Cyanotech Corporation Conservation Plan for Hawaiian Stilt (*Himantopus mexicanus knudseni*) Annual Report for 2005

Prepared by J. Scott Waddington, Cyanotech Corporation
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Abstract

This annual report covers data collected September 2004 to August 2005 for the Conservation Plan for Hawaiian Stilt (*Himantopus mexicanus knudseni*) at Cyanotech Aquaculture Facility. Netting erected over the nesting habitat and Ducks Unlimited raceway in February 2003, continued to provide physical exclusion to these areas. Cleaning the *Spirulina* production raceways reduced the invertebrate food source. The total amount of Hawaiian Stilt incidental take at Cyanotech was zero. Cyanotech's current incidental take permit allows for up to 30 incidences of take per year. There were no nests or nesting attempts at the Cyanotech facility or in the lava field of Keahole International Airport.

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Management Actions

- Maintained the netting of the 0.69 hectare (ha) nesting habitat and former Ducks Unlimited (DU) raceway to exclude stilts from utilizing these areas to nest;
- Operated all raceways at 100% of capacity to prevent stilts from nesting in idle raceways;
- Continued to research and test means and methods of bird deterrents for the facility and reduce the food source attractant in the raceways;
- Maintained a hazing program utilizing laser, pyrotechnics, Mylar tape, driving roads of facility, and other means of deterrents to discourage stilts from frequenting the facility and nesting;
- Monitored the facility daily for nesting activity, take, and possible entanglement of birds in netting and Mylar tape deterrents;
- Maintained staffing needed to provide daily coverage of hazing and deterrent maintenance.

Facility Management

Nesting Habitat

Netting erected over the nesting habitat in February 2003 provided physical exclusion to the 0.69-ha man-made nesting habitat and was maintained through 2005 (Exhibit 1). Special emphasis was again put towards prevention of stilt entanglement in the netting. Noting the stilts ability and willingness to move at night, three 90-watt floodlights were installed above the nesting habitat to illuminate the netting and Mylar tape strips in an effort to prevent any entanglement of birds. The floodlights were positioned on the North side of the habitat and operated by a photocell switch turning the lights on at sunset and off at sunrise. Netting was monitored daily to check for entangled birds. To date, there have been no entangled birds in the netting. There were no nesting attempts in or adjacent to the nesting habitat

Production Area

In 1998, a production raceway was converted into a stilt-nesting habitat and became known as the “DU raceway”. The raceway was managed for stilt nesting in 1998 and 1999, but management was discontinued in 2000 due to the inability of the habitat to maintain a self-sustaining invertebrate prey base for stilts. In 2001 and 2002, the raceway was used to test the effectiveness of Mylar tape as a deterrent. In 2003, the former DU raceway was netted as per recommendation of the 2002 annual report (Exhibit 2). The netting was monitored daily to check for entangled birds. To date, there have been no entangled birds in the netting. There were no nesting attempts in or adjacent to the DU raceway or anywhere in the production areas of Cyanotech.

Reduction of Attractants and Hazing

Safflower Oiling

The primary invertebrate food source has been the Brine fly **(***Ephydra sp.*) and the Water Boatman (*Trichocorixa sp.*). A program using Safflower oil and a backpack sprayer to spray and suffocate the Brine fly has been used in years past. The Water Boatman is a strong swimmer with the ability to swim against the current generated by the raceway paddlewheels. After each *Spirulina* production raceway harvest, seven and one half liters of oil were added by pouring into each raceway. The oil dispersed across the surface of the raceway and it is suspected that it then adheres to the Water Boatman's exoskeleton when it surfaces, giving it additional buoyancy. The Water Boatman then concentrates it's energy on maintaining it's position in the water column and not it's position with in the raceway. With the Water Boatman floating on the surface they are more easily removed utilizing mesh slant screens positioned in the raceway. The slant screens are 1.22 x 1.52 m of 14-mesh stainless steel screen that are positioned in the raceways to catch the floating Water Boatman (Exhibit 3). One slant screen was used per raceway and was moved between raceways as needed. In addition to removing debris and insects the use of slant screens provides an additional opportunity to recover any dead or injured stilts. Safflower oil is used so the company can operate within their quality parameter that requires the use of non-genetically modified ingredients in the production of its products. The cost is $20.20 per oil dose with an average of eight *Spirulina* production raceway oiled each day. Oiling is still being implemented at the time of writing on an as needed basis.

