Petition to Classify the Hawaiian Green Turtle Population as a Discrete Population Segment and Delist the DPS under the Endangered Species Act

February 14, 2012

Petitioner:

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The petitioner, Association of Hawaiian Civic Clubs, formally requests that the Secretary of Commerce, through the National Marine Fisheries Service (NMFS), and the Secretary of the Interior, through the U.S. Fish and Wildlife Service (FWS), classify the Hawaii population of green turtle (*Chelonia mydas*) as a Discrete Population Segment (DPS) under the Endangered Species Act of 1973, as amended (ESA) pursuant to the 1996 DPS policy (61 FR 4722; February 7, 1996), and delist the Hawaiian DPS.

This petition is filed pursuant to the ESA and in accordance with § 553(e) of the Administrative Procedure Act. Section 4(b)(3)(A) of the ESA (16 U.S.C. §§ 1531 *et seq*.) requires that the Services make a finding on whether a petition to list, delist, or reclassify a species presents substantial scientific or commercial information to indicate that the petitioned action may be warranted. The NMFS and FWS (collectively, the Services) have jurisdiction over this petition. This petition sets in motion a specific administrative process as defined by 50 C.F.R. § 424.14(b), placing mandatory response requirements on the Services.

The Association of the Hawaiian Civic Clubs is the oldest Hawaiian community-based grass roots organization founded in 1918 by Prince Jonah Kuhio Kalanianaoʻle, and is a confederation of 60 Hawaiian Civic Clubs located through the State of Hawaii and in the State of Alaska, Arizona, California, Colorado, Illinois, Nevada, Utah, Virginia, Washington, Tennessee, and Texas. The Association of Hawaiian Civic Clubs submits this petition using the best available science and information for effective local and ecosystem-based resource management in Hawaii.

Acknowledgements

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Executive Summary

This petition seeks to classify the Hawaii population of green turtle (*Chelonia mydas*) as a Discrete Population Segment (DPS) under the Endangered Species Act of 1973, as amended (ESA), and delist the Hawaiian DPS. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) adopted a policy in 1996 on recognizing DPSs of vertebrate fish or wildlife species for the purposes of listing, delisting, and reclassifying species under the ESA (61 FR 4722; February 7, 1996).

In1978, the green turtle (*Chelonia mydas*) was listed under the ESA as threatened throughout its range, except for breeding populations in Florida and on the Pacific coast of Mexico, where they were listed as endangered (43 FR 32800; July 28, 1978). However, the most recent green turtle 5-Year Review conducted by NMFS and FWS (NMFS and FWS 2007) recommended that an analysis and review of the species be conducted to determine the application of the DPS policy to the green turtle, given the substantial amount of information that has become available on population structure and distribution since the species' listing.

This petition reviews the biology, ecology, natural history, and status of the Hawaiian green turtle population. Results from over 38 years of intensive research indicate that this stock satisfies criteria to be designated a DPS according to the 1996 policy. Specifically, genetic research (Bowen et al. 1992; Dutton et al. 2008), tag recoveries and observations within the Hawaiian Archipelago (Balazs 1976, 1980, 1983, 1996), and satellite telemetry studies (Balazs 1994) indicate that the Hawaiian green turtle population is markedly separate and discrete from other green turtle populations in the Pacific. Further, the loss of the Hawaii population of green turtles would result in a significant gap in the range of *C. mydas*, given lack of other breeding populations of green turtles in the Hawaiian Archipelago.

This petition also reviews the factors for delisting a species, and describes the best available science and most current information to show that the Hawaii population, once designated as a DPS, should be delisted under the ESA. The nesting population of the Hawaiian green turtle has been increasing steadily at a rate of 5.7% per year since the 1970s (Chaloupka et al. 2008a), and the Hawaiian green turtle population is estimated to be over 80% of pre-exploitation levels in the early 1940s (Chaloupka and Balazs 2007). Furthermore, recent studies suggest that some foraging areas in the Main Hawaiian Islands are approaching or have reached carrying capacity (Wabnitz et al. 2010). A number of previously identified threats to the Hawaiian green turtle population have been eliminated or reduced from the implementation of regulatory and conservation measures, and remaining threats are considered to have minimal impacts given the steady increase of the Hawaiian green turtle population despite the persistence of such threats.

Introduction

The green turtle (*Chelonia mydas*) was listed on the Endangered Species List pursuant to the Endangered Species Act in 1978 (43 FR 32800; July 28, 1978). The species was separated into two different listing designations whereby the breeding populations in Florida and the Pacific coast of Mexico are listed as endangered; in all other areas throughout its range the species is listed as threatened. An Interim Recovery Plan for Hawaiian Sea Turtles was prepared in 1992 (Southwest Fisheries Science Center, 1992), followed by the Recovery Plan for the U.S. Pacific Populations of the Green Turtle by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) in 1998 (63 FR 28359; May 22, 1998).

Given the current threatened listing throughout its range (except for the breeding populations of Florida and Pacific coast of Mexico), every population in the species range must simultaneously meet the criteria specified in the Recovery Plan for the species to be "recovered", i.e. no longer needing the protections of the ESA to persist in perpetuity in the wild. This would not be practical with regards to local recovery of seemingly discrete populations, considering that green turtles are distributed circumglobally and nest in over 80 countries.

It has recently been noted that the spatial resolution in global assessments of widely distributed species such as marine turtles is often inadequate for addressing local and regional trends (Seminoff 2004a; Broderick et al. 2006; Wallace et al. 2010). A species classification under the ESA describes its vulnerability to extirpation. Inconsistencies in the perceived urgency for protection to halt a species from going extinct can occur when a "species" listed under the ESA consists of several discrete populations with highly variable population trends and risk factors. These broad groupings dilute focus and funding from populations where conservation is urgently needed by including populations that may not require the protections of the ESA for their continued survival in the wild (Broderick et al. 2006). Currently, significant inconsistency exists in how turtle populations are managed by resource management officials versus how they are listed by the ESA and subsequently treated under ESA law and policy.

The spatial scale of the appropriate management unit for highly migratory species has been a topic of recent discussion and debate. Defining appropriate management units can be especially challenging with regard to marine turtles which are distributed circumtropically, migrate across entire ocean basins between foraging and breeding grounds, exhibit early life stages that are poorly understood in terms of distribution and duration, and maintain a high degree of natal philopatry. The current recovery plans for U.S. Pacific populations of marine turtles acknowledge that the appropriate geographic scale for defining populations was not well understood at the time they were drafted (NMFS and FWS 1998). However, since the mid 1970's, much information has been learned regarding population structure, biology, ecology, phylogeny, and life history attributes of marine turtles. In the case of Hawaiian green turtles, tagging (Balazs 1976, 1980, 1983, 1996), satellite telemetry (Balazs 1994), and genetic (Dutton et al. 2008) studies have suggested that the green turtle population around the Hawaiian Islands may be considered a distinct regional population for management (Dutton et al. 2008; Wallace et al. 2010). An examination of the appropriate management unit and the spatial and phylogenetic resolution to which the Hawaii population is listed under the ESA is therefore highly warranted at this time.

