WRITTEN TESTIMONY OF
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U.S. SENATE
SUBCOMMITTEE ON OCEANS, ATMOSPHERE, FISHERIES,
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HEARING ON H.R. 1187
THE GULF OF THE FARALLONES AND THE CORDELL BANK NATIONAL MARINE SANCTUARIES BOUNDARY MODIFICATION AND PROTECTION ACT

As a marine scientist with over 30 years of experience, I have a special interest in preserving the cleanest, most pristine and bountiful waters of our planet. It is important for researchers like me to be able to observe marine life in healthy and intact ecosystems. As a scientist, I know that the healthiest ecosystems need to be protected to ensure the survival of threatened and endangered marine species and commercially valuable species. As a Professor who teaches Marine Biology to non-science majors, it is equally important to be able to show students living examples of magnificent species such as blue whales. The Sanctuary expansion areas in H.R. 1187 serve these purposes, and in my testimony I wish to mainly address the science behind the need to include these areas in the Marine Sanctuary system.

I wish to emphasize three points in my remarks:

1) The existing Gulf of the Farallones and the Cordell Bank National Marine Sanctuaries lie within one of only four coastal upwelling ecosystems on Earth, and the only one in the United States (the California Current Upwelling Ecosystem); upwelling ecosystems are the most productive ocean ecosystems.

2) H.R. 1187 will protect the source of the water, nutrients, and food and critical habitats for the exceptionally diverse marine life that resides in or utilizes the Sanctuaries, including fisheries species, endangered or threatened species, species important to understanding global climate change, and the oceanographic processes that influence the weather. Without protection for the northern half of the California Current Upwelling Ecosystem, marine life within the existing Sanctuaries is placed at risk.

3) Public support for the Sanctuaries boundary modification has been exceptional over the lengthy review process.

Below, I will address each point in detail.

1) **The Gulf of the Farallones and Cordell Bank National Marine Sanctuaries lie within one of the most productive ocean ecosystems on Earth: the California Current Upwelling Ecosystem.** The California Current Upwelling System is one of

only four coastal upwelling ecosystems on Earth and it is the only coastal upwelling ecosystem in the United States. Upwelling systems are collectively responsible for 20% of the total world fish catch, even though they occupy less than 1% of the total area of the world's oceans (Cushing 1969, Bakun and Parrish 1982, Botsford et al. 2003).

Upwelling ecosystems worldwide are defined by special oceanographic processes that lead to exceptional biological productivity. In response to winds blowing over the ocean, shallow sunlit waters are fertilized with nutrients welled up from deeper colder waters. The nutrients stimulate the growth of the microscopic marine plants (phytoplankton) at the base of open ocean food webs, resulting in dense concentrations of food for marine animals. The upwelling in the area from Point Arena to Bodega Bay to be included in the modified boundary is known to be the most intense upwelling in North America (see below).

2) **H.R. 1187 will protect the source of the water, nutrients, and food and critical habitats for the exceptionally diverse marine life that resides in or utilizes the Sanctuaries, including fisheries species, endangered or threatened species, species important to understanding global climate change, and the oceanographic processes that influence weather.**

The scientific justification for the expansion is well-founded and summarized below.

A critical center of upwelling- providing the source waters for the Gulf of the Farallones and Cordell Bank National Marine Sanctuaries downstream- lies outside of the existing boundaries. The proposed 2093 square nautical mile expansion from Point Arena to Bodega Bay includes this critical upwelling center. Deep, cold, nutrient-rich water wells up to the ocean's surface at Point Arena and flows to the south and into the existing National Marine Sanctuaries (Largier et al 1993, Kaplan and Largier 2006, Kuebel-Cervantes and Allen 2006), initiating and fertilizing blooms of the marine plants along the way and supporting organisms at all higher levels of the food web. Figure 1 shows ocean currents moving downstream from Point Arena south to the present Gulf of the Farallones and Cordell Bank National Marine Sanctuaries. The upwelling leads to such a great abundance of food that many top predators, including marine mammals and great white sharks, can thrive in the region.

