United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
1-2-2002-FW-04.1

APR - 1 2005

Memorandum

To: Chief, Division of Conservation Planning
Region 1, Portland, Oregon

From: Acting Field Supervisor, Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

Subject: Reinitiation of Section 7 Consultation to Amend the Cyanotech Habitat Conservation Plan and Extend the Duration of Incidental Take Permit, TE-051040-0

This biological opinion responds to your request to reinitiate consultation pursuant to section 7 of the Endangered Species Act of 1973, as amended (Act), for Biological Opinion No. 1-2-2002-FW-04 (issued on or before March 18, 2002). The original opinion addressed the potential effects on the endangered Hawaiian Stilt (*Himantopus mexicanus knudseni*) from the issuance of incidental take permit TE-051040-0 and implementation of the Habitat Conservation Plan (HCP) at Cyanotech Aquaculture Facility, Keahole Point, Hawaii. Incidental take permit TE-051040-0 was issued to Cyanotech on March 18, 2002, with a three-year permit term that was scheduled to expire on March 17, 2005. Reinitiation of consultation is triggered because new information (summarized below) reveals effects of the agency action that may affect listed species in a manner or to an extent not considered in the original opinion.

Cyanotech has applied to the U.S. Fish and Wildlife Service (Service) for a one-year extension of its incidental take permit and requested an amendment for revisions to its existing HCP. During the one-year extension, Cyanotech proposes to continue microalgae operations, daily monitoring, and maintenance at its aquaculture facility, implement minimization measures described in its existing HCP, fund waterbird surveys at wetland sites and labor costs for predator control at two off-site locations, and develop a long-term conservation strategy for the Hawaiian stilt in the Kona Coast region. This reinitiation will address the effects of those activities listed above until March 17, 2006, including potential adverse effects of routine operations and maintenance upon Hawaiian stilt adults or juveniles not considered in the original opinion.

This biological opinion is based upon: 1) Cyanotech's June 25, 2004, letter, received by the Service on June 30, 2004, requesting to amend the HCP and extend the permit term; 2) Biological Opinion on the Effects of the Issuance of an Incidental Take Permit Under section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended to Cyanotech Corporation, Keahole Point, Hawaii (No. 1-2-2002-FW-04; issued on or before March 18, 2002); 3) Conservation Plan for Hawaiian Stilt at Cyanotech Aquaculture Facility, Keahole Point, Hawaii, (Ducks Unlimited 2002a); 4) HCP Annual Reports prepared by Cyanotech; 5) Draft Revised Recovery Plan for Hawaiian Waterbirds, Second Revision (Service 2004); 6) other biological literature (see Literature Cited at the end of the document); and, 7) information contained in our files. Our log number for this consultation is 1-2-2002-FW-04.1. Copies of pertinent materials and documentation are maintained in an administrative record in the Service's Pacific Islands Fish and Wildlife Office in Honolulu, Hawaii.

Consultation History

Prior to permit issuance on March 18, 2002, the Service completed consultation under section 7 of the Act, addressing the potential effects on the endangered Hawaiian stilt resulting from the issuance of incidental take permit TE-051040-0 and implementation of the HCP for the Hawaiian Stilt at Cyanotech Aquaculture Facility. The Service's Biological Opinion No. 1-2-2002-FW-04, concluded that issuance of the incidental take permit and implementation of the HCP would not jeopardize the survival or recovery of the species. The biological opinion has been in effect since permit issuance.

On June 30, 2004, the Service's Pacific Islands Fish and Wildlife Office received Cyanotech's June 25, 2004, letter, requesting to amend the HCP and extend the duration of the incidental take permit.

On February 1, 2005, the Service's Portland Regional Office initiated the request for intra-Service consultation with the Pacific Islands Fish and Wildlife Office.

On February 22, 2005, the Service sent a letter to Cyanotech requesting its concurrence with the proposed HCP amendment and permit extension (Appendix 1).

On March 10, 2005, the Service's Pacific Islands Fish and Wildlife Office received the signed concurrence letter, permit application, and permit fee from Cyanotech.

DESCRIPTION OF THE PROPOSED ACTION

Cyanotech has applied to the Service for a one-year extension of incidental take permit TE-051040-0 and requested a minor amendment for revisions to its existing HCP, "Conservation Plan for Hawaiian Stilt at Cyanotech Aquaculture Facility, Keahole Point, Hawaii." Section 6.1 of the HCP notes that informal minor modifications to the plan are permissible without amending the original permit provided the changes do not: 1) cause a net adverse effect on the Hawaiian

stilt that is significantly different from the effects considered in the original HCP and issued permit, or 2) result in a failure to meet performance measures of the permit.

During the one-year extension, Cyanotech proposes to continue normal microalgae operations, daily monitoring and maintenance at its aquaculture facility, implement minimization measures described in the existing HCP, fund waterbird surveys at wetland sites and labor costs for predator control at up to two locations, and develop a long-term conservation strategy for the Hawaiian stilt in the Kona Coast region with the Service and the Hawaii Division of Forestry and Wildlife (DOFAW). A copy of Cyanotech's concurrence outlining the proposed amendment to the HCP is included in Appendix 1.

The permit extension would continue to authorize incidental take of the Hawaiian stilt at the Cyanotech Aquaculture Facility, Keahole Point, Kona, Hawaii (TMK 3:4-1-06-6). The proposed take would be incidental to the operation and maintenance of Cyanotech's microalgae facility and continued implementation of the HCP. The proposed permit extension is for one year beyond the current expiration date of March 17, 2005. The action area includes the Cyanotech Aquaculture Facility, and the man-made and natural wetland sites in the Kona Coast where predator control and waterbird surveys are proposed.