In 1996, the National Marine Fisheries Service and the U.S. Fish and Wildlife Service adopted a policy on recognizing distinct population segments of vertebrate fish or wildlife species for the purposes of listing, delisting, and reclassifying species under the ESA (61 FR 4722; February 7, 1996). Given that the purpose of the ESA is to recover species, the first step toward the recovery of the Hawaiian green turtle population is for the stock to acquire proper management designation. This will not only help in the design of an appropriate management strategy, but will validate over three decades of dedicated research and conservation by researchers, managers, and Hawaii residents. A formal review of available information on the Hawaiian green turtle population against the DPS criteria is necessary to determine if this population may be considered for reclassification of its listing status independent of other *C. mydas* populations around the globe and within the Pacific. The best available science is presented in the following sections which supports the designation of the Hawaiian green turtle population as a DPS.

Further, Hawaii is one of the few sites in the Pacific with consistent long-term datasets necessary to draw reliable conclusions about trends of annual nester abundance (Maison et al. 2010), despite the large number of active monitoring projects throughout the Pacific (Maison et al. 2010; Trevor 2010). Results from nearly 40 years of scientific research and monitoring indicate that the once-depleted nesting population of Hawaiian green turtles has been increasing steadily at a rate of 5.7% per year since the 1970s, and that the population, once designated as a DPS, should be delisted under the ESA.

Biology and Ecology

The green turtle (*Chelonia mydas*) has a circumtropical distribution with distinct regional population structures (Bowen et al. 1992) and is the most abundant large marine herbivore (Bjorndal 1997). Green turtles are found throughout the world, occurring primarily in tropical, and to a lesser extent, subtropical waters. The species occurs in five major regions: the Pacific Ocean, Atlantic Ocean, Indian Ocean, Caribbean Sea, and Mediterranean Sea. These regions can be further divided into nesting aggregations within the eastern, central, and western Pacific Ocean; the western, northern, and eastern Indian Ocean; Mediterranean Sea; and eastern, southern, and western Atlantic Ocean, including the Caribbean Sea. For the purposes of this document, focus and discussion will pertain only to the green turtle population of Hawaii.

The Hawaiian green turtle is an herbivore that spends most of its life foraging and resting in nearshore neritic habitats. Adult females undertake reproductive migrations at intervals of 3 to 4 years with an approximate 25-35 year generation period (Zug et al. 2002; Balazs and Chaloupka 2004b). Nesting females in the Hawaiian Archipelago average 92 cm in straight carapace length, weigh on average approximately 140 kg, and lay up to six clutches of eggs per year (mean of 3.7) with clutches consisting of approximately 100 eggs each (Balazs and Chaloupka 2004b). Approximately 33 % of mature females nest each year and adult males are believed to migrate to breed on an annual basis (Balazs 1980, 1992). Upon leaving the natal beaches, hatchlings embark upon an oceanic journey appropriately named the “lost years”, which is believed to last up to 6 years until they once again return to Hawaii as juveniles settling into coastal neritic habitats at approximately 35 cm in length (Zug et al. 2002).

The principal nesting rookery for the Hawaiian green turtle population is located on the small sand islands at French Frigate Shoals (FFS), Northwestern Hawaiian Islands (NWHI), which accounts for approximately 90 percent of all nesting within the Hawaiian Archipelago (Balazs 1976, 1980; Balazs and Chaloupka 2004a). The main rookery island at FFS is on East Island where at approximately 55 percent of all FFS nesting occurs (Balazs 1976; Balazs and Chaloupka 2004a). Some nesting also occurs at other atolls and islands in the NWHI and on Kauai, Oahu, Molokai, Lanai, and Maui within the MHI (Frey et al. 2011). Important resident and foraging areas have been identified and are being monitored along the coastlines of Oahu, Molokai, Maui, Lanai, Hawaii, and throughout the reefs of the Northwestern Hawaiian Islands (Balazs 1982; Balazs et al. 1987; Parker and Balazs 2010).

Annual surveys of the number of green turtles coming ashore to nest each night have been conducted at East Island since 1973, initially by the Hawaii Institute of Marine Biology (University of Hawaii) and, from 1981 onward, as a cooperative project between NMFS and FWS (Balazs, 1976, 1980; Wetherall et al. 1998). Long-term monitoring of the population indicates a strong degree of island fidelity within the regional rookery, and tagging studies have shown that turtles nesting at FFS come from numerous foraging areas where they reside throughout the Hawaiian Archipelago (Balazs 1982; Balazs et al. 1987; Balazs and Chaloupka 2004a, 2006). In general, foraging areas in Hawaii have less mixing than in other regions (NMFS and FWS 2007).

The nonbreeding range of green turtles is generally tropical, and can extend thousands of miles from shore in certain regions. Hawaiian green turtles monitored through satellite transmitters were found to travel more than 1,100 km from the FFS nesting beach, south and southwest against prevailing currents to numerous distant foraging grounds within the 2,400 kilometer span of the Archipelago and out to Johnston Atoll (Balazs 1994; Balazs et al. 1994; Rice and Balazs 2008) (Figure 1).

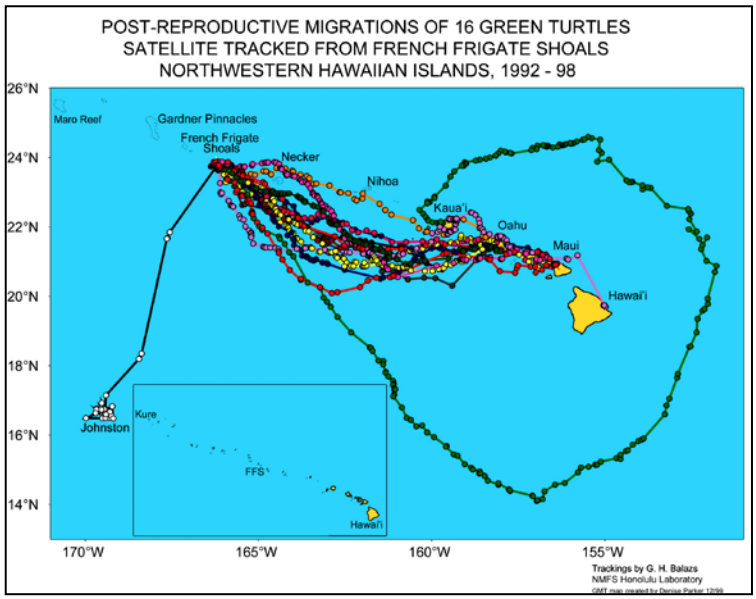

Figure 1. Post-nesting migrations of green turtles from FFS tracked via satellite telemetry (data source: NOAA Fisheries PIFSC).

