. Modeling of the proposed Cape Wind project found that the turbines would be spaced far enough apart

to prevent any wake effect between piles; any effects would be localized around each pile (MMS 2009a). The analysis of Cape Wind demonstrated that the flow around the monopiles (which range in diameter from 3.6-5.5 m [11.8-18.0 feet] wide) would return to 99% of its original flow rate within a distance of 4 pile diameters (approximately 14.4-22 m [47.2-72.2 feet]) from the support structure (ASA 2005). Both of these studies, however, are representative of monopile wind turbine subsurface structure and may not be directly applicable to jacket-style foundations. The potential localized effects of lattice jacket structures on the hydrodynamics are likely to be even less compared to that found with monopiles as pile diameters for lattice jackets are much smaller (1.5 m [4.9 feet]) than monopiles (4-5 m [13-16.5 feet] diameter). Furthermore, the spacing between the turbines using lattice jacket support structures will be much greater than the 4 pile diameters. However, the effects of currents may be site-specific, as there could be localized currents or other conditions that could affect or be affected by the presence of wind turbines; site specific modeling may be necessary to determine impacts."

(5) We propose modifying and adding the following sentences to Section 850.3.1 Benthic Habitat Disturbance, Paragraph 7 (pg. 98). These proposed changes are in response to comments from NOAA National Marine Fisheries Service requesting the chapter mention that scars along the bottom could impact migration for benthic animals and the extent of impacts may depend on the amount of time it may take for the natural bathymetry to recover. The proposed changes are shown below:

"In ~~most~~ many cases, the seabed is expected to return to its pre-disturbance state after cable installation. The extent of the impacts from cable laying may depend on the amount of time it takes for the natural bathymetry to recover. Post-construction monitoring may be used to track the recovery of a project site. On rock or other hard substrates where the seabed may not recover easily, backfilling may be required, or else permanent scarring of the seabed may result. Scars along the bottom may impact migration for benthic animals. Species found in rock habitats tend to be sessile (permanently attached to a substrate), either encrusting or otherwise attached to the rock, and are therefore more susceptible to disturbance (BERR 2008). Clay, sand, and gravel habitats are typically less affected. Undersea cables can also cause damage to benthic habitat if allowed to "sweep" along the bottom while being placed in the correct location (Johnson et al. 2008). Initial re-colonization of the site by benthic invertebrates takes place rapidly, sometimes within a couple of months (BERR 2008). In deeper waters, where disturbance of the seabed occurs with less frequency, recovery to a stable benthic community can take longer than in shallow waters, sometimes years. Generally, the effect on the benthic ecology will not be significant if the cabling is done in areas where the habitat is homogenous. However, if the cabling activity takes place in areas of habitat that are rare or particularly subject to disturbance, the effects could be greater (BERR 2008). The most serious threats are to submerged aquatic vegetation, which serves as an important habitat for a wide variety of marine species. Shellfish beds and hard-bottom habitats are also especially at risk (Johnson et al. 2008). Shellfish in particular are usually not highly mobile, and cannot relocate during the cable-laying process. Biogenic reefs made up of mussels or other shellfish may become destabilized if plowing for cable-laying damages the reefs (BERR 2008)."

(6) We suggest modifying Section 850.4 paragraph 6 (pg. 110) in response to comments received from the Conservation Law Foundation. These changes clarify that the potential for permanent foraging habitat loss as a result of offshore renewable energy development and that foraging habitat should be avoided when siting any future projects. This also clarifies the rationale for designating sea duck foraging habitat as Areas Designated for Preservation in Section 860.

> "Land-based surveys conducted by Paton et al. (2010) support the findings of the literature review, as large concentrations of seaducks (e.g. scoters and eiders) have been recorded in these nearshore areas, particularly off Brenton Point (see Figure 8.41). Because one potential effect of offshore renewable energy development may include permanent habitat ~~displacement~~loss, identifying and avoiding potentially important foraging habitat prior to siting future projects may help to minimize any adverse impacts."