The area to be included within the modified boundary (Point Arena to Bodega Bay) is not only the source of water, nutrients, and food for the existing Sanctuaries, but it also consistently generates the most intense upwelling in North America. Ocean production is positively correlated with upwelling intensity: the more intense the upwelling, the more productive the ocean. The intensity of the upwelling from Point Arena to Bodega Bay is characterized according to NOAA's upwelling index:
http//www.pfeg.noaa.gov/products/PFEL/modeled indices/upwelling/NA/daily_upwell-graphs.html#p09daily.gif. Cold water is also an indication of upwelling strength. Figure 2 shows water temperatures are coldest around Point Arena, also signifying the intensity of the upwelling.

The rich food generated by the upwelling provides a feast for a diverse assemblage of local and migratory marine life in the Gulf of the Farallones and Cordell Bank National Marine Sanctuaries. Overall, the California Current Upwelling Ecosystem supports more than one-third of the world's whale and dolphin species in the region between Bodega Bay and Monterey Bay (Keiper et al. 2005). The Gulf of the Farallones has the largest concentration of breeding seabirds in the continental U.S. (12 species) and is home to five species of seals and sea lions. Thirty-six species of marine mammals migrate through the Sanctuary where they feed on the rich food, as do 163 species of birds. The Cordell Bank National Marine Sanctuary is home to at least 240 fish species, 69 species of seabirds, and 28 marine mammal species, with other species migrating through. The nearshore fish community includes many commercially valuable, but also threatened, species of rockfish, lingcod, and greenling.

In the fall, a species of seabird (sooty shearwater) migrates from the north to the south through the Sanctuaries on route to South America and to New Zealand, which protects the shearwaters as important elements of indigenous Maori culture. The shearwaters are so numerous that the flocks resemble smoke over the ocean's surface.

Black-footed albatross migrate between their feeding ground on Cordell Bank and their nesting sites on Midway Atoll in the central Pacific.

Humpback and blue whales, both endangered with extinction, feed on the rich abundant food in the Sanctuary waters, generated by the upwelling. The blue whales utilizing these waters represent the largest concentration of this species on Earth.

This highly productive marine ecosystem also gave rise to the oldest known coastal human settlement in northern California (at Duncan’s Landing), which was dated at 8600 years (Kennedy et al. 2005).

Mobile marine species cross over from the Sanctuaries to utilize critical habitat that lies unprotected in the expansion area. The expansion area hosts diverse populations of local and migratory fishes, birds, and marine mammals, which are attracted to the rich food, in a very similar manner to the areas protected in the existing Sanctuaries.

NOAA's Biogeography Program (NOAA 2003) revealed that the area to be included in the modified boundary in fact has in some cases even richer biological resources. 'Hotspots' for high species diversity and high abundances of fishes and birds were identified within the expansion area. Some of the highest habitat suitability for the following species extends north of the boundary: commercial fish species (juvenile bocaccio, dover sole adults and juveniles, rockfish, Dungeness crab), harbor seals, Risso's dolphin (seasonally). Two sites near Point Arena remain major winter haulout areas for the diminishing population of Steller sea lions (threatened). The area visited most by gray whales occurred between Fort Ross and Point Arena, outside the existing boundaries. Similarly, the seasonal high use area for the northern fur seal (conservation status: vulnerable) was just to the north and west of the Sanctuaries.

Resident species in the expansion area include rockfish, lingcod, flatfish, Dungeness crab, sea lions, seals, and seabirds. Coastal seabirds and migratory shorebirds using the Pacific flyway frequent this stretch of coast. Secluded stretches of coast offer haul out areas for harbor seals and Steller sea lions (threatened) as well as nesting sites for many species of local seabirds. Gray whales pass through this corridor during their annual migration between breeding areas in Mexico and feeding grounds in Alaska. Other migratory species visiting the area seasonally to forage in the food-rich waters include endangered and threatened species such as humpback and blue whales, northern fur seals, coho salmon, black-footed albatross and leatherback sea turtles. Chinook or king salmon from northern California watersheds also frequent this area in spring and summer to feed on shrimp-like krill, anchovies, and sardines.

In addition to fishes, birds, and marine mammals, extensive underwater forests of kelp (a giant seaweed) grow close to shore in the expansion area, where they serve as a critical nursery grounds for rockfishes. The kelp forests also support thriving populations of commercially valuable red sea urchins and red abalone (Karpov 2001, Rogers-Bennett 2003). The red abalone are abundant enough for an active recreational fishery, the only remaining abalone fishery on the west coast.