Greater discussion regarding genetic identity occurs in relevant sections of this document; however, in summary, the Hawaiian green turtle genetic stock is composed of a spatially distinct metapopulation with numerous distinct foraging grounds within the Hawaiian Archipelago (Balazs and Chaloupka 2004b; Dutton et al 2008). The Hawaii population is comprised of the same mtDNA haplotype with no difference in mtDNA stock composition between foraging ground populations and females nesting at the regional rookery (LeRoux et al. 2003; Dutton et al. 2008). In other words,

both the nesters and resident turtles from the various foraging grounds throughout the Archipelago are from the same genetic stock (LeRoux et al. 2003; Dutton et al. 2008; Frey et al. 2011).

A portion of the population in Hawaii is affected by a tumor disease, fibropapillomatosis (FP), which is of an unknown etiology and is one of the major causes of stranding in this species (Chaloupka et al. 2008b). The presence of FP among stranded turtles increased rapidly following the late 1980s outbreak, peaked during the mid-1990s, and has since declined steadily (Chaloupka et al. 2009; Van Houtan et al. 2010). Annual disease monitoring based on a mark-recapture program also indicates that FP prevalence and severity have steadily declined since the mid-1990s (Chaloupka et al. 2009; Chaloupka and Balazs 2005). While the disease is sometimes fatal, recent studies found no apparent effect of FP on Hawaiian green turtle population-specific somatic growth rates (Balazs and Chaloupka 2004b; Chaloupka and Balazs 2005). Long-term tumor regression has been documented even for turtles with advanced FP (Chaloupka et al. 2009), although long-term observations at Honkowai, Maui suggested that regression may be more common in adults than in juveniles (Bennett et al. 2000). Moreover, despite the occurrence of FP, nester abundance has continued to increase (Chaloupka and Balazs 2005). Recent analysis of stranding records for Hawaiian green turtles has linked FP occurrences with land use patterns, specifically with watersheds with high nitrogen footprints (Van Houtan et al. 2010).

Population Status and Trends

Prior to 1970s, the Hawaiian green turtle population was subject to human exploitation from turtle and egg harvesting at foraging and nesting grounds from the mid-1800s until the early 1960s, and nesting habitat destruction (Balazs 1976, 1980). Since enactment of the ESA and green turtle listing in 1978[1], the nesting population of Hawaiian green turtles has been recovering rapidly at a rate of 5.7 percent per year (Balazs and Chaloupka 2006; Chaloupka and Balazs 2007; Chaloupka et al. 2008a).

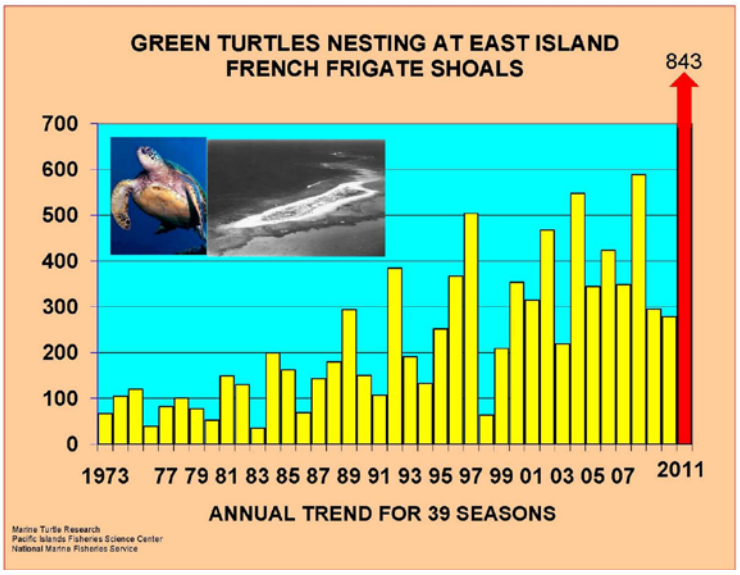

Figure 2. Estimated number of Hawaiian green turtles nesting at East Island, French Frigate Shoals, NWHI, 1973-2011 (figure source: NMFS Pacific Islands Fisheries Science Center Marine Turtle Research).

The nesting data of East Island, FFS since 1973 show that the nesting population has shown a continuous increasing trend over 37 seasons (Tiwari et al. 2010), with 67 nesting females in 1973 to 843 nesting females estimated in 2011 (Figure 2). The stepwise increase of the long-term nester trend can be attributed to increased female survivorship since harvesting of turtles in the foraging

[1] The State of Hawaii first implemented protection of *C. mydas* in 1974 (Regulation 36 of the Department of Land and Natural Resources, Division of Fish and Game, effective May 30, 1974) with the ESA expanding and strengthening protection throughout the Hawaiian Archipelago in 1978.

grounds was prohibited in the mid-1970s and cessation of habitat damage at the FFS rookery since the early 1950s (Balazs and Chaloupka 2004a). Moreover, the increase in the abundance of nesting turtles has occurred despite FP, local inshore fisheries bycatch, and boat strikes (Balazs and Chaloupka 2008b) and nesting-island site fidelity ensures that abundance and trend estimates are not confounded by substantial immigration or emigration (Littnan et al. 2009).

An assessment of the Hawaiian green turtle population using a stochastic simulation model estimated that the population in 2004 was at 83 percent of pre-exploitation levels (early 1940's) with approximately 61,000 green turtles resident in Hawaiian coastal habitats (Chaloupka and Balazs 2007). According to this assessment, the Hawaiian green turtle population could withstand a limited annual harvest of less than 10 tons of biomass (equivalent to 200 juvenile turtles weighing 45kg each). In a rebuttal to this assessment, Snover (2008) argued that recent observed nesting data indicate the population has yet to approach carrying capacity, and questioned the validity of the model used to assess harvest potential. Regardless of whether the entire Hawaiian green turtle population is approaching carrying capacity at this time or whether the population could withstand a certain amount of harvest, Chaloupka and Balazs (2007) adds to the evidence that the population has significantly increased over the last four decades.

Research on foraging ground abundance is consistent with the increased nesting (Balazs 1996, 2000; Balazs et al. 2005). Indeed, NMFS's Five Year Review discussed several studies and concluded that the increase in basking, *inter alia*, supports the idea that Hawaiian green turtles are more abundant than in the past (NMFS 2007).

A recent study of ecosystem structure and processes at Kaloko-Honokohau on the western coast of the Island of Hawaii where green turtles exhibit reduced growth rates and poor body conditions confirmed that the carrying capacity of green turtle foraging ground at Kaloko has been reached (Wabnitz et al. 2010). Further, the study showed that a high degree of competition for the same resource between sea urchins, herbivorous reef fish, and green turtles exist at Kaloko. While not all foraging areas around MHI have reached carrying capacity, green turtles observed at a number of other foraging grounds along the Kona Coast of the Island of Hawaii are known to have slow somatic growth (Balazs and Chaloupka 2004b), suggesting that those sites may be approaching or have reached carrying capacity. Given that the current nesting activity at East Island, FFS, is well below the nesting beach carrying capacity (Tiwari et al. 2010), the Hawaiian green turtle population may be limited by foraging ground carrying capacity.