STATUS OF THE SPECIES

Taxonomy

The Hawaiian stilt (*Himantopus mexicanus knudseni*) is part of a cosmopolitan superspecies complex including the black-necked stilt (*Himantopus mexicanus*) of North and South America, the black-winged stilt (*H. himantopus*) of Eurasia and Africa, and the pied stilt (*H. leucocephalus*) and black stilt (*H. novazelandiae*) from Australasia (Robinson *et al.* 1999). The Hawaiian stilt is clearly allied with the black-necked stilt and is considered a distinct subspecies (AOU 1998). Colonization of Hawai`i by stilts probably resulted from North American vagrants.

Species Description

The stilt is a slender wading bird, black above (except for the forehead), white below and with distinctive long, pink legs. The Hawaiian stilt differs from the black-necked stilt by having black extending lower on the forehead as well as around to the sides of the neck, and by having a longer bill, tarsus (lower leg), and tail (Coleman 1981; Robinson *et al.* 1999). Sexes are distinguished by the color of the back feathers (brownish in females, black in males) as well as by voice (females having a lower voice). Downy chicks are well camouflaged, tan with black speckling. Immatures have a brownish back, and white patches on their cheeks (Pratt *et al.* 1987). Immature birds produce a sharp peeping call. The total length of adult Hawaiian stilts is about 40 centimeters (16 inches). A comprehensive summary of the current knowledge of stilts in North America has been published by The Birds of North America (Robinson *et al.* 1999).

Historical Range and Population Status

Hawaiian stilts were historically known from all of the major islands except Lanai and Kahoolawe (Paton and Scott 1985). Prior to 1961, documented records of Hawaiian stilts on the island of Hawai`i were limited to three collected by S. B. Wilson in the late 1800s and possibly one collected by Collett prior to1893 (Banko 1979). As with the other Hawaiian waterbirds, there are no estimates of historical numbers. However, extensive wetlands and aquatic agricultural lands historically provided a fair amount of habitat. Loss of this habitat undoubtedly caused a decrease in stilt numbers. It has been suggested that the population had declined to approximately 200 birds by the early 1940s (Munro 1960). This number, however, may have been an underestimation of the population, as other estimates from the late 1940s place the population at approximately 1,000 birds (Schwartz and Schwartz 1949). This number may also be a low estimate, as a sizable number of stilts can be found seasonally on Niihau, which was not surveyed in the 1940s. The Hawaiian stilt was a popular game bird, and hunting contributed to local population declines until waterbird hunting was prohibited in 1939 (Schwartz and Schwartz 1949).

Current Range and Population Status

Hawaiian stilts are currently found on all of the main Hawaiian Islands except Kahoolawe. Based on biannual Hawaiian waterbird surveys from 1998 through 2003 (excluding 2002 because of missing data), the stilt population averaged 1,350 birds, but fluctuated between 1,200 and 1,500 birds (HDLNR 1976-2003). The census method used during these surveys appears to provide a relatively accurate picture of the number of stilts at a site (Chang 1990). Summer counts were not averaged because these counts are generally more variable than winter counts due to the variability in hatch-year bird survival (Reed and Oring 1993).

Long-term census data indicate statewide populations have been relatively stable or slightly increasing for the last 30 years (Reed and Oring 1993), with year-to-year variability in the number and distribution of stilts observed. This variability can be partially explained by rainfall patterns and reproductive success (Engilis and Pratt 1993). Hawaiian stilts readily disperse between various islands and collectively the Hawaiian island populations constitute one homogeneous metapopulation (Reed *et al.* 1994; Reed *et al.* 1998).

Considerable movement of Hawaiian stilts occurs between Kauai and Niihau, apparently in response to rainfall patterns and the flooding and drying of Niihau's ephemeral lakes (Engilis and Pratt 1993). On Kauai, stilts are numerous in large river valleys such as Hanalei, Wailua, and Lumahai, and on the Mana Plain. Stilts also frequent Kauai's reservoirs, particularly during drawdown periods, as well as sugarcane effluent ponds in Lihue and Waimea. During the five-year period from 1998 to 2003 (excluding 2002 because of missing data), the stilt population on Kauai has fluctuated between approximately 125 to 350 birds (HDLNR 1976-2003). There is no data for the same period on Niihau, however, the island can potentially support a large number of

stilts (over 300 birds were observed in 1997) when the island's extensive ephemeral lakes were flooded (HDLNR 1976-2003).

Oahu supports the largest number of stilts in the Hawaiian Islands (Engilis 1988; HDLNR 1976-2003). Large concentrations of stilts can be found at the James Campbell National Wildlife Refuge and on Nuupia Ponds in Kaneohe. Concentrations also exist at several sites in Pearl Harbor including West Loch Shoreline Park, at the Chevron Refinery, at the fishponds at Kualoa Beach Park, at Salt Lake District Park, and along the leeward coast. During the five-year period from 1998 to 2003, Oahu accounted for 35 to 50 percent of the State's stilt population, with approximately 450 to 700 birds counted during any single year (HDLNR 1976-2003).