Species of ancient deep-sea corals (bamboo corals) also live throughout the region and provide scientists with clues to climate change. The corals lay down growth rings like trees, providing incomparable records of past climate conditions (Roark et al. 2005). In addition these corals provide important habitat for deep-sea fishes. These corals are structurally fragile and susceptible to disturbance from oil and mineral exploration and extraction.

The Bodega Canyon lies within the modified boundary of the Cordell Bank National Marine Sanctuary and is a specialized habitat for a variety of species. The Bodega Canyon is one of several submarine canyons along the west coast. Cutting into the continental shelf, these canyons are critical conduits for transporting organic matter that provisions deep-sea animals (Vetter 1995). The steep walls of the canyons support a diverse assemblage of marine species including deep-water corals. Small shrimp-like animals ('zooplankton', especially the type know as 'krill') emerge from Bodega Canyon every night, attracting predators that aggregate on the down current side of submarine canyons to feed (Chess 1989). Krill is an important link in the Cordell Bank food web. Krill is the primary diet for blue whales and a seabird species (Cassin’s auklet) and a dietary staple for rockfishes, coho and king salmon.

Endangered blue whales are the largest animals ever known and each day they must consume two tons of food largely in the form of krill. To maintain this consumption rate, they seek dense krill aggregations. The krill in turn depend on the algal blooms sustained by upwelling. Krill concentrate downstream of intense upwelling centers, such as Point Arena, and at the edges of submarine canyons, including Bodega Canyon. California blue whales predictably can be found foraging at the edge of submarine canyons (Croll et al. 2005). Protecting these critical foraging areas is important to securing the continued survival of these magnificent whales.

Expanding the boundary for the Sanctuaries is crucial to achieving their management goal of protecting the *ecosystem* for the marine life within, as stated in the Draft Joint Management Plan. *The expansion area is an integral part of the California Current Upwelling Ecosystem which also encompasses the existing Sanctuaries.* The abundant food for the species living in the Sanctuaries is produced upstream of the existing boundaries. And, many of the larger and mobile species travel outside of the Sanctuaries to utilize habitats in the expansion area. Critical parts of the ecosystem, such as the upwelling center at Point Arena and Bodega Canyon, are not protected in the existing Sanctuaries. Ecosystem-based management has strong support from both scientists and the public in recognition that species do not live in isolation of their environment or other species, including humans.

The California Current Upwelling Ecosystem not only sustains phenomenal biological productivity, it also generates weather patterns along the west coast. The thick cloud cover over the ocean and coast- the 'marine layer' noted by Pacific coast weathermen- results from the cold surface waters of the upwelling, in conjunction with the summer Pacific High Pressure System. Such clouds are known to have an important influence on the heat budget of Earth (Rogers et al. 1995, Faloona et al. 2005, Wen et al. 2006). This thick cloud layer can be strongly altered by pollution and by disruption to the upwelling system.

3) **Public support for the Sanctuaries boundary modification has been exceptional over the lengthy review process.**

Since my appointment as the Director of the University of California's Bodega Marine Laboratory, I have personally witnessed overwhelming support for the Sanctuaries and the expansion. I have been involved in the Gulf of the Farallones, Cordell Bank, and the Monterey Bay National Marine Sanctuaries due to common research and education interests. The Sanctuaries and the Bodega Marine Laboratory collaborate on public education efforts. The Laboratory provides a neutral venue for public meetings, including fishermen's associations and scoping meetings for the Joint Draft Management Plan, and hosts Sanctuary-sponsored lectures and Sanctuary Advisory Council meetings. I attend Sanctuary volunteer celebration events. In addition, I participate in public forums and workshops dedicated to the science-based management of California's ocean resources, as a charter member of the University of California's Marine Council and until recently, a member of the California Resources Agency Sea Grant Advisory Panel. I interact frequently with the public through these activities, the students I teach and their parents, and Bodega Marine Laboratory's public education program, which reaches up to 12,000 visitors yearly. The public I have met who know about the Sanctuaries consider them a national treasure and are pleased that Congress is considering an expansion.