The Marine Turtle Specialist Group (MTSG) of the International Union for Conservation of Nature and Natural Resources (IUCN) recently conducted a regional assessment of Hawaiian green turtles (Pilcher et al. 2012). Green turtles have been previously listed as globally Endangered under the IUCN Red List, with the most recent global assessment conducted in 2004. The new regional assessment evaluated the status of only Hawaiian green turtles, given the discrete and genetically distinct population segment that is endemic to the Hawaiian Archipelago. The assessment concluded that the Hawaiian green turtle population is approaching full recovery to pre-exploitation levels, continues to grow, and anthropogenic hazards do not appear to be restricting population recovery. The MTSG originally submitted a proposal to the IUCN in October 2011 to reclassify the Hawaiian green turtles from the existing Endangered status to the "Near Threatened" status. However, upon IUCN Red List review, the MTSG

revised the assessment and issued a proposed category listing of “Least Concern” on January 30, 2012. The assessment is currently pending official acceptance by the IUCN.

Distinct Population Segment

The Services should recognize the Hawaii population of green turtles as a distinct population segment (DPS). In 1996, the Services adopted a policy on recognizing DPSs of vertebrate fish or wildlife species for the purposes of listing, delisting, and reclassifying species under the ESA (61 FR 4722, February 7, 1996). Three elements are considered in a decision regarding the status of a possible DPS as endangered or threatened under the Act. These are applied similarly for consideration of additions to the lists of endangered and threatened wildlife and plants, reclassifications, and removals from the lists. The three elements include: (1) Discreteness of the population segment in relation to the remainder of the species to which it belongs; (2) The significance of the population segment to the species to which it belongs; and (3) The population segment's conservation status in relation to the Act's standards for listing (i.e., is the population segment, when treated as if it were a species, endangered or threatened?).

Discreteness

The first quality that must be satisfied for a population to be considered as a DPS is that it must be discrete. According to the DPS policy, a population segment of a vertebrate species may be considered discrete if it satisfies either one of the following conditions:

> 1. It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation.
>
> 2. It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.

The best available science indicates that *C. mydas* populations in the Indo-Pacific region are unequivocally separated physically, morphologically and genetically from *C. mydas* populations in the Atlantic Ocean (Broderick et al. 2006; Bowen et al. 1992; Moritz 1994; Wyneken 1999). Furthermore, the Hawaiian green turtle population is markedly separated from other *C. mydas* populations in the Pacific based on genetics and geographic dispersion.

Genetic Distinction

An understanding of population structure, dispersal, and reproductive behavior of green turtle populations has been realized through analyses of maternally inherited mitochondrial DNA (mtDNA) (Bowen et al. 1992; Dethmers et al. 2006; Dutton et al. 2008). Genetic studies have revealed a phylogenetic separation of *C. mydas* populations between the Atlantic Ocean and the Indo-Pacific on evolutionarily significant time scales (Bowen et al. 1992; Dutton et al. 1996). Moritz (1994) maintained the genetics information supported the delineation of two evolutionarily significant units of *C. mydas*; one consisting of Atlantic Ocean populations and

the other of populations in the Indo-Pacific. The genetic divergence between these Atlantic and Pacific lineages of *C. mydas* is similar to that separating other species, such as olive ridley (*Lepidochelys olivacea*) and Kemp's ridley (*Lepidochelys kempii*) turtles (Dutton et al. 1996).

Morphological evidence for phylogenetic separation between Atlantic and Indo-Pacific populations consists of differences in rear flipper size and differences in the structure of their esophagus (e.g., presence of a crop) (Balazs et al. 1998; Wyneken 1999). Numerous management units of *C. mydas* exist within each of those ocean basins with genetic divergence on time scales of ecological relevance (Bowen et al. 1992). Overall, the global matriarchal phylogeny of *C. mydas* appears to have been shaped by geography and behavior (natal homing on regional or rookery-specific scales) (Bowen et al. 1992).

Analyses of *C. mydas* mtDNA among the Pacific Ocean populations demonstrate the genetic discontinuity of the Hawaiian green turtle population from other populations in the Pacific (Bowen et al. 1992; Dutton et al. 2008). Genetic samples obtained from capture-mark-recapture (CMR) studies and strandings of green turtles in the Hawaiian Archipelago indicate that most (>99%) green turtles occurring in Hawaii are from one genetic stock (Dutton et al. 2008; LeRoux et al. 2003; Frey et al. 2011). Comparisons of haplotype frequencies found no significant differences among years (LeRoux et al. 2003). Current research and analysis confirms a previous hypothesis of stock structure and population dynamics first developed in the mid 1970's based on tag recoveries and observations within the Hawaiian Archipelago (Balazs 1976, 1980, 1983, 1996) and satellite telemetry studies (Balazs 1994).

Hawaiian green turtle foraging ground populations are comprised of one genetic stock derived from the nesting population at French Frigate Shoals (FFS) (Dutton et al. 2008; LeRoux et al. 2003). Furthermore, genetic research indicates that the FFS rookery is distinct from other rookeries in the eastern and western Pacific based on mtDNA with no significant difference identified between haplotype frequencies of turtles in Hawaiian foraging grounds and those at the FFS nesting rookery (LeRoux et al. 2003). Although Hawaii is occasionally, albeit rarely, visited by animals from rookeries outside the Hawaiian Archipelago, mixed stock analysis confirms that the Hawaii foraging ground population is comprised almost exclusively of FFS nesting stock origins (Dutton et al. 2008). These findings strongly suggest that the multiple Hawaiian green turtle foraging populations comprise a single genetic stock that is distinct from other green turtle rookeries in the Indo-Pacific Ocean Basin.

Spatial Disconnectedness

The available information on dispersal and genetic stock composition of Hawaiian green turtles suggest that this population is likely spatially disconnected from other *C. mydas* populations in the Pacific Ocean. Evidence for lack of connectivity with other populations in the Pacific Ocean includes results from CMR studies, satellite telemetry, genetic analysis of stranded turtles within the Hawaiian Archipelago, and genetic analysis of adult green turtles at other rookeries in the Pacific. This spatial disconnectedness may be attributed to geographic isolation and oceanographic conditions that prevent dispersal and survival of pelagic juveniles to suitable foraging grounds beyond the central Pacific (Dutton et al. 2008).

Occurrences of turtles from the east Pacific stock that nests along the Pacific coast of Mexico have been recorded in Hawaiian waters (Balazs 1976; Dutton 2003; Dutton et al. 2008), although such cases are rare. An examination of the genetic composition of 788 individual green turtles from foraging populations and strandings in the Hawaiian Archipelago indentified only three individuals that had haplotypes only found at rookeries other than FFS (Dutton et al. 2008).