(7) We suggest adding the following sentence to Section 850.4.4 Habitat Displacement or Modification paragraph 1 (pg. 122) based on comments received from the Conservation Law Foundation. This addition is recommended to clarify that current research suggests that the potential for permanent loss of foraging habitat may be significant to avian species. Ultimately, this finding and recommendations from our Ocean SAMP avian research team provides the basis for designating sea duck foraging habitat as Areas Designated for Preservation. The proposed change is shown below:

> "Offshore renewable energy development may result in temporary or permanent habitat displacement or modification during the construction, operation or decommissioning of a facility. Depending on the location of the facility, birds may potentially be displaced from offshore feeding, nesting, migratory staging, or resting areas. Displacement may be caused by the visual stimulus of rotating turbines, or the boat/ helicopter traffic associated with construction or maintenance activities (Fox et al. 2006). Habitat loss or modification on avian species may result in increased energy expenditures as birds may need to fly farther to access alternate habitat (MMS 2009a). Increased energy expenditures if severe may result in decreased fitness, nesting success, or survival (MMS 2009a). Current research suggests that the permanent loss of habitat, particularly foraging habitat, has the potential to significantly impact certain avian species. However, t~~T~~he severity of the effects of displacement from foraging habitat depends on the amount of habitat lost, the distance to, and the food resources available at the nearest alternate site (MMS 2009a). Siting offshore renewable energy facilities in areas to avoid important bird foraging areas may minimize any potential adverse impacts on birds (OSPAR 2006; MMS 2007a)."

(8) We suggest adding the following footnote to Section 850.4.4. Collisions with Structures, paragraph 4 (pg. 125). The addition of this footnote is in response to a comment received from Caroline Karp regarding the prevalence of fog in the Ocean SAMP area as it relates to the risk of collision to avian species in the area.

> "[49] Merrill (2010) reports that based on historical data sets, the Ocean SAMP typically experiences 3-4 foggy days per month during the months of March-May and October-December, and 6-10 foggy days during June, July and August."

(9) We suggest deleting the last sentence in Section 850.5 Marine Mammal, paragraph 3 (pg. 127). The deletion of this sentence was suggested by NOAA National Marine Fisheries Service because it makes a broad conclusion regarding impacts to whales which is not supported by any analysis. The proposed change is shown below:

> "Marine mammal species in the Ocean SAMP area are either whales (cetaceans), a scientific order which includes dolphins and porpoises, or seals (pinnipeds). Marine mammals are highly mobile animals, and for most of the species, especially the migratory baleen whales, the Ocean SAMP area is used temporarily as a stopover point during their seasonal movements north or south between important feeding and breeding grounds. The Ocean SAMP area overlaps with the Right Whale Seasonal Management Area, although the typical migratory routes for right whales and other baleen whales lie further offshore and outside of the Ocean SAMP area (Kenney and Vigness-Raposa 2009; see Chapter 7, Marine Transportation, Navigation and Infrastructure). Right whales and other baleen whales have the potential to occur in the SAMP area in any season, but would be most likely during the spring, when they are migrating northward and secondarily in the fall during the southbound migration. In most years, the whales would be expected to transit through the Ocean SAMP area or pass by just offshore of the area. ~~Therefore, any future offshore renewable energy projects within the Ocean SAMP area are unlikely to impede the movement of animals between important feeding and breeding grounds~~."

(10) We suggest adding the following information to Section 850.5 Marine Mammals paragraph 5 (pg. 132).This revision is in response to a comment from NOAA National Marine Fisheries Service recommending the addition of a sentence noting that both the Marine Mammal Protection Act (MMPA) protections and the Endangered Species Act (ESA) prohibit the taking of certain species. Also the commenter suggested including the ESA definition of take and that any wind farm will require consultation under the ESA and MMPA. The proposed changes are shown below:

> "The degree to which offshore renewable energy facilities may affect marine mammals depends in large part on the specific siting of a project, as well as the use of appropriate

mitigation strategies to minimize any adverse effects (MMS 2007a). All potential adverse impacts and enhancements posed by any future project within the Ocean SAMP area to marine mammals will undergo rigorous review under the National Environmental Policy Act (NEPA) to comply with the standards under the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). Under the MMPA all marine mammals are protected, and acts that result in the taking (a take is defined as "harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal") of marine mammals in U.S. waters is prohibited without authorization from the National Marine Fisheries Service (NMFS). Further protection is granted under the ESA by the NMFS for marine mammals that are listed as threatened or endangered. The ESA prohibits any person, including private entities, from "taking" a "listed" species. "Take" is broadly defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect or to attempt to engage in any such conduct." As a result, any proposed ~~project's~~ project will require consultation under the ESA and MMPA to examine all potential effects on ~~the welfare of~~ marine mammals ~~are scrutinized~~ prior to development in order to ensure that potential adverse impacts are minimized. For more information on the MMPA and the ESA see Chapter 10, Existing Statutes, Regulations, and Policies."

(11) We suggest adding the following word to Section 850.5 Marine Mammals, paragraph 6 (pg. 132). This change was suggested by NOAA National Marine Fisheries Service as the risks to marine mammals from any project are likely to vary based on the exact project design and location. The propsed change is shown below:

"The principle impacts identified in the PEIS include potential effects of increased underwater noise, impacts to water quality, vessel strikes and displacement (MMS 2007a). Of these potential impacts, increased underwater noise may pose~~s~~ the greatest risk to marine mammals, especially to baleen whales (e.g. humpback whales and the North Atlantic right whale), who are in theory most sensitive to the low frequency sounds produced during construction activities (see below for further discussion)."

(12) We suggest adding the following phrase to Section 850.5.1 Noise paragraph 3 (pg. 133). Listing the maintenance of an exclusion zone was suggested by NOAA National Marine Fisheries Service. The proposed change is shown below:

"Underwater noise may be generated during all stages of an offshore renewable energy facility, including during pre-construction, construction, operation and decommissioning. The strength and duration of the noise varies depending on the activity (see Table 8.17). For example, some construction activities, such as pile driving, result in short periods of intense noise generation, compared with long-term, low level noise associated with operational activities. While the intensity and duration of the noise produced by pile driving activities and operational wind turbines vary, both produce low frequency noise, and therefore potentially pose a risk in particular to large whales, such as the North Atlantic right whale, humpback whales, and fin whales, as these species are thought to be most sensitive in this frequency range (Southall et al. 2007; see Figure 8.45). In order to minimize the risk of causing hearing impairment or injury to any marine mammal during activities of high noise, monitoring the project area for the presence of marine mammals and maintenance of an exclusion zone has been required (MMS 2009a; JNCC 2009). Furthermore, scheduling construction activities to avoid periods when marine mammals may be more common in the project area is one precautionary measure to minimize any potential adverse impacts (OSPAR 2006). Information on the potential long-term impacts of displaced individuals, or on the potential effects under water noise may cause to resident marine mammal populations, is not currently available (MMS 2007a, OSPAR 2008)."

(13) The following additions are suggested for Table 8.17. *Above and Below Water Noise Sources Associated with Offshore Renewable Energy Development* (pg. 134). The clarification of what the noise source described as 'Construction' referred to and the recognition that pile-driving noise will vary greatly depending on the size of the pile and type of hammer used were suggestions provided in the comments received from NOAA National Marine Fisheries Service. The proposed changes are shown below:

Above Water Noise

Noise Source	**Duration**	**Frequency Range**	**Frequency of Peak Level (Hz)**	**Peak Sound Intensity Level (dB re-20 µPa)**	**Reference Distance (m)**
Ship/barge/ boat[a,b,d]	Intermittent to continuous, up to several hours or days	Broadband, 20–50,000 Hz	250–2,000	68–98	Near source
Helicopter	Intermittent, short duration	Broadband with tones	10–1,000	88	Near source
Pile driving [a,d]	50-100 millisecond pulses/beat, 30–60 beats/min, 1–2 hours/pile	Broadband	200	110	15 m (49.2 feet)
Construction Equipment[d]	Intermittent to continuous	Broadband	Broadband	68–99	15 m (49.2 feet)