Raceway Cleaning

The alternative method of removing the invertebrate food source was to drain the production raceways, allow them to dry, and sweep out the sediment and invertebrates. Draining and cleaning the raceways is part of the normal operation and maintenance of *Spirulina* Production. Raceways have been cleaned on average of once every 12 months. Cyanotech has implemented an on going cleaning schedule for the *Spirulina* production raceways that will have each raceway cleaned a minimum of twice per year. Raceway cleaning is based upon visual inspection of each raceway. Raceways with the most invertebrates are taken out of production for cleaning. The goal for this project is to clean one to two raceways per week.

Hazing

As in 2001 and 2002, a hazing program was implemented to increase the amount of activity in the production areas to make these areas less desirable for nesting. Methods included the driving of all the roads in the facility, the use of Mylar tape as a visual deterrent, and the production raceways being maintained at 100% of production capacity from February through the end of August. Driving the roads (six kilometers) via a golf cart has continued four to six times daily from the 2002-nesting season, in an effort to keep stilts from roosting and nesting in these areas. Mylar tape was again utilized

through out the facility, at the beginning of the nesting season, but its use was discontinued with the lack of stilts frequenting the facility making it unnecessary. Beginning in 2003, laser and pyrotechnics devices were also utilized to aid the hazing efforts. An "Avian Dissuader", a laser deterrent device, manufactured by Sea Technology Inc., was effectively used as a hazing aid (Exhibit 4). The laser is a pistol type design and operates on the "point and shoot" basis. The laser beam is aimed at the ground or embankments of raceways close to the stilts or the stilts' body and the red dot of light frightens the stilts and causes them to move from the area. The beam is adjustable from 3 to 30 cm and has a manufacturer's claimed effective range of 500 m. According to manufacturer's directions, the laser is most effective at sunrise and sunset. The laser was never directed at individuals, automobiles, boats, aircraft or the airport.

Pyrotechnics were also effectively utilized as a hazing aid (Exhibit 5). Two types of shells were used, "Screamer Sirens" and "Bird Bangers". The Screamer Siren shells, according to the manufacture, travel 50 to 75 m making a siren-like sound as it flies. The Bird Banger shells travel 35 to 50 m down range before exploding. The use of pyrotechnics causes the stilts to take flight, while the laser is used to single out individuals and keep them from returning to the raceways.

Morning surveys of stilts on the facility were taken one half hour before sunrise and then hazing using the laser would begin if stilts were present at the facility (Figure 1). Morning surveys were conducted each day of the week with the exception of Sundays. A survey of stilts was also conducted one half hour before sunset and hazing would begin if stilts were present at the facility (Figure 2). Evening surveys were conducted every Tuesday and Friday. An ITT PVS-14, generation III, night vision monocular was used during the pre-sunrise and after the pre-sunset surveys and hazing activities to provide more accurate data and more effective hazing.

Hazing efforts have been successful in reducing the numbers of stilts frequenting the facility and also resulted in no nesting attempts at the facility. The stilts have become conditioned to the point that merely driving in their vicinity is enough to have them leave the facility with minimal if any use of either the laser or the pyrotechnics.

Property Outside of Cyanotech Boundaries (Lava Field of Keahole International Airport)

The lava field adjacent to the Cyanotech facility, where stilts had nested in previous years, was monitored weekly for nesting activity. Surveys were conducted every Saturday through the nesting season. A Nikon 20 x 60 Fieldscope and Zeiss 10 x 40 binoculars were used to survey the lava field. In addition to weekly surveys daily observations of stilt movements at and around the facility helped determine if stilts were frequenting the lava field. There were no instances of stilts being observed in the lava field.