Studies to date have not indicated green turtles of Hawaiian genetic origin in the western Pacific or at Melanesian rookeries, and only one eastern Pacific rookery (Revillagigedos, Mexico) has detected Hawaii haplotypes (Dutton et al. 2008). Nearly 12,000 green turtles have been tagged in Hawaii since 1973. Of the more than 7,000 tagged turtles that have been recaptured, only two were recovered outside of Hawaii. Both turtles were post-nesters. One tag was recovered in Japan and the other in the Philippines. Due to the remarkably low frequency with which tags were recovered outside of Hawaii, these turtles were deemed to have gotten "off track" (George Balazs, NMFS, personal communication). While this information may suggest that the Hawaiian green turtle stock is spatially disconnected from other green turtle stocks in the Pacific, it is acknowledged that further research is needed on the extent to which Hawaiian green turtles utilize habitats in the greater Pacific Ocean to further support this hypothesis.

However, the steadily increasing abundance of nesters at the FFS rookery over the past 38 years (see Figure 2) provides further evidence that the Hawaiian green turtle population may be independent of other populations in the Pacific Ocean. Prior to 1974, the Hawaiian stock was subject to intense human exploitation and nesting habitat destruction. Protection and management activities since 1974 throughout the Hawaiian Archipelago and habitat protection at the FFS rookery since the 1950s have resulted in increased population trends of both nesting and foraging turtles (Balazs 1996; Balazs and Chaloupka 2004a, 2004b, 2006; Chaloupka and Balazs 2007). Behavioral changes have been observed in the population over time as a direct consequence of management and conservation actions in Hawaii. Documented changes in foraging strategies and habitat use from predominately deep night-time foraging to daytime inshore waters (Balazs et al. 2003; Rice et al. 2000), and increased scope and magnitude of basking events and tolerance to humans since the early 1980's has occurred (Balazs 1996; Parker and Balazs 2010; Rice et al. 2000; Whittow and Balazs 1982). It appears that the population has responded to reduced anthropogenic threats throughout the Archipelago by altering its behavioral patterns to utilize terrestrial and near shore neritic habitats that were previously unavailable to them. Moreover, continuing threats to other populations of *C. mydas* in the Pacific Ocean (e.g., Maison et al. 2010) have not been detectable in the population growth rate or influenced the behavioral ecology of the Hawaii population. These changes and rate of increase of the Hawaiian stock of green turtles may provide further evidence that the Hawaiian green turtle population is spatially disconnected from other populations in the Pacific.

Verification of spatial separation of the Hawaiian green turtle population from other *C. mydas* populations in the Pacific Ocean during the oceanic life history stage (estimated to be approximately 6 years from hatching) will require further research. Currently the dispersal of hatchlings upon leaving the FFS rookery is unknown as is the extent of green turtle populations intermingling during their oceanic life history stages (Zug et al. 2002). Despite this gap in knowledge, the nearshore foraging life history stages of juvenile, subadult and adult green turtles in Hawaii appear to be markedly partitioned from other populations in Pacific (Dutton et al.

2008). Although one cannot eliminate the possibility of populations intermingling in oceanic habitats at the early life history stage, life history information and corroborating scientific research strongly suggest that the Hawaiian Archipelago green turtle population meets the criteria of *marked* separation as required by the DPS policy.

Significance

If a population segment is considered discrete, its biological and ecological significance will then be considered in light of Congressional guidance (see Senate Report 151, 96th Congress, 1st Session) that the authority to list DPS's be used ''sparingly'' while encouraging the conservation of genetic diversity. In carrying out this examination, the Services will consider available scientific evidence of the discrete population segment's importance to the taxon to which it belongs. According to the policy, this consideration may include, but is not limited to, the following:

> 1. Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon,
>
> 2. Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon,
>
> 3. Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range, or
>
> 4. Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics. Because precise circumstances are likely to vary considerably from case to case, it is not possible to describe prospectively all the classes of information that might bear on the biological and ecological importance of a discrete population segment.

There are several classes of information that provide compelling evidence of the biological and ecological significance of the Hawaiian green turtle population. An extensive review of the appropriateness of the designation of this population as a DPS would attract full submission of this information and elicit debate on the topic. Here we note the potential for a significant gap in the species' range if the Hawaiian green turtle stock is extirpated and the evidence for marked genetic differentiation in this population from other populations of *C. mydas* in the Pacific Ocean as examples of the ecological significance of this population.

Significant Gap in the Species Range

If the Hawaiian stock of green turtles is deemed to be a geographically isolated population of *C. mydas* in the Pacific Ocean as the prevailing information suggests, loss of this population would result in a significant gap in the range of *C. mydas*. There are no other breeding populations of *C. mydas* in approximately 15-30° North latitude and 180-150° West longitude in the Central North

Pacific Ocean, therefore making it unlikely that the region would be quickly repopulated by other Pacific stocks should the Hawaii stock become extinct

Marked Genetic Differences

See above discussion of "*Genetic Distinction*."

Delisting

Once designated as a DPS, the Services should delist the Hawaiian DPS of green turtles. The Services may delist a species if, after a review of the status of the species, the best scientific and commercial information available substantiate that it is neither endangered nor threatened and protection under the ESA is no longer required (50 CFR 424.11(d)). In determining whether a species should be delisted, the Services consider (50 CFR 424.11(c), (d)):

(1) The present or threatened destruction, modification, or curtailment of its habitat or range;
(2) Over utilization for commercial, recreational, scientific, or educational purposes;
(3) Disease or predation;
(4) The inadequacy of existing regulatory mechanisms; or
(5) Other natural or manmade factors affecting its continued existence.

The Recovery Plan distinguishes between the Hawaii population and other green turtle populations in the Pacific (NMFS and FWS 1998). The Services acknowledged even at that time that the Hawaii population has benefitted from effective protection at the primary nesting areas of the NWHI and effective enforcement of regulations prohibiting take of the species. Green turtles were originally listed under the ESA because of overexploitation for commercial and other purposes, the lack of adequate regulatory mechanisms and effective enforcement, evidence of declining numbers, and habitat loss and degradation (NMFS and FWS 1998). In the 1998 Recovery Plan, the Services identified the biggest threats faced by green turtles in Hawaii as: the loss of foraging habitat, entanglement and ingestion of marine debris, incidental take in sport and commercial fisheries, poaching, and proliferation of fibropapilloma (NMFS and FWS 1998). Even in 1998, NMFS recognized that various threats that generally impacts green turtles are not relevant for green turtles nesting in the remote NWHI, such as increased human contact, coastal construction, artificial lighting near nesting beaches, vehicular driving on beaches, and marina and dock development

The Association of Hawaiian Civic Clubs has reviewed the best available scientific information regarding the listing factors in Section 4(a)(1) of the ESA and provide the following assessment for each factor. We conclude that the ESA criteria for delisting the Hawaiian DPS of green turtles have been met.