Underwater Noise Sources

Noise Source	**Duration**	**Frequency Range**	**Frequency of Peak Level (Hz)**	**Peak Sound Intensity Level (dB re-1 µPa)**	**Reference Distance (m)**
Ship/barge/ boat[a,b,c,,f]	Intermittent to continuous, up to several hours or days	Broadband, 20–50,000 Hz	250–2,000	150-180 rms	1m (3.3 feet)
**Pile driving[a,d,f]	50-100 millisecond pulses/beat, 30–60 beats/min, 1–2 h/pile	Broadband 20- above 20,000 Hz	100-500	228 peak, 243-257 peak to peak	1m (3.3 feet)

Seismic air-gun array [b,f]	30-60 millisecond pulses, repeated at 10 -15 sec intervals	Mainly low frequency, but some 10-100,000 Hz	10-125	Up to 252 downward, up to 210 horizontally	1m (3.3 feet)
Seismic explosions TNT (1-100lbs)[e,f]	~1-10 milliseconds	2-1,000 Hz	6-21	272-287	1m (3.3 feet)
Dredging [c,f]	Continuous	Broadband 20-20,000 Hz	100-500	150-186	1m (3.3 feet)
Drilling [b,c,f]	Continuous	Broadband 10-10,000 Hz	20-500	154	1m (3.3 feet)
Operating Turbine (1.5 MW operating in winds of 12 m/s) [a]	Continuous		50 Hz/ 150 Hz	120-142	1m (3.3 feet)

[a] Thomsen et al. (2006). [c] Richardson et al. (1995). [e] Ross (1976).
[b] LGL (1991). [d] Washington DOT (2005). [f] OSPAR (2009a).

**(note: noise associated with pile driving will vary greatly depending on the size of the pile and hammer used)

(14) We suggest the following additions to Table 8.18. *Criteria for Estimating the Effects of Noise on Marine Mammals under the Marine Mammal Protection Act* (pg. 136). Including this additional information in the table provides a more complete description of the criteria used and was a suggestion provided in a comment from NOAA National Marine Fisheries Service. The proposed changes are shown below:

Criteria	NMFS Criteria
Level A Injury (Pinnipeds)	190 dB re 1 µPa rms (impulse, e.g. pile-driving)
Level A Injury (Cetaceans)	180 dB re 1 µPa rms (impulse)
Level B Harassment/Behavior	160 dB re 1 µPa rms (impulse)
Level B Harassment/Behavior	120 dB re 1 µPa rms (non-pulse noise, e.g. vibratory pile driving)

(15) We propose the following changes to Section 850.5.1 Noise paragraph 9 (pg. 137). In addition, the insertion of a footnote is suggested describing the attenuation rate, or loss of sound transmission, calculated for the Ocean SAMP area by Miller et al. (2010). Both of these suggested changes are in response to comments received from NOAA National

Marine Fisheries Service asking that this additional information to be included within the chapter. The proposed changes are shown below:

> "Research conducted by Miller et al. (2010) modeled the extent of pile-driving noise within the Ocean SAMP area and mapped the areas subject to sound intensities of concern under the MMPA (see Table 8.18 and Figure 8.47). This analysis was calculated for a 1.7 m [5.5 foot] diameter pile (similar to those used in lattice jacket structures) driven into the bottom with an impact hammer. The red shaded area represents the zone of injury, the orange area represents the zone of harassment or potential behavior response, and the yellow area represents the zone of audibility or detection by marine mammals.[55] It should be noted that this is an estimate and that the zones may be larger or smaller depending on the actual size of the pile and method of installation."
>
> [55] Based on an attenuation rate = 17log(range from source) for a sound source at 200 Hz. See Miller et al. 2010 for more information.

(16) We recommend revising the language used in Section 850.5.1. Noise, paragraph 10 (pg. 139). As suggested by NOAA National Marine Fisheries Service, this revised language more clearly describes the area monitored by marine mammal observers. The proposed changes are shown below:

> "Pile driving may create noise that may adversely affect marine mammal feeding or social interactions, or alter or interrupt vocal activity (MMS 2007; Thomsen et al. 2006). However, these impacts will vary within, as well as between, species. Any marine mammal that remains within the project area at the start of pile driving activities are subject to the increased risk of hearing impairment that may occur within close range (Madsen et al 2006; Thomsen et al. 2006). Placing marine mammal observers onboard construction vessels and halting construction activity once a marine mammal has been spotted within ~~a project area~~ a designated exclusion zone are precautionary measures that can be taken to reduce this potential risk (MMS 2007a). In addition, acoustic isolation of the ramming pile may reduce the noise level of pile driving activities. Acoustic deterrent devices and ramp-up pile-driving procedures may also help to protect individuals from impairment or injury by encouraging them to leave the construction site (Thomsen et al. 2006; Tougaard et al. 2003; Tougaard et al. 2005)."