Specifically, my direct involvement with the public review process for the expansion is as follows:

- January 2002- Bodega Marine Laboratory hosted public scoping hearing on Joint Management Plan (attended by over 120 people)
- August 2004- Testified at a public scoping hearing for Congresswoman Woolsey. Provided new scientific information that inextricably linked the expansion area to the current NMS through providing food and habitat for the organisms that depend on the NMS
- December 2004- Testified before the Sonoma County Board of Supervisors, who unanimously approved of the expansion
- August 2005- Participated in an informational conference on the proposed expansion at Sanctuary Headquarters in San Francisco in 2005 on behalf of Senator Boxer and Congresswoman Woolsey
- January 2006- Provided scientific briefing for the proposed expansion for California's Secretary to Resources, Mr. Mike Chrisman. The California Coastal Commission approved of the proposed legislation for the expansion
- November 2007- Testified on H.R. 1187 before the House Subcommittee on Fisheries, Wildlife, and the Ocean
- Attended public scoping and informational meetings for the Sanctuaries and the expansion
- Attended meetings of the Sanctuary Advisory Councils, often hosted by the Bodega Marine Laboratory
- Supervise faculty who serve on the Sanctuary Advisory Councils and conduct research in the Sanctuaries and expansion area
- Provide scientific advice on areas within my expertise.

This legislation has been in the making for a long time. As early as 2001 the expansion was considered in public scoping hearings for the Joint Draft Management Plan for the three Sanctuaries. The 2003 release of the NOAA's Biogeographic Assessment (see bibliography provided at the end of the written testimony) provided impetus for this legislation. The assessment revealed the inextricable ecological linkages between the current Sanctuaries and the expansion area and that biological resources were in some cases richer in the expansion area. The bill was first introduced in the House by Congresswoman Woolsey in 2004 and reintroduced with a companion bill by Senator Boxer in 2005. Congresswoman Woolsey reintroduced a modified bipartisan bill with Congressman Gilchrist in 2007 and Senator Boxer introduced the Senate bill in 2008. A revised version of H.R. 1187 - the same bill that this subcommittee is now considering - passed the House in March 2008.

Along the way, public review and comment on the proposed expansion has been exceptionally thorough. The bill was launched with a capacity crowd public hearing attended by scientists, fishermen, environmentalists, and members of the general public at the Sonoma County Board of Supervisors Chambers in 2004. The bill has also been reviewed several times by the Gulf of the Farallones NMS and Cordell Bank NMS Advisory Councils, the groups that under administrative procedures, begin the designation process. The bill has been endorsed by both Advisory Councils. Additionally, the bill had a House Oceans Subcommittee informational hearing in October 2007 and

markups by the subcommittee and the full House Natural Resource Committee in March 2008.

Additionally, the legislation has been reviewed and endorsed by the California Coastal Commission, the California State Lands Commission, the Boards of Supervisors of Marin, Sonoma, San Francisco and Mendocino Counties, the City of San Francisco, and the Port of Oakland. All these meetings were noticed and the public was given the opportunity to comment. If the expansion is authorized, the public will again have ample opportunity to participate in the details of the expansion as the regulations will be developed through the administrative process.

The members of the California State Lands Commission include the Lieutenant Governor, the State Controller and the State Director of Finance. The Commission has broad authority to protect lands including the state's waterways, tidelands, and submerged lands. As part of its responsibilities, the Commission regulates and permits oil and gas leases and has comprehensive oil spill prevention programs. In its endorsement resolution, it noted the need to protect "these currently unprotected but biologically significant ocean areas in the Sanctuaries."

At least 36 local, state, and national organizations supported H.R. 1187, including the state, county, and city governments listed above and

- **California State legislators** representing Mendocino and Sonoma County, including Assemblywomen Patricia Berg and Noreen Evans, Assemblyman Jared Huffman, State Senator Pat Wiggins and former State Senator Wes Chesbro while in office.
- **distinguished scientists** (letters from 25 scientists from the University of California and other research institutions),
- **businesses** (the Russian River Chamber of Commerce, Sonoma County Economic and Development Board, Mendocino Sea Vegetable Company)
- **fishermen (**the Pacific Coast Federation of Fishermen's Association; Bodega Bay Fishermen's Marketing Association)
- **environmental groups** (individual and joint letters of support from Natural Resources Defense Council, Ocean Conservancy, Sierra Club, Marine Conservation Biology Institute, Conservation Law Foundation, U.S. Public Interest Research Group, Cook Inletkeeper, Planning and Conservation League, The Marine Mammal Center, Surfrider Foundation, Farallones Marine Sanctuary Association, Environmental Action Committee of West Marin, Pacific Environment, Mendocino Sea Vegetable Company, California Coastal Protection Network, Environment California, Environment America, National Marine Sanctuary Foundation).