Maui's two large coastal wetlands, Kanaha and Kealia, support a significant number of Hawaiian stilts, with important nesting habitat at Kealia. Monthly counts indicate that birds freely move between these two wetlands, apparently in search of optimal foraging habitat (Ueoka 1979). A small number of stilts also frequent aquaculture areas on Maui. During the five-year period from 1998 to 2003, stilt numbers on Maui have ranged from approximately 250 to 530 birds (HDLNR 1976-2003).

Molokai's south coast wetlands and playa lakes are, at times, important habitats for stilts, with large concentrations at the Kaunakakai Sewage Treatment Plant. There is some evidence of periodic movements of birds between Maui and Molokai, again probably in response to available foraging habitat (Engilis and Pratt 1993). Since 1968, statewide waterbird surveys have shown a significant increase in stilts on Molokai (Reed and Oring 1993). The number of stilts has fluctuated between approximately 25 to 90 birds during the 10-year period (1993 to 2003) on Molokai.

The first stilts on Lanai were documented in 1989 at the Lanai City wastewater treatment ponds (Engilis and Pratt 1993; M. Ueoka, Hawaii Division of Forestry and Wildlife, pers. comm. 1993). Hawaiian stilts are now permanent residents at the Lanai City wastewater treatment pond. They have been recorded there annually since the ponds became operational in 1989 and numbers sometimes exceed 100 birds (HDLNR 1976-2003).

The Kona Coast from Kawaihae Harbor south to Kailua supports the largest number of stilts on Hawaii Island, with Makalawena and Aimakapa Ponds being key breeding areas. Until recently, Cyanotech Ponds were a key breeding area because management focused on providing adequate breeding habitat for stilts to minimize nesting attempts in hazardous areas (Waddington 2003). For a variety of reasons, these ponds are no longer available to stilts, and we are working with Cyanotech and Hawaii DOFAW to identify other suitable nesting habitats on Hawaii for stilts displaced from Cyanotech (J. Kwon, U.S. Fish and Wildlife Service, pers. comm. 2004).

Hawaiian stilts have become numerous at the Kealakehe Wastewater Treatment Plant. The County of Hawaii has designed wildlife habitat for Hawaiian stilts to fit within the 12-hectare (30-acre) perimeter around the Kona Wastewater Treatment Plant. Comprehensive surveys on

Hawaii have placed the Kona Coast population at 130 birds (Ducks Unlimited 1996 to 1997). The scattered anchialine ponds (land-locked, brackish-water pools adjacent to the ocean, lacking surface connection to the ocean but with a subterranean connection and showing a damping tidal fluctuation in water level) along the Kona Coast are also important feeding sites. Hawaiian stilts can also be found along the Hamakua Coast and in the Kohala River valleys of Waipio, Waimanu and Pololu. Based on biannual waterbird surveys (2000 to 2001; excluding 2002 because of missing data), there are approximately 200 birds on Hawaii Island (HDLNR 1976-2003).

Life History

Hawaiian stilts prefer to nest on freshly exposed mudflats interspersed with low growing vegetation. The nest itself is a simple scrape on the ground. They have also been observed using grass stems and rocks for nesting material (Coleman 1981; M. Morin 1994). Nesting also occurs on islands (natural and manmade) in fresh or brackish ponds (Shallenberger 1977). Higher nesting densities are found on large mudflat expanses interspersed with vegetation. Stilts have also been observed successfully using manmade floating nest structures on Kauai (T. Telfer, Hawaii Division of Forestry and Wildlife, pers. comm. 1988) and floating wooden platforms at `Aimakapa Fishpond in Kona, Hawaii (Morin 1994). Stilts are territorial and maintain an area approximately 14 to 30 meters (46 to 98 feet) around nests (Robinson *et al.* 1999).

The nesting season normally extends from mid-February through August, but varies among years perhaps depending on water levels. Stilts usually lay three to four eggs that are incubated for approximately 24 days (Coleman 1981; Chang 1990). Chicks are precocial, leaving the nest within 24 hours of hatching. Young may remain with both parents for several months after hatching (Coleman 1981). Parents are extremely aggressive toward foreign young (Robinson *et al.* 1999). A hatching success of 54 percent (n = 243 nests, 833 eggs) was reported from the Kii Unit of the James Campbell National Wildlife Refuge (Chang 1990). Of the 243 total nests observed at Kii, 61 (25 percent) were lost to predation and 42 (17 percent) were lost to flooding or abandonment (Chang 1990). Robinson *et al.* (1999) reported 2.18 chicks hatched per nest and 0.93 fledged per brood for Hawaiian stilts.

Predators of Hawaiian stilts include the short-eared owl or pueo (*Asio flammeus sandwichensis*), black-crowned night heron (*Nycticorax nycticorax)*, laughing gull (*Larus atricilla*), ruddy turnstone (*Arenaria interpres*), cattle egret (*Bubulcus ibis*), common mynah (*Acridotheres tristis*), mongoose (*Herpestes javanicus*), black rat (*Rattus rattus*), domestic cat (*Felis catus*), domestic dog (*Canis lupus*), and the bullfrog (*Rana catesbeiana*) (Robinson *et al.* 1999). Stilts have a variety of antipredator behaviors, including mobbing aerial predators, a "popcorn display" (birds hopping and flapping around a ground predator), and striking ground predators from behind with their legs (Robinson *et al.* 1999). Because of their exposed nest sites, stilts appear to be more susceptible to avian predators than other Hawaiian waterbirds.