(17) We recommend the inclusion of the following footnote to accompany 850.5.1. Noise, paragraph 11 (pg. 139). This addition is in response to a comment received from NOAA National Marine Fisheries Service requesting the inclusion of information on the source level of the pile driving noise and the noise levels at 20km that are discussed in the text of the chapter. The proposed footnote is shown below:

"[56] Measurements made at Horns Rev during pile driving activities recorded high sound levels of about 190 dB re 1 µPa at several hundred meters away from the sound source. A best fit attenuation of 18 dB per 10 times increase in distance was used to estimate a source level of 235 dB re 1 µPa at 1 meter distance and 150 dB re 1 µPa at a distance of more than 20 km. See Tougaard et al. 2006 for more information."

(18) We recommend the addition of the following footnote to accompany 850.5.1. Noise, paragraph 15 (pg.141). This footnote is in direct response to a comment received from NOAA National Marine Fisheries Service requesting more explanation of the findings of Miller et al. (2010) regarding ambient noise levels in the Ocean SAMP area. The proposed footnote is shown below:

"[60] Miller et al. (2010) created an ambient noise budget for an area southwest of Block Island using a Passive Aquatic Listener device for the 1/3-octave band centered at 500 Hz. The main contributors to the noise budget at this location were shipping with 97 dB re 1 µPa and wind related noise was 97 dB re 1 µPa. Rain was next with 92 dB re 1 µPa and lastly, biological noise with 87 dB re 1 µPa."

(19) We suggest revising one citation used in Section 850.5.2. Vessel Strikes, paragraph 2 (pg. 142). This change is suggested as a result of a comment received from NOAA National Marine Fisheries Service stating that a more accurate citation was the NOAA National Marine Fisheries Service ship strike rule. The proposed change is shown below:

"Of all whale species within the Ocean SAMP area, the population-level impacts of a vessel strike would be most severe to the North Atlantic right whale (MMS 2007a). Ship strikes more commonly result in whale fatalities when a ship is travelling at speeds of 14 knots [16 mph] or more. In fact, the number of ship strikes recorded decreases significantly for vessels travelling less than 10 knots [11.5mph] (Jensen and Silber 2004), which suggests that reducing ship speeds to this level may reduce the risk of vessel strikes even further (~~MMS 2009a~~ NOAA National Marine Fisheries 2008). As a result of this finding, the PEIS suggests vessels reduce ship speed and maintain a safe operating distance when a marine mammal is observed (MMS 2007a; MMS 2009a). In addition, by locating offshore renewable energy installations away from migratory routes, the risk of vessel strikes is further minimized (MMS 2007a). It should also be noted that there is already a vessel speed restriction in place during parts of the Ocean SAMP area during certain times of the year to minimize the risk of right whale ship strikes; this speed restriction is part of the Right Whale Seasonal Management Area and is enforced by NMFS (NOAA National Marine Fisheries Service n.d.). See Chapter 7, Marine Transportation, Navigation, and Infrastructure for further discussion."

(20) We suggest deleting the following reference from Section 850.6 Sea Turtles paragraph 2 (pg. 145). NOAA National Marine Fisheries Service suggested not referring to the NOAA Biological Opinion for the Cape Wind project when describing the occurrence of sea turtles

in the Ocean SAMP area, rather only using primary sources such as Kenney and Vigness-Raposa (2009). The proposed change is shown below:

> "According to ~~the NOAA Biological Opinion for the Cape Wind FEIS (MMS 2009a) and to~~ Kenney and Vigness-Raposa (2009), the sea turtles that may be found in the Ocean SAMP area include the following:"

(21) We suggest the following change to Section 850.6 Sea Turtles paragraph 3 (pg.145). These revisions are in response to a comment received from NOAA National Marine Fisheries Service suggesting that this paragraph clarify that the foraging depths of 16-49 feet were for sea turtles in Long Island waters. The commenter also suggested that any reference to NOAA's Biological Opinion as part of the Cape Wind EIS be cited as a NOAA reference and not MMS 2009a.