Notably, there is wide support from the fishing community for the expansion. These fishermen recognize that protecting the quality of the source waters and the food pipeline for the Sanctuaries and critical fishery habitat that is currently unprotected is important for sustainable fisheries in the area. In addition, California State Senator Pat Wiggins, the Chairwoman of the Joint legislative Committee on Fisheries and Aquaculture having oversight over the State Department of Fish and Game, stated in her endorsement letter for H.R. 1187: "This bill places no additional restrictions on the fishing community, so

does not conflict with existing or future regulations from our State Department of Fish and Game." The Sanctuary designation protects fisheries while allowing fishing and does not change existing authorities for fisheries.

This great public interest is attracted fundamentally by the diverse marine life of the region (including iconic species such as the California sea lion), which also generates an important tourism economy and serves as a hook for science education. The Gulf of the Farallones National Marine Sanctuary has attracted over 100 dedicated volunteers a year in its beach watch program alone. The volunteer contributions have been estimated at over $200,000 worth of effort annually. The beach watch program has been sustained for 10 years, with more than 90% of the volunteers returning each year. The interpretive center in San Francisco for the Gulf of the Farallones National Marine Sanctuary hosts over 40,000 visitors yearly.

The expanded boundary would bring the superb public education programs of the National Marine Sanctuaries farther north along the Pacific coast to reach rural and disadvantaged children. The Sanctuaries work closely with local schools and provide teacher training for activities such as monitoring tideline and beach communities and building a new curriculum that integrates geography and marine science through tracking tagged migratory animals online. They also have been exceptional research and education partners for institutions of higher education in the region.

The public is concerned that the expansion be authorized now because the threats have been realized and will continue.

The expansion area and the California Current Upwelling Ecosystem have been threatened by pollution historically and recently.

The most environmental impact on the Sanctuaries and unprotected adjacent waters occurred on November 7, 2007, when 58,000 gallons of bunker oil spilled from the *Cosco Busan* and were dispersed into the Gulf of the Farallones and Monterey Bay Sanctuaries. At first count, 2200 birds were oiled or killed. The research of the environmental impacts of this spill will only add to a solid base of knowledge about the effects of hydrocarbons on marine life built upon by scientists in NOAA, universities, and private institutes after similar incidents such as the *Exxon Valdez* oil spill.

The *Cosco Busan* spill was presaged in the Gulf of the Farallones Draft Management Plan, which cited the evident risks from commercial vessels like the *Cosco Busan* that draw greater than 50 feet of water and are fueled with bunker oil, which is similar to crude oil. Additional risks were cited from the movement of oil tankers carrying an estimated 544 million gallons annually along the California coast. In addition to the *Cosco Busan* spill, have been 10 vessel oil spills in the Gulf of the Farallones National Marine Sanctuary since 1971 (tallied in the Gulf of the Farallones Draft Management Plan), which killed tens of thousands of seabirds. The debilitating effects of oiling sea birds and marine mammals are well known by the public.

In the late 1970s and 1980s there were attempts to lease oil tracts off the counties of Sonoma and Mendocino. Congress and past Republican and Democratic Administrations have already recognized that oil drilling is inappropriate in this area and have placed them under moratoriums. However, the current moratorium will expire in 2012 and there have been efforts to erode it in the meantime. Exploration and extraction activities disturb the sea floor and even minute concentrations of chemicals from oil and mineral extraction (in the 'production water') are toxic to sea life including economically valuable marine species (herring, sea urchins, Pacific oysters) that live in the Sanctuaries and expansion area (Garman et al. 1994, Krause 1984).

Sewage pollution is another type of pollution that threatens the Sanctuaries and the area to be included in the modified boundary. In 1986, 1995, and as recently as 2003, there were proposals to build ocean sewage outfalls along the Sonoma Coast, and there was a massive raw sewage spill in the Russian River in 1985, all just north of the existing boundary.