Stilts are opportunistic feeders. They eat a wide variety of invertebrates and other aquatic organisms as available in shallow water and mudflats. Specific organisms taken include water boatmen (insects in the family Corixidae), beetles (order Coleoptera), possibly brine fly (*Ephydra riparia*) larvae, polychaete worms, small crabs, fish (*e.g.*, Mozambique tilapia [*Oreochromis mossambica*] and mosquito fish [*Gambusia affinis*]), and tadpoles (*Bufo* spp.) (Shallenberger 1977; Robinson *et al.* 1999).

Feeding typically occurs in shallow flooded wetlands. These types of wetlands are ephemeral in nature and may appear at any time of year, but are primarily available in winter. Hawaiian stilts require specific conditions (water depths of 13 centimeters [five inches] or less) for optimal foraging (Telfer 1973). Thus, intra- and inter-island movements are important strategies for exploiting food resources and has been documented between Oahu and Maui by statewide waterbird survey data and banding studies (Ueoka 1979; Engilis and Pratt 1993; Reed *et al.* 1994; Reed *et al.* 1998).

Habitat Description

Hawaiian stilts use a variety of aquatic habitats but are limited by water depth and vegetation cover. Stilts require early successional marshlands with water depth less than 24 centimeters (9 inches) and favor perennial vegetation that is limited and low growing such as nonnative pickleweed (*Batis maritima*), California grass (*Brachiaria mutica*), and seashore paspalum or knotgrass (*Paspalum* spp.), or exposed tidal flats. Native low-growing wetland plants associated with stilt nesting areas include water hyssop (*Bacopa monnieri*), sea purslane (*Sesuvium portulacastrum*), and the sedges makaloa (*Cyperus laevigatus*) and kaluha (*Bolboschoenus maritimus*) (Robinson *et al.* 1999). Stilts may also use taro ponds where the full-grown vegetation forms a protective canopy. Stilts are rarely found in wetlands above 200 meters (660 feet) elevation.

Ephemeral wetlands on Molokai, Maui, and Niihau are important for stilts. Management techniques that mimic seasonal inundation and evaporation of freshwater mudflats are beneficial to nesting stilts and provide invertebrate forage for their young. Insular mudflats that are isolated from terrestrial predators are still susceptible to avian predation. On the island of Hawaii, anchialine ponds provide important foraging habitat for the Hawaiian stilt. Prawn farms, which have numerous ponds with changing water levels, provide excellent foraging habitat for adult birds.

Stilts generally forage and nest in different wetland sites, moving between these areas daily. Adults with three day-old chicks have been observed to move 0.5 kilometer (0.3 mile) from the nest site (Reed and Oring 1993). Nesting sites are adjacent to or on low-relief islands within bodies of fresh, brackish, or salt water. These include irrigation reservoirs and settling basins, natural or manmade ponds, marshes, taro patches, silted ancient fish ponds, salt evaporation pans, and other wetlands.

Feeding habitat consists of shallow water that is fresh, brackish, or saline. Freshwater sites include irrigation ditches, reservoirs, settling basins, taro patches, sewage ponds, and marshes. Brackish-water feeding habitat consists of coastal ponds, fish ponds, and estuaries. Saltwater feeding habitat includes inshore reefs, beach areas, and tidal flats. Loafing areas include open mudflats, pickleweed flats, and pasture lands where visibility is good and predator populations are low.

ENVIRONMENTAL BASELINE

The environmental baseline describes the status of the species and factors affecting the environment of the species or critical habitat in the proposed action area contemporaneous with the consultation in process. The baseline includes State, local, and private actions that affect a species within the action area at the time the consultation begins. Unrelated Federal actions that have already undergone formal or informal consultation are also a part of the environmental baseline. Federal actions within the action area that may benefit listed species or critical habitat are also included in the environmental baseline.

Status of the Species within the Action Area

Cyanotech operates approximately 48 acres of open water ponds that produce high-value natural microalgae products. The nutrient-rich ponds support high-density invertebrate populations, which provide a primary food source for the endangered Hawaiian stilt. Since 1996, adult stilts have been attracted to the microalgae raceway ponds where they forage and nest. However, after hatching next to raceways, stilt chicks were unable to fledge and were found dead in raceways as a result of drowning or adverse reactions to the microalgal medium. An HCP was developed to address take of stilt chicks and eggs incidental to normal operations and maintenance of Cyanotech's microalgae facility. The biological goals of the HCP were to ensure net reproductive success by eliminating nesting in hazardous areas, to reduce the invertebrate food source that attracts stilts, and to encourage stilt dispersal to other natural wetland areas. Since 1998, 237 stilts have fledged from Cyanotech: 33 in 1998, 31 in 1999, 84 in 2000, 41 in 2001, and 48 in 2002 (see Appendix 2, Table 1).

Cyanotech implemented numerous non-harmful bird deterrent measures such as modification of gravel berms, netting, hazing (increased human presence, use of lasers and pyrotechnics), mylar tape, predator calls, agitation calls, and effigies to discourage nesting in hazardous areas and reduce overall stilt foraging and loafing at Cyanotech. Cyanotech has also researched methods to reduce the invertebrate prey base including increased raceway agitation, modification of raceway cleaning methods, sonic larvicides, and spraying with safflower oil. Chemical larvicides were not attempted due to the high alkaline conditions of the algal medium, which renders the larvicides ineffective and concerns related to contamination of the microalgae product. No known injury or mortality of adult stilts has resulted from the implementation of bird deterrents.