> "Sea turtles may use the Ocean SAMP area for foraging. They are capable of diving to great depths, although ~~most tracking studies of turtles in the Northeast have~~ a study of sea turtles off Long Island found them primarily foraging in waters between 16 and 49 feet (4.9 and 14.9 meters) in depth. Leatherback turtles, likely the most abundant sea turtles in the Ocean SAMP area, have been shown to dive to great depths and may spend considerable time on the bottom , sometimes holding their breath for as long as several hours. Some sea turtles, particularly green sea turtles, feed on submerged aquatic vegetation (~~MMS 2009a~~NOAA National Marine Fisheries 2009). While the placement of wind turbines will be at depths greater than where this foraging takes place, if cables are placed through areas of submerged aquatic vegetation, this could have an effect on sea turtles. Similarly, many sea turtles may feed on benthic invertebrates such as sponges, bivalves, or crustaceans, all of which are likely be found in the Ocean SAMP area (NOAA National Marine Fisheries 2009~~MMS 2009a~~). Sea turtles may be affected by any loss of these food species during the cable-laying process; again, turtles are unlikely to forage at the depths where the turbine bases are likely to be located. Leatherback turtles are known to consume Lion's mane jellyfish (*Cyanea capillata*) as a mainstay of their diet; these jellyfish are plentiful in the Ocean SAMP area during the summer and fall (Lazell 1980)."

(22) We suggest adding a sentence to Section 850.6 Sea Turtles paragraph 4 (pg. 146). This is to address comments received from NOAA National Marine Fisheries Service to clarify that sea turtles may be found more commonly in the Ocean SAMP area than the data would suggest. The proposed change is shown below:

> "Additionally, any of these turtle species may migrate through the Ocean SAMP area as part of their northward or southward migration in spring and fall, respectively (~~MMS 2009a~~ NOAA National Marine Fisheries 2009). While sightings of most of these species are infrequent, sea turtles, particularly juveniles, are not routinely detected during surveys, meaning they may be more common in the Ocean SAMP area than survey data would suggest."

(23) We suggest deleting one sentence from Section 850.6.1 Sea Turtles – Noise, paragraph 2 (pg. 146) and adding another sentence. These changes address comments received from NOAA National Marine Fisheries Service in the review process. The deleted sentence may not accurately characterize sea turtle foraging habits, and the additional sentence is to clarify the potential effects of noise will vary depending on the project and site-specific conditions.

> "The Cape Wind FEIS (MMS 2009a) predicts that no injury during the pile driving process is likely to occur to sea turtles, even if the turtle were as close as 30 m (98.4 feet) from the source. The noise generated by pile driving is likely to cause avoidance behavior in sea turtles, which may move to other areas. ~~However, only leatherback turtles are likely to be foraging in the area of the construction activity, as the other species seek out prey available at shallower depths, and their preferred prey items are located throughout the Ocean SAMP area.~~ Sea turtles migrating through the area may also be affected, as they may avoid the construction area. These effects are expected to be short-term and minor (MMS 2009a). The noise created during construction, and thus the effects of noise on sea turtles, may vary depending on the size of the piles and the characteristics of the particular site."

(24) We suggest deleting one sentence from Section 850.6.1 Sea Turtles – Noise, paragraph 3 (pg. 146), and adding an additional sentence. This suggestion is based on comments from NOAA National Marine Fisheries Service which reflect the fact that the effect of seismic surveys cannot be known without knowing the details of the seismic surveying.

> "Any seismic surveys used in the siting process have the potential to affect individual sea turtles by exposing them to levels of sound high enough to cause disturbance if a turtle is within a certain distance of the sound source (1.5 km [0.9 miles]).~~, although not high enough to cause injury. These effects will be minimal and short-term (MMS 2009a).~~ While the Cape Wind EIS predicted only minimal effects to sea turtles from seismic surveys (MMS 2009a), the effects to sea turtles from seismic surveys in the Ocean SAMP area will depend on the type of survey device used, the water depths, and other factors."