(1) The Hawaiian green turtle population is not faced with present or threatened destruction, modification, or curtailment of its habitat or range.

In the Five Year Review, the Services identified the following threats to green turtle habitat: construction of buildings and pilings, beach armoring and renourishment, sand extraction, and

the presence of artificial lights near nesting beaches. In addition, the Services discussed impacts to habitats featuring important green turtle foods (e.g. seagrass and algae) from runoff, excessive boat anchoring, and dredging (e.g., port development) (NMFS and FWS 2007).

The Papahānaumokuākea Marine National Monument provides the primary nesting habitat for the green turtle in the Hawaiian archipelago and also serves as foraging grounds and migration pathways (Littnan et al. 2009). The Monument's Draft Management Plan (2008) includes the goal of "[e]nsur[ing] that nesting populations of green turtles at source beaches are stable or increasing over the life of the plan" (the life of the plan being 15 years)" (Littnan et al. 2009). This requires management of the Monument to:

- Continue collecting data to monitor nesting turtles on East Island, French Frigate Shoals, and the periodic reassessment of the distribution of nesting activity on the other islands and atolls within the NWHI;
- Protect and manage nesting habitat, including prevention of introduction of mammalian predators such as rats, reduction of artificial light near nesting beaches, prohibition of habitat alteration, and the regulation of human access and activities; and
- Protect and manage foraging areas and migration routes within the Monument, including identifying and mapping these areas, managing vessel transit and discharge, and minimizing the introduction of contaminants.

Within the Monument is the Hawaiian Islands National Wildlife Refuge (NWR) which is administered by the FWS to protect the French Frigate Shoals (where 90% of Hawaiian green turtles nest) as well as total of 1,729 acres of emergent land and more than 638,360 acres of submergent lands and waters. According to the FWS website on this refuge, "[e]xcept for field stations on Tern and Laysan Islands, these remote islands are not inhabited by humans or open to public visitation," and "[e]ven scientific research or education permit opportunities are limited and closely scrutinized to minimize unnecessary disturbance."

The state and federal governments also protect other important green turtle habitat. For example, the U.S. National Park Service oversees Kaloko-Honokōhau National Park, where more than 136 juvenile and sub-adult green turtles that appear to reside in the park (National Park Service N.D.). The FWS manages Johnston Island NWR, Kilauea NWR, Kingman Reef NWR and other coastal refuges where green turtles forage and people can only access the refuge with a special use permit. The State of Hawaii also has a system of state parks and Marine Life Conservation Districts throughout the main islands that protect habitat where turtles forage and nest (NMFS and FWS 1998).

Modification of coastal waterways has caused shallow water coral reefs to degrade (Wolanski et al. 2009). Foraging habitats are particularly vulnerable to the effects of coastal development and urbanization, although foraging populations of green turtles in the MHI are thriving despite high levels of coastal development. Nesting habitat in the NWHI, however, faces no direct anthropogenic threat, as it is protected.

(2) The Hawaiian green turtle is not subject to overutilization for commercial, recreational, scientific, or educational purposes.

Historically, one of the most serious threats to green turtles throughout the Pacific was direct take of eggs and adult turtles for commercial and other purposes (NMFS and FWS 1998; NMFS and FWS 2007). Contact with the turtles in the NWHI and in NWRs is severely limited even for research purposes, indicating that the turtles are unlikely to be over-utilized for recreational or scientific purposes. Even in 1998, NMFS recognized that because most nesting occurs in the French Frigate Shoals, direct take of nesting females and eggs is unlikely in Hawaii (NMFS and FWS 1998).

Green turtles were historically utilized by Native Hawaiians for consumption (Balazs 1980) as well as for making tools and jewelry (Malo 1951). Until the early 1800's, consumption of turtles were limited by a *kapu* system that prohibited much of the population from eating turtle meat (Balazs 1980). Consumption of green turtles became more common with the abolition of the kapu system, the influx of Caucasians and other ethnic groups, and the discovery of abundance resources in the NWHI (Balazs 1980). Commercial exploitation expanded since the mid-1940's and increased significantly during the late 1960's and early 1970's due to the local tourism and restaurant demand (Witzell 1994; Chaloupka & Balazs 2007). Harvest of green turtles for commercial purposes ceased in 1974 with the introduction of Regulation 36 by the Hawaii State Division of Fish and Game, and all harvest was prohibited when green turtles were listed as threatened under the ESA in 1978. Direct take of green turtles and their eggs are no longer considered to be a threat in Hawaii, although some limited illegal harvest is known to occur.

Incidental bycatch in commercial and recreational fisheries in Hawaii are known to occur, but their effects on the population are likely to be minimal (Chaloupka et al. 2008b). Longline fisheries are prohibited within a buffer zone surrounding the main Hawaiian Islands that ranges from 50-75nm from shore, and rarely interact with green turtles. Only six green turtles were observed incidentally caught and released alive during 2004-2011 in the Hawaii-based shallow-set longline fishery targeting swordfish, which has 100% observer coverage. The shallow-set longline fishery operates under regulations that minimize sea turtle bycatch, including mandatory use of circle hooks and fish bait. Additional low-level interaction also occurs in the Hawaii-based deep-set longline fishery targeting tuna. Some of the green turtles incidentally caught in the Hawaii longline fisheries are of Eastern Pacific origin.

The full extent of green turtle interactions with nearshore fisheries in Hawaii are unknown, but analysis of stranded turtles in Hawaii during the 1982-2003 period indicated that approximately 12% of strandings were attributed to trauma induced by hook-and-line and gillnet fishing gear (Chaloupka et al. 2008b). However, impacts of such interactions do not appear to be jeopardizing the population, considering the steady increase of the Hawaiian green turtle population despite the persistence of some degree of nearshore fisheries interactions.

In addition, scientists at the NMFS Pacific Island Fisheries Science Center initiated the Barbless Circle Hook project in 2004 to increase awareness and use of barbless hooks by Hawaii shoreline fishermen. Barbless hooks can reduce the severity of injuries to any protected species accidentally hooked, and increase the chances of the animal ridding itself of the hook if the hook

is not removed prior to release. In addition to the favorable properties for sea turtles and other protected species, barbless hooks have been shown to be effective in catching target fish species and also reduce the severity of injury for fish captured for catch-and-release. Increasing number of Hawaii fishing tournaments are featuring barbless hook categories, indicating the growing acceptance and popularity of using barbless hooks by shoreline fishermen.

(3) According to the best scientific information, disease and predation are not factors that affect the Hawaiian green turtle's recovery.