Prior to 2003, the primary invertebrate food source was the Brine fly (*Ephydra* sp.) in the Lake and *Spirulina* production raceways. In 2003, the Water Boatman (*Trichocorixa* sp.) also became established in the *Spirulina* production raceways and provided an additional food source for the stilts. The Water Boatman is predatory and may have contributed to a reduction in Brine fly densities in the raceways. In 2004, Cyanotech experimented with efforts to reduce invertebrate densities by adding safflower oil to *Spirulina* raceways. Safflower oil adheres to the Water Boatman exoskeletons thereby creating increased buoyancy causing them to remain at the surface where they can be removed by mesh slant screens or seine nets. A total of 15 slant screens and two seine nets are currently being used throughout the facility.

In 2002, the average monthly count of stilts reached its peak, with 104 birds during the breeding season (March 2002 to August 2002) and 113 birds during the non-breeding season (September 2002 to February 2003). Following closure of the managed breeding area in late 2002, the number of stilts observed at Cyanotech has been significantly lower. In 2003, the average monthly count of stilts was approximately 16 birds during the breeding season and 84 birds during the non-breeding season. In 2004, the average monthly count of stilts was approximately 9 birds during the breeding season and 38 birds during the non-breeding season (see Appendix 2, Table 1).

During the 2002 breeding season, the 1.7-acre (0.69 hectare) basin known as the Lake was managed as an on-site nesting area to provide mitigation for incidental take of stilt eggs and chicks. Forty-eight stilts fledged at the Lake during 2002 and incidental take was limited to three stilt chicks.

The number of stilt nesting pairs reached its peak in 2002 when 93 pairs were estimated in the vicinity of the Cyanotech facility (82 pairs at the Lake, five pairs at the raceway ponds, and six pairs on the lava). Following consultation with the Service and DOFAW, Cyanotech agreed to discontinue management of the Lake as a nesting area for the two remaining breeding seasons (2003 and 2004) under the HCP largely based on concerns from the Federal Aviation Administration regarding the proximity of the Lake to the airport, and the fact that the number of stilts fledged in the first year was relatively high and the level of incidental take was low.

During the 2003 and 2004 breeding seasons, Cyanotech continued to implement bird deterrent measures and raceway berm modifications, and discontinued management of the Lake as stilt nesting habitat. There were no stilt nesting attempts in hazardous areas adjacent to raceway ponds, therefore, no incidental take of stilt eggs or chicks occurred in 2003 and 2004. Additionally, no stilt nesting attempts were observed on the lava adjacent to Cyanotech or at the Kona International Airport. As stilts are generally nomadic and move opportunistically to available open water bodies, we presume that stilts formerly attracted to Cyanotech have attempted to nest elsewhere. However, monitoring data required to document dispersal and successful reproduction at other sites on the Kona Coast and on other islands are incomplete or unavailable.

Currently, the Lake is kept dry with netting placed above the surface to prevent any use by stilts or other bird species. Mylar tape is tied to the underside of the netting to provide visual reference during the daylight hours. Based on observations of stilt movement at night, three 90-watt floodlights were installed on the premises to illuminate the netting and mylar strips and prevent incidences for bird entanglement.

During the 2003 breeding season, two adult or juvenile stilts were retrieved from Cyanotech's microalgae raceways during daily pond monitoring events. Between December 2003 and February 2004, an additional 10 dead adult or juvenile stilts were retrieved from Cyanotech's raceways. No adult or juvenile stilt mortalities were reported during the 2004 breeding season or during the same period (September 2004 to February 2005) when mortalities were recorded in the previous year. These juvenile and adult mortalities were not expected and not addressed in our original opinion.

Cause of death for the recovered stilts has been difficult to determine mainly due to the poor condition in which the birds are found. Of the 12 adult or juvenile stilts recovered during the permit term, only three were in a condition suitable for necropsy. Final diagnosis for two of the three necropsies was "undetermined", with the third suggesting "forced submergence" or drowning as the likely cause of death (U.S. Geological Survey-Biological Resources Division, National Wildlife Health Center, Diagnostic Case Reports Nos. 17787, 17793, 17803). Intra-specific aggression, including forced submersion, has been observed especially during the months leading up to the breeding season (October to February).

The Kona Coast region from Kawaihae Harbor south to Kailua includes natural wetlands (Makalawena, Aimakapa, Kukio) and man-made facilities (Cyanotech, Kealakehe Wastewater Treatment Plant) that provide breeding sites for the largest concentration of stilts on the Island of Hawaii. In addition, scattered anchialine ponds (land-locked brackish-water pools adjacent to the ocean, lacking surface connection to the ocean but with a subterranean connection and showing a damping tidal fluctuation in water level) along the Kona Coast are important feeding sites. Comprehensive surveys on Hawaii have estimated the number of stilts in the Kona Coast region to be between 130 and 225 individuals (Ducks Unlimited 2002b).

EFFECTS OF THE ACTION

Overview

During the one-year permit extension, Cyanotech proposes to continue microalgae operations, daily monitoring, and maintenance at its aquaculture facility, implement minimization measures described in the existing HCP, fund waterbird surveys at wetland sites and labor costs for predator control at up to two locations, and develop a long-term conservation strategy for the Hawaiian stilt in the Kona Coast region with the Service and Hawaii DOFAW.