Stilt Counts, Nesting, and Incidental Take

Stilt Counts

Stilt counts are conducted weekly through out the year (Figure 3). A mean of 0.31 (Standard Error = ± 0.18) adult stilts per weekly survey were observed at Cyanotech during 2005 nesting season (March-August), compared to 8.58 (Standard Error = ± 3.31) for the 2004 nesting season. A mean of 0.38 (Standard Error = ± 0.38) adult stilts were observed at Cyanotech during the non-nesting season weekly surveys (September 2004-Febuary 2005) compared to 37.69 (Standard Error = ± 4.45) for September 2003-February 2004.

Nesting

There were no nests or nesting attempts at the Cyanotech facility or in the lava field of Keahole International Airport.

Incidental Take

As per the Conservation Plan, surveying for incidental take was conducted twice per week during the nesting season and once per week during non-nesting season. However, monitoring for injured or dead stilts was conducted daily as part of normal operations of the production raceways. Surveying the raceways for debris was conducted daily in an effort to protect the mechanical and harvest systems of the production raceways. Surveying the raceways visually first thing in the morning before the paddlewheels were turned on has proven to be the most effective method of identifying and recovering debris and stilts from the raceways. Visual observations were also made while the driving the production area to deter stilts from utilizing the facility to nest or roost.

There was one stilt mortality recovered from a roadway on March 1, 2005. The stilt was predated with the remains consisting of two wings, upper and lower mandible, and feathers. The remains were bagged, labeled, put in a freezer and the Wildlife Agencies were notified. The total amount of incidental take at Cyanotech was zero. Cyanotech's current incidental take permit allows for up to 30 incidences of take per year.

Recommendations and Requests

Continue to work cooperatively with Wildlife Agencies to secure an extension of one year to current conservation plan and permits. The year extension being requested would allow for more data collection and analysis as well as an opportunity to further modify and refine methods of reducing the invertebrate food source and deterring stilts from frequenting the facility.

Continue to modify and improve current deterrent measures as well as identify and research new deterrent measures for the facility.

Continue to modify and improve methods of reducing the invertebrate food source in the production raceways.

The netting and netting support structures need to be inspected and reinforced where necessary to insure the integrity and effectiveness of the netting of both the nesting habitat and the former DU raceway.

It is recommended that Cyanotech operate at 100% of production capacity during the stilt nesting season (March-August). If this is not possible, idle raceways should be filled with seawater to prevent stilts from nesting in the idle raceways.

Cyanotech requests that the Wildlife Agencies continue to work cooperatively with the Cyanotech staff to provide technical assistance on policy and conservation issues, as well as biological expertise (e.g., permit compliance, adaptive management, bird deterrents, etc.).

References

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Acknowledgements

U.S. Fish and Wildlife Service
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Natural Energy Laboratory of Hawaii Authority
Cyanotech Corporation