The disease with the greatest potential to affect green turtle populations is fibropapillomatosis, as seen in stranding cases in the Hawaiian Archipelago (Chaloupka et al. 2008b). As this petition has previously discussed, however, current research indicates that FP prevalence and severity has steadily declined since the mid-1990s (Chaloupka et al. 2009), there is no apparent effect of FP on Hawaiian green turtle population-specific somatic growth rates (Balazs and Chaloupka 2004b; Chaloupka and Balazs 2005), the FP prevalence and severity have steadily declined since the mid-1990s (Chaloupka et al. 2009; Van Houtan et al. 2010), and long-term tumor regression has been documented even for turtles with advanced FP (Chaloupka et al. 2009). NMFS has also identified predation by non-human predators as a moderate threat in the French Frigate Shoals (NMFS and FWS 1998).

Despite these threats, nester abundance has continued to increase (Balazs and Chaloupka 2004a; Chaloupka and Balazs 2005), leading organizations such as the IUCN MTSG and State of the World's Sea Turtles (SWOT) to conclude that although turtles today still exhibit FP symptoms, the severity of the threat to the overall population has substantially diminished (Mast et al. 2011; Pilcher et al. 2011).

(4) Existing regulatory mechanisms are adequate for the Hawaiian green turtle's protection.

Even if the Hawaii population of green turtle is not listed under the ESA, state and local laws will be sufficient to protect the species. For example, federal, state and local laws regulate construction in coastal areas that might impact areas frequented by green turtles through coastal zone management programs sponsored by NOAA (NMFS and FWS 1998). The Western Pacific Fishery Management Council is also required by the Magnuson-Stevens Act (MSA) to prevent bycatch and minimize mortality for bycatch, 16 U.S.C. §§ 301(a)(9), and authorizes a bycatch reduction program to address bycatch through engineering measures, 16 U.S.C. § 1865. The United States is also a signatory to the binding Inter-American Convention for the Protection and Conservation of Sea Turtles, which sets standards for the conservation of sea turtles and their habitats with an emphasis on bycatch reduction (NMFS and FWS 2007).

State laws also protect the Hawaiian green turtle. In 1974, the Hawaii Division of Fish and Game adopted Regulation 36, which prohibited commercial exploitation of sea turtles, restricted the use of nets in harvesting green turtles, and required a permit to take green turtles for home consumption. This regulation was later superseded with the listing of green turtles under the ESA in 1978. Today, all species of sea turtles are fully protected under Hawaii Revised Statues Chapter 195D and Hawaii Administrative Rules 13-124. Further, the State of Hawaii Department

of Land and Natural Resources is currently developing a Habitat Conservation Plan for Hawaiian green turtles, with the intention of expanding the plan to a full management plan that can be implemented when the species is delisted from the ESA.

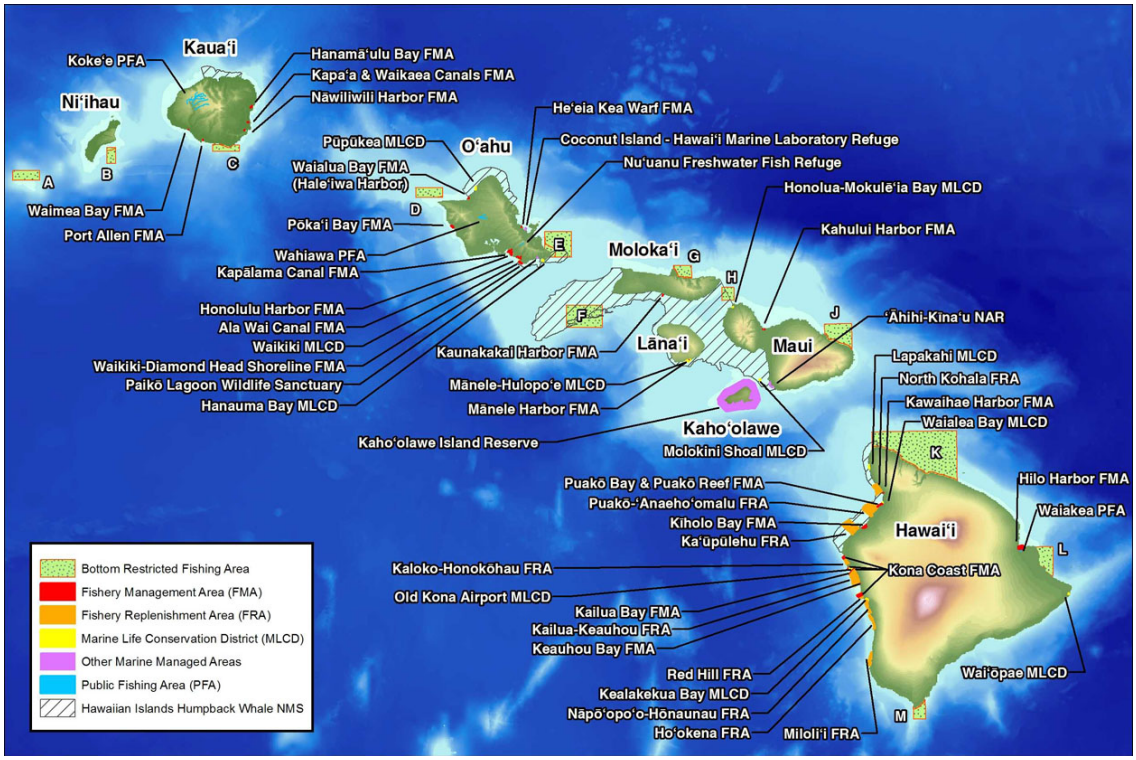

Figure 3. Map of marine managed areas in the main Hawaiian Islands. (Source: Hawaii Division of Aquatic Resources; http://hawaii.gov/dlnr/dar/regulated_areas.html)

The primary nesting habitat, French Frigate Shoals, receives protection as it is located within the Northwestern Hawaiian Islands Marine National Monument (NWHIMNM, also called Papahānaumokuākea Marine National Monument). NWHIMNM received World Heritage status in 2010. The marine protected area is managed by both State and Federal agencies. In addition, the State of Hawaii administers a system of marine managed areas in the main islands (Figure 3) including Marine Life Conservation Districts (MLCDs) established under Hawaii Administrative Rules (HAR) Title 13 Subtitle 4 Part I, and Fishery Management Areas (FMAs) established under HAR Title 13 Subtitle 4 Part II. Taking of any type of living material is generally restricted in MLCDs, and FMAs establish closures to certain species or gear types. These protected areas may also serve to green turtles through the reduction of fisheries interactions.

The federally-managed Hawai'i-based longline fishery operates under a number of regulatory measures to reduce turtle bycatch. These measures include mandatory uses of circle hooks and mackerel-type bait, 100% observer coverage in the shallow-set fishery, mandatory annual attendance of a protected species workshop by longline vessel operators, and annual interaction limits for loggerhead and leatherback turtles. The deep-set sector of the longline fishery currently has approximately 20% observer coverage. These bycatch reduction measures have significantly reduced bycatch by up to 90% (Gilman et al. 2007).