Operations and Maintenance of Microalgae Raceway Ponds

Microalgae is grown and harvested within 67 raceway ponds that comprise about 48 acres of man-made open-water habitat. To optimize growth of microalgae, the water depth is maintained at approximately 12 inches. The water is hypersaline (30-40 parts per thousand) and alkaline with an average pH between 10.3 and 10.6. Paddle wheels are installed at one end of each raceway to maintain a constant flow of water. Submersible pumps are used to maintain nutrient and water levels and for inoculation and harvesting. Cyanotech conducts daily monitoring at all ponds to locate and remove debris that may damage the mechanical and harvest systems. During this routine monitoring, 12 dead adult or juvenile stilts were retrieved from the microalgae raceways between March 2003 and February 2004. These mortalities were unexpected and not assessed in our original biological opinion. Our previous analysis only considered Cyanotech's operational impacts upon stilt nests, eggs, and chicks as previous mortalities were recorded for only these life phases of the stilt at Cyanotech.

Despite the reported number of adult and juvenile mortalities at Cyanotech, we recognize that a certain level of mortality and injury of stilts occurs in wild populations. For example, over the last four years, an average of 10 stilts were found dead each year at Kealia Pond National Wildlife Refuge on Maui as a result of causes other than predation and disease, or otherwise "undetermined" due to the poor condition in which the birds were recovered (M. Nishimoto, Maui National Wildlife Refuge Complex, pers comm, 2004).

Adult and/or juvenile stilts will continue to visit Cyanotech to forage for invertebrates and loaf in microalgae raceway ponds. While there, stilts remain susceptible to injury or mortality as a result of drowning, adverse physiological reaction to microalgae media, or harmful interactions with raceway machinery (*e.g.*, paddle wheels and/or submersible pumps). Cyanotech will continue implementing measures to minimize potential adverse effects associated with foraging and loafing in raceways, daily monitoring for injured or dead adult and juvenile stilts as part of its normal operations, and work with the Service and DOFAW to develop appropriate conservation measures, as necessary. It remains to be seen whether retrieval of injured or dead adult and juvenile stilts will continue during the one-year permit extension. However, using a conservative estimate based on the highest number of stilts retrieved during a one-year period, we anticipate harm in the form of injury or mortality of up to 10 adult or juvenile stilts as a result of Cyanotech's ongoing operations and maintenance of its microalgae raceway ponds.

Implementation of Ongoing Minimization Measures

In the HCP, Section 3.4 Success Criteria #5 and Section 3.7 Adaptive Management allows Cyanotech to discontinue management of the Lake as a stilt breeding area prior to the end of the permit period (*i.e.*, after the first or second year) if net reproductive success is ensured throughout the permit term. Net reproductive success is defined as a greater overall number of stilts fledged than the number of stilt eggs, chicks, fledglings and adults incidentally taken as a result of Cyanotech's microalgae operation and implementation of the HCP.

In 2002, a total of 48 stilts fledged at Cyanotech and incidental take of three chicks occurred that year. This represented a net reproductive success of 45 fledglings. As the number of stilts fledged in the first year was relatively high and the level of incidental take was low, we anticipated that net reproductive success would still be achieved during the life of the permit, despite closure of the Lake in 2003 and 2004. This resulted in a dramatic decrease in the average monthly stilt counts at Cyanotech during the breeding season (104 in 2002, 16 in 2003, and nine in 2004). A dry Lake coupled with effective hazing efforts at the raceways, eliminated stilt nesting throughout the entire facility and the adjacent lava fields over the past two years. Based on the nomadic and opportunistic nature of stilts visiting available open water bodies, we assume stilts that were previously attracted to hazardous areas or bred successfully at the Lake likely dispersed to other wetlands in the Kona Coast region or to the neighbor islands.

Cyanotech will continue to implement deterrents such as modification of gravel raceway berms, hazing (increased human presence, use of lasers and pyrotechnics), mylar tape, predator calls, agitation calls, effigies, and research on reduction of the invertebrate prey base to discourage nesting in hazardous areas and reduce overall stilt foraging and loafing at Cyanotech. Bird deterrent measures proposed are not intended to cause harm. However, implementation of bird deterrents may result in incidental take in the form of harassment and less common mortality and injury of adult and/or juvenile stilts. For example, as birds respond and disperse from bird deterrent measures they may become entangled in existing netting. However, Cyanotech will attach mylar tape and illuminate the netting with floodlights at night to minimize potential stilt entanglement events.

Hazing impacts are also anticipated for adults in early nest-building activities when they disperse from the site. Applying a conservative approach and using the average monthly count of stilts during the non-breeding season to estimate the number of stilt breeding pairs, the effects of bird deterrent measures may include harassment of up to 19 pairs of breeding stilts per year over the proposed one-year extension.

Based on the average monthly count of stilts observed at Cyanotech in 2004, implementation of bird deterrent measures to reduce foraging at the raceways during the non-breeding season may result in the harassment of up to 38 adult or juvenile stilts per year over the proposed one-year extension.

While there have been no reports of harm to stilts as a result of these measures, there is still a small probability that this event could occur. Therefore, we anticipate harm caused by evaluation and/or implementation of netting, bird repellents, or more rigorous hazing measures (*e.g.* lasers, pyrotechnics) may result in mortality or injury of one adult or juvenile over the proposed one-year extension.

Based on Cyanotech's elimination of nesting attempts during the last two breeding seasons, achievement of an overall reduction in the number of adult and/or juvenile stilts, and effective

hazing efforts, we do not anticipate any incidental take of eggs and/or chicks from stilts nesting in hazardous areas.