Exhibit 1 Netted Nesting Habitat

Exhibit 2 Netted Ducks Unlimited Raceway

Exhibit 3 Slant Screen for Insect Removal

Exhibit 4 Avian Dissuader Laser

Exhibit 5 Pyrotechnic System

Figure 1

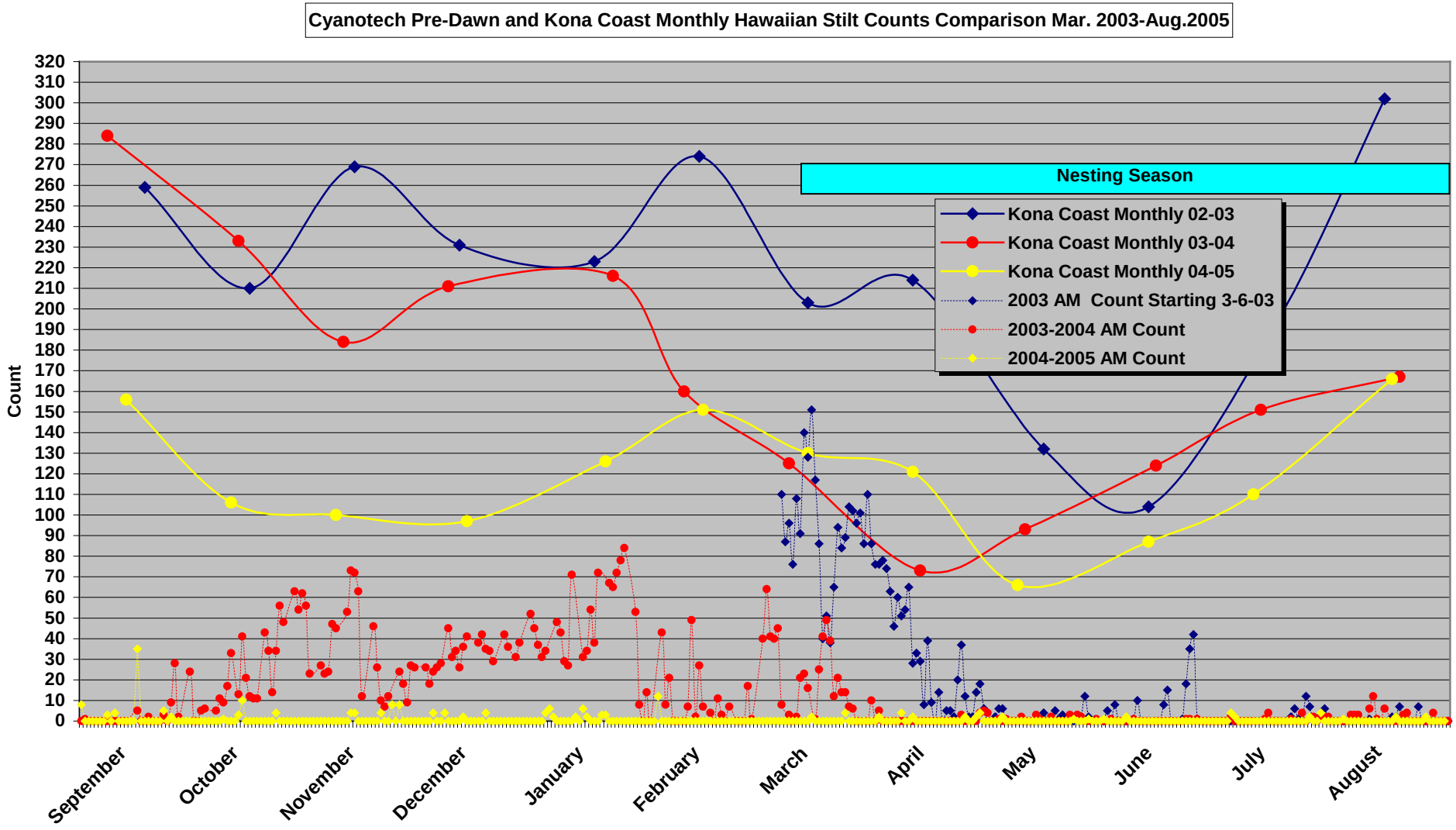

Cyanotech Pre-Dawn and Kona Coast Monthly Hawaiian Stilt Counts Comparison Mar. 2003-Aug.2005
Count
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Nesting Season
Kona Coast Monthly 02-03
Kona Coast Monthly 03-04
Kona Coast Monthly 04-05
2003 AM Count Starting 3-6-03
2003-2004 AM Count
2004-2005 AM Count
September
October
November
December
January
February
March
April
May
June
July
August