Internationally, the Hawaii population is part of the listing of *Chelonia mydas* in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), prohibiting all forms of international trade in the species or its parts or derivatives for commercial purposes; the United States is a party to CITES and to the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC).

(5) There are no other natural or manmade factors affecting its continued existence.

The Services identified climate change, fisheries bycatch, boat strikes, entanglement in marine debris, and intake of turtles into cooling systems of coastal powerplants as manmade factors affecting green turtles in their foraging and nesting areas (NMFS and FWS 2007).

Climate change could affect green turtles by impacting food supply, causing higher water levels that decrease available nesting habitat, and resulting in warmer temperatures that skew sex ratios (NMFS and FWS 2007). NMFS suggests, however, that the effects of climate change will be most dramatic on developed nesting beaches where shoreline armoring and construction have denuded natural vegetation (NMFS and FWS 2007). As described above, much of the green turtle habitat in the Hawaiian islands is protected under federal law such that access is extremely limited to the remote, undeveloped locations in the NWHI where breeding and foraging occur. In addition, a recent analysis of the carrying capacity of green turtle nesting population on East Island, FFS, suggests carrying capacity of East Island will likely remain high and well over the current nesting population even with the predicted sea level rise (Tiwari et al. 2010). Further, long-term accretion of islands (Webb and Kench 2010) may mitigate some loss of nesting habitat due to sea level rise.

Similarly, although boat traffic impedes green turtle access to foraging grounds (NMFS and FWS 2007) and boat strikes are known to account for approximately 2.5% of strandings in Hawaii (Chaloupka et al. 2008b), limited access to large portions of green turtle habitat should prevent boat traffic and boat strikes from threatening the survival and recovery of the Hawaiian green turtle population. The same is likely to be true for the intake of turtles into cooling systems of coastal powerplants—the lack of development and human occupation should be reflected in a lack of coastal powerplants in the NWHI.

Research has also indicated that green turtles are susceptible to being captured as bycatch in fisheries, primarily nearshore recreational fisheries and longline fisheries (NMFS and FWS 2007). While the extent of green turtle interactions with nearshore fisheries in Hawaii are unknown, analysis of stranded turtles in Hawaii (Chaloupka et al. 2008b) indicated that approximately 12% of strandings were attributed to trauma induced by hook-and-line and gillnet fishing gear. However, impacts of such interactions do not appear to be jeopardizing the population, considering the steady increase of the Hawaiian green turtle population despite the persistence of some degree of nearshore fisheries. Further, green turtle interactions in Hawaii-based longline fisheries are rare (Work and Balazs 2010), given that longline fisheries are prohibited within a buffer zone surrounding the main Hawaiian Islands which ranges from 50-75nm from shore. Existing regulatory mechanisms, as described in the previous section, should address incidental bycatch and habitat degradation concerns.

Green turtles can also ingest or become entangled in marine debris, which may lead to reduced food intake and even mortality (NMFS and FWS 2007). However, this is believed to be a minor problem in Hawaii (NMFS and FWS 1998), as supported by the small proportion (<0.5%) of turtle strandings in Hawaii that are attributed to marine debris (Chaloupka et al. 2008b).

Conclusion

The best available scientific information supports designating this discrete stock of Hawaiian green turtles as a DPS. In assessing the status of *C. mydas* populations, rookeries are considered demographically independent as a result of the strong propensity for natal philopatry in female green turtles (NMFS and FWS 1998; Seminoff 2004b). Current recovery plans for *C. mydas* recognize the demographic and biologic independence of East Pacific greens (NMFS and FWS 1998b) and recent scientific information provides further evidence of marked separation of the Hawaii population. Available information indicates a lack of nearshore foraging or reproductive mixing between the Hawaiian green turtle population with other green turtle populations in the Pacific. The increasing population trends at nesting and foraging habitats is strongly correlated with ongoing management and conservation actions that have been occurring throughout the Hawaiian Archipelago since the mid 1970's. Therefore, due to geographical and biological separation from other green turtle populations in the Pacific, the vulnerability of this stock to becoming extirpated in the wild can be evaluated on an isolated basis as it is not dependent on the dynamics of or threats to other stocks in the Pacific. We therefore request that the Services consider the information presented in this document and evaluate the Hawaiian green turtle population against the DPS criteria under the ESA.

If the Services choose to designate a Hawaii DPS, the best available scientific information also supports the delisting of the Hawaii DPS. The long-term, steady increase in the number of nesting females at the principal Hawaiian green turtle rookery in the NWHI and increases in the number of immature and adult turtles residing in foraging pastures of the main Hawaiian Islands indicates that this stock is well on the way to recovery (Balazs 1996; Balazs and Chaloupka 2004a, 2004b, 2005, 2006; Chaloupka and Balazs 2007), and some foraging grounds appear to be approaching or have reached carrying capacity (Wabnitz et al. 2010). Certain threats identified in the 1998 Recovery Plan and the 2007 Five Year Review have been mitigated by the establishment of federal and state protected areas, amendments to the Magnuson-Stevens Act to prevent bycatch, and implementation of a coastal zone management program and other regulatory measures. Further, additional scientific research suggests that while FP remains a threat, its prevalence and severity have decreased since the 1990s, and the disease does not appear to be negatively impacting the recovery and continued survival of Hawaiian green turtles. On these grounds, the Hawaii population no longer needs the protection of the ESA and should be delisted.

Processing of This Petition

This petition is filed pursuant to the ESA and in accordance with § 553(e) of the Administrative Procedure Act. Section 4(b)(3)(A) of the ESA (16 U.S.C. 1531 *et seq*.) requires that the Services make a finding on whether a petition to list, delist, or reclassify a species presents substantial scientific or commercial information to indicate that the petitioned action may be warranted. This petition sets in motion a specific administrative process as defined by 50 C.F.R. § 424.14(b), placing mandatory response requirements on the Services.

As a petition to classify a species as a DPS and delist the DPS, the Services are bound to process this petition within a predetermined time frame as defined by 50 C.F.R. § 424.14(b) to the maximum extent practicable. The regulations require the NMFS and FWS to make a finding within 90 days of receipt of this petition as to whether a finding of 'DPS' and delisting may be warranted. The finding shall be promptly published in the Federal Register pursuant to 50 CFR § 424.14(b)(1). Within 12 month of receiving this petition, NMFS and FWS are required to find that this petition is not warranted, is warranted or warranted but precluded, and shall promptly publish notice of such intention in the Federal Register according to 50 CFR § 424.14(b)(3). The Association of Hawaiian Civic Clubs fully expects the NMFS and FWS to comply with these mandatory deadlines.

Signature Page

This petition to classify the Hawaiian Green Turtle Population as a Discrete Population Segment (DPS) and delist the DPS under the Endangered Species Act is hereby submitted to the Secretaries of Commerce and the Interior.

Petitioner,

Soulee Stroud
President
Association of Hawaiian Civic Clubs

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