Because the management program at Cyanotech is designed to eliminate nesting and reduce overall stilt use of the microalgae facility, dispersal to other suitable wetlands may promote and support stilt foraging and breeding. Anticipated benefits to stilts breeding in more suitable habitat include a potential increase of new recruits to maintain or bolster overall population numbers.

Waterbird Surveys

We do not anticipate negative adverse effects to the species from funding waterbird surveys in the Kona Coast region. Instead, beneficial outcomes are anticipated including new information on stilt habitat use, dispersal patterns, and reproductive success along the Kona Coast. This data may identify potential habitat and management opportunities and facilitate the development of a long-term conservation strategy for stilts in the Kona Coast region.

Predator Control at Two Off-site Locations

We do not anticipate negative adverse effects to the species from funding the labor costs of predator control at two off-site locations in the Kona Coast region. Predator control at these off-site locations is expected to provide additional predator-reduced foraging and nesting habitat. The anticipated benefits include an increase in successful reproduction and a corresponding increase in survivorship for all stilt life phases (eggs, chicks, fledglings, juveniles, and adults) that may potentially bolster the overall Kona Coast stilt population.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, local, or private actions that are reasonably certain to occur in the area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The proposed amendment to the HCP and extended permit term is anticipated to expire in March 2006. Since Cyanotech is likely to continue microalgae production beyond that time and into the future, we assume that stilts will continue to visit to the microalgae raceway production ponds to forage and attempt nesting. Cyanotech will work with the Service and DOFAW to evaluate the level of impact to the stilt from its future operations and develop conservation measures, as necessary, for a long-term strategy for the stilt at Cyanotech. Future conservation measures may include continued implementation of bird deterrence at Cyanotech and habitat enhancement activities at off-site locations in the Kona Coast region.

The County of Hawaii has proposed construction of wetland habitat for endangered Hawaiian waterbirds at the Kealakehe Wastewater Treatment Plant located five miles south of Cyanotech. Ten acres of wetlands are being designed to provide feeding and nesting habitat for stilts and the Hawaiian coot (*Fulica alai*). Management of water levels, development of food base for target species, planting of appropriate aquatic vegetation, and predator control is described in initial project plans. Implementation of this project is contingent upon appropriation of funding and necessary approvals.

CONCLUSION

After reviewing the current status of the Hawaiian stilt, the environmental baseline of the species in the action area, the effects of the proposed HCP amendment and permit extension, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Hawaiian stilt.

A total of 48 stilts fledged at Cyanotech in 2002, and incidental take of a total of three chicks occurred that year. This represents net reproductive success of 45 fledglings. During the 2003 and 2004 breeding seasons a total of 12 adults or juveniles were also found dead within the microalgae raceways. Using a rough estimate of pre-fledgling to first-year survival for Hawaiian stilts developed by Reed *et al.* (1998) of 0.57, the loss of 12 adults and juveniles translates into approximately 22 fledglings[1] and net reproductive success of 23 fledglings. The cause of adult or juvenile mortalities is unknown and may not be attributable to Cyanotech's operations. In addition, even if we assume the mortalities from 2003 and 2004 were caused by Cyanotech operations and an equivalent amount of adult or juvenile mortality is observed during the one-year permit extension, Cyanotech would not exceed the level of incidental take authorized and still achieve net reproductive success as defined in the HCP.

Therefore, given the anticipated overall net reproductive success for the stilt, potential for increased recruitment at off-site locations, and minimization of impacts to the stilt at Cyanotech, it is the Service's biological opinion that the proposed amendment does not create a net adverse affect to the species, nor is it likely to jeopardize the continued existence of the species. No critical habitat has been designated for this species, therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or

[1] Based on the estimate of Reed *et al.* (1998) of pre-fledgling to first-year survival for Hawaiian stilts of 0.57, mortality of 12 adult or juvenile stilts translates into (1.00/0.57)*(12) = 21.05 fledglings.

patterns which include, but are not limited to, breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The proposed amendment to the Cyanotech HCP and one-year extension of the incidental take permit and its associated documents clearly identify anticipated impacts to affected species likely to result from the proposed taking and the measures that are necessary to minimize those impacts. All conservation measures described in the proposed HCP, together with the terms and conditions described in any section 10(a)(1)(B) permit issued with respect to the proposed HCP, are hereby incorporated by reference as reasonable and prudent measures and terms and conditions within this Incidental Take Statement pursuant to 50 CFR 402.14(i). Such terms and conditions are non-discretionary, and must be undertaken for the exemptions under section 10(a)(1)(B) and section 7(o)(2) of the Act to apply. If the permittee fails to adhere to these terms and conditions, the protective coverage of the section 10(a)(1)(B) permit and section 7(o)(2) may lapse. The amount or extent of incidental take anticipated under the proposed Cyanotech HCP, associated reporting requirements, and provisions for disposition of dead or injured animals are as described in the HCP and its accompanying section 10(a)(1)(B) permit.

AMOUNT OR EXTENT OF TAKE

Based on the proposed HCP amendment and one-year permit extension and the analysis of the effects of the proposed action provided above, the Service anticipates the following take may occur as a result of the proposed action:

1. One (1) Hawaiian stilt adult or juvenile may be incidentally taken in the form of harm (injury or mortality) from implementation of bird deterrence measures (*e.g.*, netting, bird repellents, predator calls, effigies, mylar tape) and hazing activities (*e.g.,* increased human activity, lasers, pyrotechnics).