(25) The following changes are suggested in order to make the policies and regulatory standards of this chapter fully consistent with the language used in Chapter 11, The Policies of the Ocean SAMP. These changes were agreed upon by the Ocean SAMP Subcommittee on July 22nd, 2010.

Section 860.2.1 Overall Regulatory Standards, Standard #1 (pg. 179):

> "All Offshore Developments regardless of size, including energy projects, which are proposed for or located within the Ocean SAMP area, are subject to the policies and

standards outlined in Section 860. For the purposes of the Ocean SAMP, Offshore Developments are defined as:

i. Large-scale projects, such as:
    a. offshore wind facilities (5 or more turbines within ~~up to~~ 2 km of each other, or 18 MW power generation);
    b. wave generation devices (2 or more devices, or 18 MW power generation);
    c. instream tidal or ocean current devices (2 or more devices, or 18 MW power generation); and
    d. offshore LNG platforms (1 or more); and
    e. Artificial reefs (1/2 acre footprint and at least 4 feet high), except for projects of a public nature whose primary purpose is habitat enhancement.
ii. Small-scale projects, defined as any projects that are smaller than the above thresholds;
iii. Underwater cables;
iv. Mining and extraction of minerals, including sand and gravel;
v. Aquaculture projects of any size, as defined in RICRMP Section 300.11; or
vi. Other development (as defined in the RICRMP) which is located in tidal waters from the mouth of Narragansett Bay seaward, between 500 feet offshore and the 3-nautical mile, state water boundary."

Section 860.2.1 Overall Regulatory Standards, Standards #5 (pg. 181):

"Any assent holder of an approved Offshore Development shall:

i. Design the project and conduct all activities in a manner that ensures safety and shall not cause undue harm or damage to natural resources, including their physical, chemical, and biological components to the extent practicable; and take measures to prevent unauthorized discharge of pollutants including marine trash and debris into the offshore environment.
ii. Submit requests, applications, plans, notices, modifications, and supplemental information to the Council as required;
iii. Follow up, in writing, any oral request or notification made by the Council, within 3 business days;
iv. Comply with the terms, conditions, and provisions of all reports and notices submitted to the Council, and of all plans, revisions, and other Council approvals, as provided in Sections 860.2.5;
v. Make all applicable payments on time;
vi. Conduct all activities authorized by the permit in a manner consistent with the provisions of this document, the Rhode Island Coastal Resources Management Program, and all relevant federal and state statutes, regulations and policies;
vii. Compile, retain, and make available to the Council within the time specified by the Council any information related to the site assessment, design, and operations of a project; and

viii. Respond to requests from the Council in a ~~timely manner~~timeframe specified by the Council."

(26) We recommend the addition of the following sentence to 860.2.2 Areas of Particular Concern, Standard #2 (pg. 183) in order to make this standard consistent with other sections of the Red Book. This language is recommended to allow for more detailed maps created using finer resolution data to be used in place of the large scale maps of Areas of Particular Concern currently within the Ocean SAMP document. Maps created using finer resolution data may depict the location of protected features more accurately, and therefore should be used by the Council when assessing whether a proposed offshore development has avoided these areas.

> "The Council has designated the areas listed in 860.2.2.3 as Areas of Particular Concern. The Council shall require applicants for Offshore Developments to avoid Areas of Particular Concern within the Ocean SAMP area. Avoidance shall be the primary goal for these areas for any Large-scale project. Small-scale or Other Offshore Development may also be required to avoid these areas. Where these Areas of Particular Concern cannot be avoided, the applicant shall be required to minimize to the greatest extent possible any impact, and as necessary, mitigate any significant impact to these resources. The applicant shall be required to demonstrate why these areas cannot be avoided or why no other alternatives are available. Proposed underwater cables will be subject to certain categories of Areas of Particular Concern, as determined by the Council in coordination with the Joint Agency Working Group. The maps listed below in 860.2.2.3 depicting Areas of Particular Concern may be superseded by more detailed, site-specific maps created with finer resolution data."