Figure 2

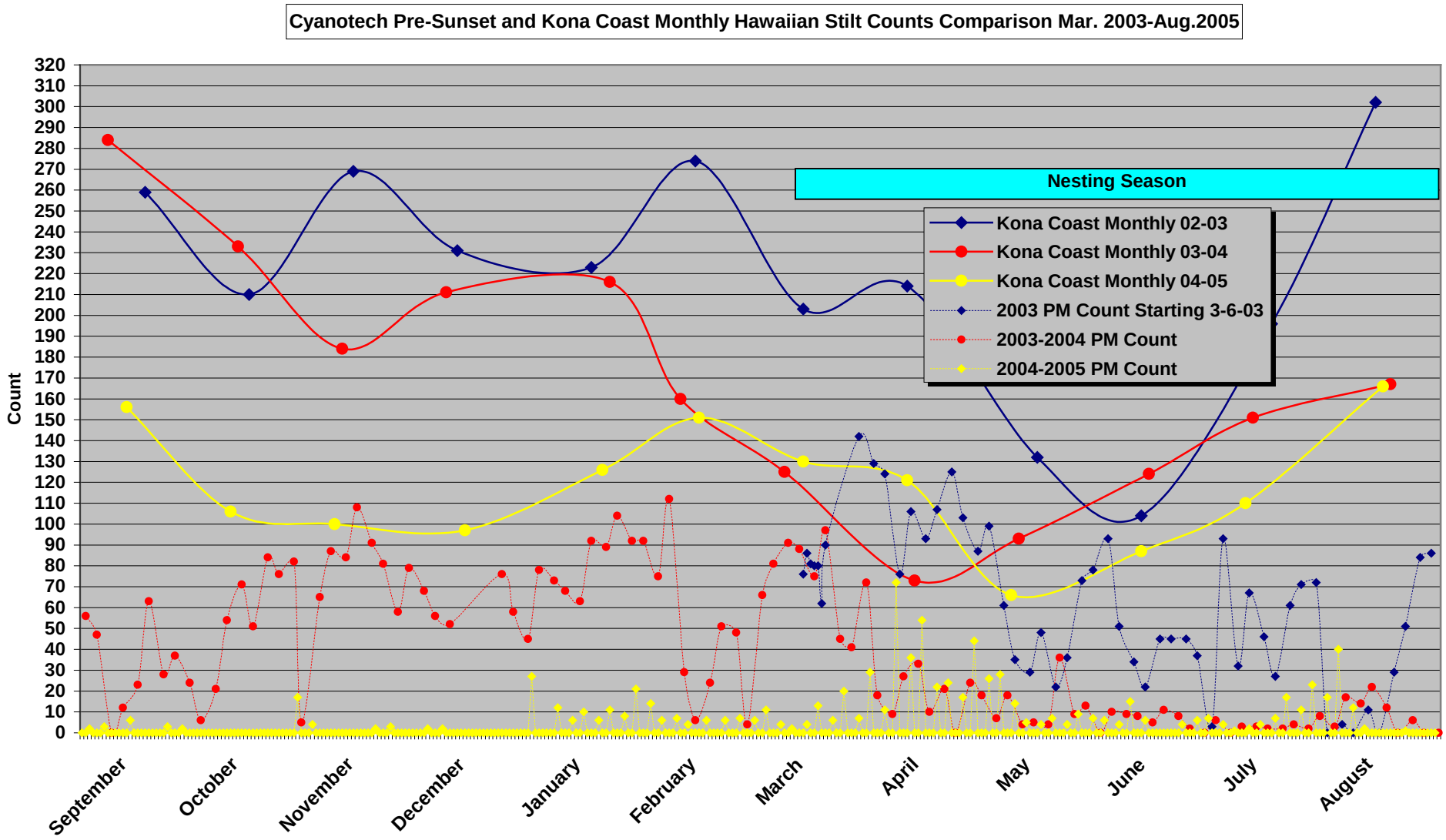
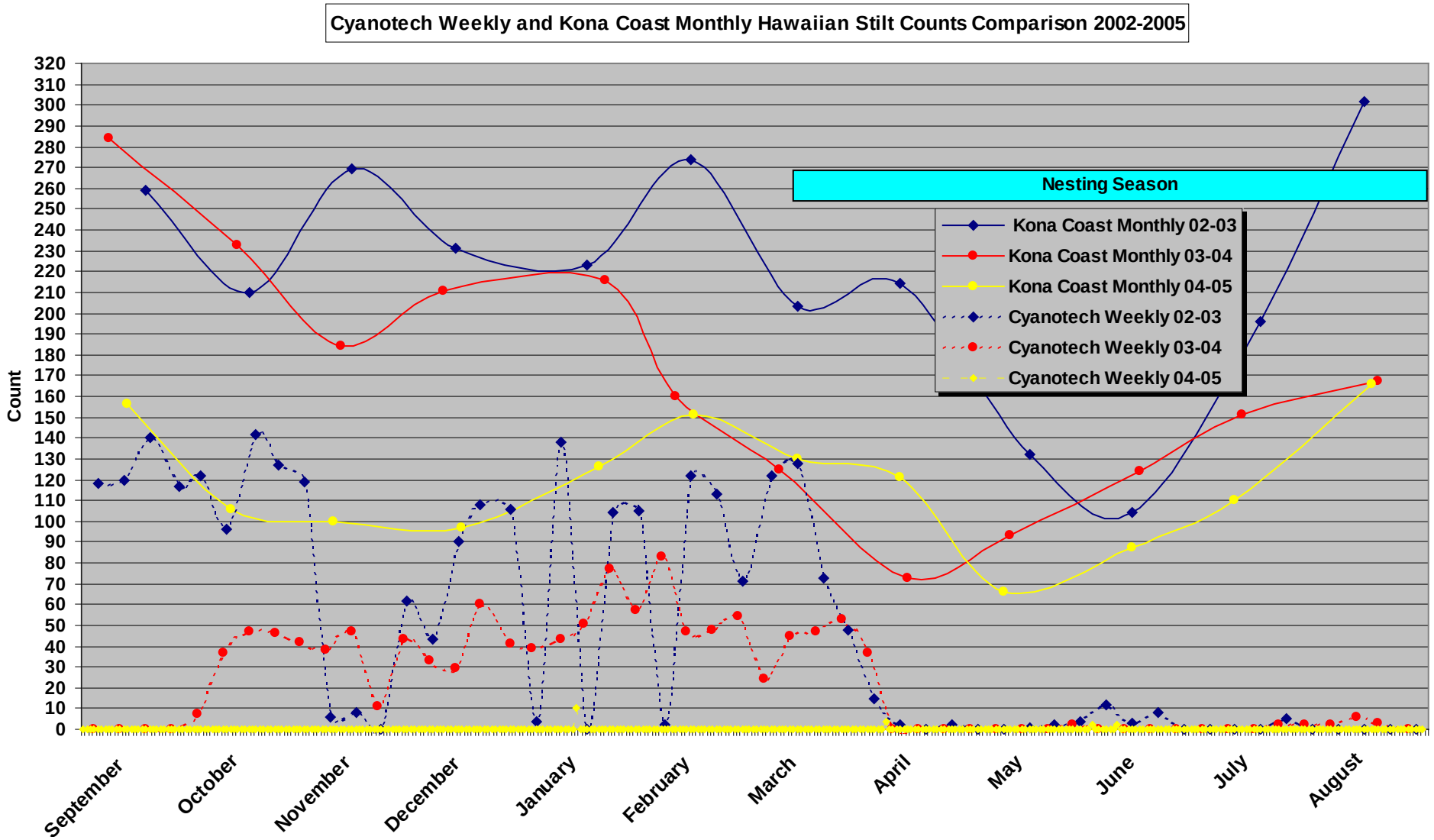

Cyanotech Pre-Sunset and Kona Coast Monthly Hawaiian Stilt Counts Comparison Mar. 2003-Aug.2005
Count
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Nesting Season
Kona Coast Monthly 02-03
Kona Coast Monthly 03-04
Kona Coast Monthly 04-05
2003 PM Count Starting 3-6-03
2003-2004 PM Count
2004-2005 PM Count
September
October
November
December
January
February
March
April
May
June
July
August

Figure 3


Cyanotech Weekly and Kona Coast Monthly Hawaiian Stilt Counts Comparison 2002-2005
Count
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Nesting Season
Kona Coast Monthly 02-03
Kona Coast Monthly 03-04
Kona Coast Monthly 04-05
Cyanotech Weekly 02-03
Cyanotech Weekly 03-04
Cyanotech Weekly 04-05
September
October
November
December
January
February
March
April
May
June
July
August