2. Up to 19 pairs of Hawaiian stilt adults may be incidentally taken in the form of harassment from implementation of bird deterrence measures (*e.g.*, netting, bird repellents, predator calls, effigies, mylar tape) and hazing activities (*e.g.*, increased human activity, lasers, pyrotechnics) during the stilt breeding season.

3. Up to 38 Hawaiian stilt adults or juveniles may be incidentally taken in the form of harassment from implementation of bird deterrence measures (*e.g.*, netting, bird repellents, predator calls, effigies, mylar tape) and hazing activities (*e.g.*, increased human activity, lasers, pyrotechnics) during the non-breeding season.

4. Up to 10 Hawaiian stilt adults or juveniles may be incidentally taken in the form of harm (injury or mortality) as a result of normal operation and maintenance activities.

EFFECT OF TAKE

In the accompanying biological opinion, the Service determined that the maximum level of incidental take authorized under the proposed HCP and permit is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

No reasonable and prudent measures beyond the conservation measures described in the HCP have been identified to further minimize incidental take.

TERMS AND CONDITIONS

No additional terms and conditions are necessary because no additional Reasonable and Prudent Measures have been identified.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a) (1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are Service suggestions regarding discretionary agency activities to promote the recovery of listed species. However, the process of developing an HCP essentially necessitates the incorporation of this approach into the planning process. Accordingly, there are no additional conservation recommendations.

RE-INITIATION NOTICE

This concludes formal consultation on the proposed extension of the section 10(a)(1)(B) incidental take permit to Cyanotech. As required in 50 CFR 402.16, reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may affect listed species in a manner or to an extent not considered in this opinion; 3) the agency action is subsequently modified in a manner that causes an adverse affect to the listed species that was not considered in this opinion; or 4) a new species is listed or critical habitat designated that may be affected by this action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

If you have any questions regarding any of the information contained in this biological opinion, please contact James Kwon of my staff (phone: 808/792-9400; fax: 808/792-9581).

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Minor Amendment to Cyanotech Habitat Conservation Plan and Extension of Incidental Take Permit (TE-051040-0)

The terms of the Habitat Conservation Plan (HCP), "The Conservation Plan for the Hawaiian Stilt at Cyanotech Aquaculture Facility, Keahole Point, Hawaii" and Incidental Take Permit (TE-051040-0) remain in effect with the addition of the following items:

1. Cyanotech will provide funds in the amount of $7,800.00 for the Kona Coast Waterbird Surveys through Ducks Unlimited Inc.
   a. The funding will cover surveys conducted from September 2003 through August 2005.
   b. The survey sites will be consistent with past surveys and coordinated with the U.S. Fish and Wildlife Service (Service) and the State of Hawaii Division of Forestry and Wildlife (DOFAW)
   c. Waterbird surveys will be conducted a minimum of once per month (typically on the second Monday of each month with the exception of January and August when they are done to coincide with the State Waterbird Count).
   d. Observations of the number of each species of waterbirds and shorebirds and the number of nesting coots and stilts, chicks, and fledglings will be recorded.
   e. Data will be presented in an annual report to be submitted with the Cyanotech HCP annual report.

2. Cyanotech will provide a total of $7,200.00 to fund the labor costs for predator control at up to two appropriate off-site locations to be coordinated with the Service and DOFAW.
   a. At each site, predator control will be implemented over a 12-month period starting March 2005. Methods of predator control will be developed and implemented in coordination with the Service, DOFAW, and other experts.
   b. Cyanotech will assess the effectiveness of predator control methods in reducing predator populations and report results in the Cyanotech HCP annual report.
   c. Cyanotech will coordinate with DOFAW to ensure predator control activities are executed.

3. Cyanotech will monitor the occurrence of adult and juvenile mortalities and work with the Service and DOFAW to develop appropriate conservation measures.

4. Cyanotech agrees to the extension of Incidental Take Permit TE-051040-0 for a period of one year with the expiration date of March 17, 2006.

Gerald R. Cysewski, Ph.D.
President and CEO, Cyanotech Corporation

2/25/05
Date

Scott Waddington
Biologist, Cyanotech Corporation

2-24-05
Date

Appendix 2.

Table 1. Status of Species at Cyanotech Aquaculture Facility 1998 to 2004. ^{B} = Average monthly count of adult stilts during breeding season (March – August). ^{NB} = Average monthly count of adult stilts during non-breeding season (September – February).

	1998	1999	2000	2001	2002	2003	2004
Average Monthly Count of Adults	53	56	84	99	104^{B} 113^{NB}	16^{B} 84^{NB}	9^{B} 38^{NB}
Nesting Pairs (Est.)	20	34	61	42	93	0	0
No. of Fledglings Produced	33	31	84	41	**48**	0	0
Incidental Take of Chicks	1	29	10	14	3	0	0
Incidental Take of Adults or Juveniles	0	0	0	0	0	2	10
Incidental Take – Total (No. of Fledglings)					**3**	**4***	**18***
Net Reproductive Output – (No. of Fledglings)					**45**	**41**	**23**

* The number of fledglings incidentally taken in 2003 and 2004 is extrapolated from the number of adult or juvenile mortalities and based on estimation of the pre-fledgling to first-year survival at a rate of 0.57 (Reed *et al.* 1998). For example, in 2003, incidental take of two adults or juveniles translates into (1.0/0.57)*(2) = 3.5 or 4 fledglings. In 2004, incidental take of 10 adults or juveniles translates into (1.0/0.57)*(10) = 17.54 or 18 fledglings.