(27) The following proposed change is recommended for 860.2.3 Prohibitions and Areas Designated for Preservation (pg. 194). This change is in response to comments received from the Conservation Law Foundation recommending that the rationale behind designating sea duck foraging habitat as an Area Designated for Preservation be explained.

> "Ocean SAMP sea duck foraging habitat in water depths less than or equal to 20 meters [65.6 feet] (as shown in Figure 8.54) is designated as an Area Designated for Preservation due to their ecological value and the significant role these foraging habitats play to avian species, and existing evidence suggesting the potential for permanent habitat loss as a result of offshore wind energy development."

(28) The following proposed change is recommended for 860.2.4 Other Areas, Standard #1 (pg. 196) in response to feedback from URI Ocean SAMP researcher Chris Damon. This change is recommended to accurately describe the grid size used in the analysis of commercial marine traffic, as shown in Figure 8.55.

> "Large-scale projects or other development which is found to be a hazard to commercial navigation shall avoid areas of high intensity commercial marine traffic. Avoidance shall

be the primary goal of these areas. Areas of High Intensity Commercial Marine Traffic are defined as having 50 or more vessel counts within a ~~100 by 100 meter~~1 km by 1 km grid, as shown in Figure 8.55."

(29) The following addition is proposed for Table 8.26 *Resources, Conditions and Activities that shall be described in the Construction and Operations Plan* (pg. 209). This addition is recommended to make the regulatory standards of this chapter and Chapter 2, Ecology of the SAMP Region (270.2 Standard #3) consistent. The proposed change is shown below:

Type of Information:	**Including:**
(1) Hazard information and sea level rise.	Meteorology, oceanography, sediment transport, geology, and shallow geological or manmade hazards. Provide an analysis of historic and project (medium and high) rates of sea level rise and shall at minimum assess the risks for each alternative on public safety and environmental impacts resulting from the project (see Section 350.2 for more information).
(2) Water quality and circulation	Turbidity and total suspended solids from construction. Modeling of circulation and stratification to ensure that water flow patterns and velocities are not altered in ways that would lead to major ecosystem change.
(3) Biological resources.	Benthic communities, marine mammals, sea turtles, coastal and marine birds, fish and shellfish not targeted by commercial or recreational fishing, plankton, seagrasses, and plant life.
(4) Threatened or endangered species.	As defined by the ESA (16 U.S.C. 1531 et. seq.)
(5) Sensitive biological resources or habitats.	Essential fish habitat, refuges, preserves, Areas of Particular Concern, sanctuaries, rookeries, hard bottom habitat, barrier islands, beaches, dunes, and wetlands.
(6) Fisheries Resources and Uses	Commercially and recreationally targeted species, recreational and commercial fishing (including fishing seasons, location, and type), commercial and recreational fishing activities, effort, landings, and landings value.
(6) Archaeological resources.	As required by the NHPA (16 U.S.C. 470 et. seq.), as amended.

(7) Social and economic resources.	As determined by the Council in coordination with the Joint Agency Working Group.
(8) Coastal and marine uses.	Military activities, vessel traffic, and energy and non-energy mineral exploration or development.

(30) It is recommended that the following references be added to this chapter's works cited to make the works cited consistent with the above changes.

Merrill, J. 2010. *Fog and Icing Occurrence, and Air Quality Factors for the Rhode Island Ocean Special Area Management Plan 2010.* Technical Report.

NOAA National Marine Fisheries. 2008. Endangered Fish and Wildlife; Final Rule To Implement Speed Restrictions to Reduce the Threat of Ship Collisions With North Atlantic Right Whales. *Federal Register* 73(198): 60173-60191. Friday, October 10, 2008

Tougaard, J., Tougaard, S., Jensen, R.C., Jensen, T., Teilmann, J., Adelung, D., Liebsch,N. and Muller, G. 2006. *Harbour seals at Horns Reef before, during and after construction of Horns Rev Offshore Wind Farm*. Final report to Vattenfall A/S. October 2006.

Thank you for your consideration.

Sincerely,

Grover J Fugate

Grover Fugate