More generally, the reports of the recent Pew and U.S. Oceans Commissions reflect broad public sentiment that our oceans are under incredible environmental stress and rapid and substantive action is required to redress the perils facing our oceans. Given that the Pew and U.S. Ocean Commissions agree that it is a priority to protect biologically important areas and that there is ample scientific evidence of the value of the resources within the proposed expansion area, sound economic reasons, and broad public support for the expansions, it is important that Congress pass this legislation, rather than wait on the uncertainties of a lengthy administrative designation process. Congress previously created three Marine Sanctuaries. Congress also directed the Secretary of Commerce to administratively designate four National Marine Sanctuaries by specific dates. In 1996, Congress expanded the Flower Garden Bank NMS by adding Stetson Bank, a direct precedent to HR 1187/ S. 2635. In sum, Congress has had direct involvement in the designation of seven of thirteen National Marine Sanctuaries and expanded one National Marine Sanctuary.

Giving the Sanctuary program authority to address these threats and realities will help ensure that these ecologically unique waters remain clean and abundant with marine life. The Sanctuary would be able to collect penalties and settlements after spills and dedicate them to restoration projects in the expansion area, as it has in the existing Sanctuaries.

The expansion will also better enable the Sanctuaries to carry out their management goal of protecting the ecosystem for the marine life within by including the critical parts currently unprotected, such as Bodega Canyon and the upwelling center at Point Arena. The expansion thus also addresses the U.S. and Pew Ocean Commissions conclusion that the ocean management must be based around ecosystems, rather than traditional jurisdictional boundaries; the legislation would adjust the jurisdictional boundary to better match the ecosystem.

In the invitation letter, the Committee asked me to address the resources necessary to carry out the expansion. It is important to fully fund the National Marine Sanctuaries to

further protect one of the richest marine ecosystems on Earth. However, funding should not stand in the way of passing the legislation because it provides in itself important protection for nationally valuable marine resources. As stated earlier in my testimony, the designation alone allows the Sanctuaries to collect fines. Potential polluters might think twice. The designation would attract competitive research grants. Although it was a hardship, the Cordell Bank NMS operated without funding in the first few years of its designation. The Sanctuary programs have achieved admirable success in partnering within the region, using volunteers, and attracting private donations to leverage their limited resources. However, additional funding is important for the Sanctuaries to fully expand its program and activities into new areas.

H.R. 1187 authorizes an appropriation of $6,500,000 for implementation of the boundary modification and such sums as necessary for construction and acquisition projects for the Sanctuaries. The Congressional Budget Office, as ordered by the House Committee on Natural Resources, reported on March 12, 2008 that "enacting the bill would have no effect on revenues or direct spending." The CBO estimated that "assuming appropriation of the amounts specified by the bill for sanctuary management or estimated to be necessary for authorized construction and acquisition activities", implementation would cost $20 million over the 2009-2013 period. The average annual appropriations to manage the two marine Sanctuaries currently are approximately $2 million. This small amount supports an exceptional Sanctuary program in management, public education, and research.

In summary: *Expanding the Gulf of the Farallones and Cordell Bank National Marine Sanctuaries to include the Point Arena upwelling center is necessary to protect and study the source water for these two existing Sanctuaries. Nutrients and food produced in the Point Arena upwelling center are delivered by water currents moving south to the Gulf of the Farallones and Cordell Bank. By expanding the Gulf of the Farallones and the Cordell Bank National Marine Sanctuaries north to Point Arena, the wellspring for the biological productivity, the food pipeline, hotspots of biological diversity, and critical habitat for seabirds, marine mammals, and fisheries species that range northward from the existing Sanctuaries will be protected. Expanding the two Sanctuaries in H.R. 1187 will help achieve the goal of ecosystem-based management on a regional scale.*

As a marine scientist and educator, and as Director of one of the Nation's oldest marine laboratories (Bodega Marine Laboratory) situated within the proposed boundary modification, I find the ecological uniqueness of the region a compelling reason to protect the source waters and critical habitat for the marine life that frequents the Gulf of the Farallones and Cordell Bank National Marine Sanctuaries. Together, the area encompasses a major portion of the only coastal upwelling ecosystem in the United States, which is one of only four on Earth. As a citizen and a resident of this exceptional and unique stretch of the Nation's coast, I find the diversity and abundance of marine life and the high productivity that puts food on the table very valuable to protect now and for future generations.

I thank the subcommittee for the opportunity to share this information and offer any assistance I can provide in the next stages of its actions concerning H.R. 1187.

Relevant Scientific Literature (Upon request, I will provide copies of any of these and additional publications)

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Figure 1. The source waters for the Gulf of the Farallones and the Cordell Bank National Marine Sanctuaries lie in the expansion area from Point Arena to Bodega Bay. Point Arena is an important center of ocean upwelling, providing nutrients and food. Surface currents are shown flowing southward from Point Arena, California. 'BML' refers to Bodega Marine Laboratory, situated just north of the existing Sanctuary boundary. Arrows point in the direction of the surface currents. Color indicates the speed of the current (red = faster).

Data from the coastal radar of the Bodega Ocean Observing Node at the Bodega Marine Laboratory, University of California at Davis. Funding was provided by the Bodega Marine Laboratory and the State of California's Coastal Ocean Currents Monitoring Program.

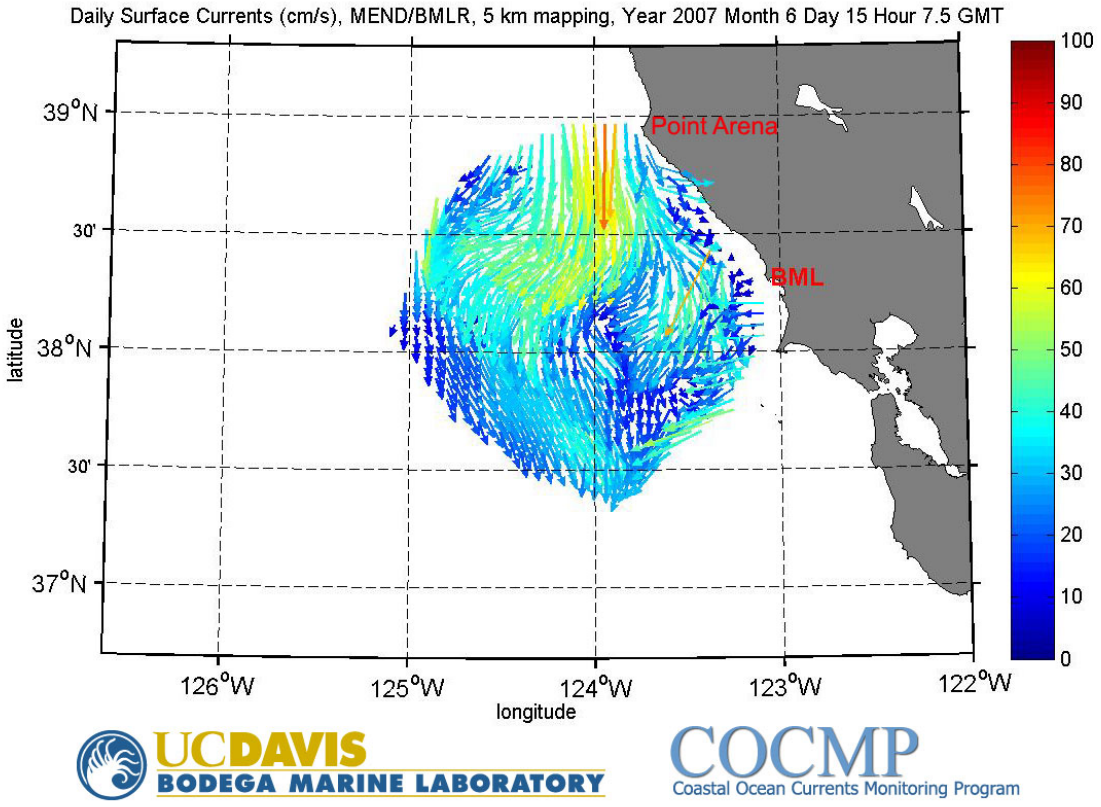

Figure 2. Sea Surface Temperatures (SST) for the northern half of the California Current Upwelling Ecosystem. Data from the National Marine Fisheries Service. The darker the blue, the colder the water, indicating the strength of the upwelling. The expansion area from Point Arena to Bodega Bay is the area of strongest upwelling.