

August 31, 2004

Sandi Patton  
Mauna Lani Hotel

Dear Sandi:

I have completed our site inspection report of the Mauna Lani Hotel honu program based upon the inspection visit that Mike Osborn and I conducted on August 7, 2004.

We have some serious concerns about the care of the honu at the Mauna Lani Hotel based upon the mortalities associated with bristle worm infestation. Drs. Morris and Work have thoroughly investigated these mortalities and bristle worm infestation is the common thread. We are concerned that the Mauna Lani has not taken their recommendations seriously enough, placing the remaining honu at risk of bristle worm infestation and, possible, death. These mortalities have occurred over a protracted period and we did not see evidence that recommendations were undergoing implementation.

It is important that the Hotel understand the seriousness of this problem. The honu belong to the State and the people of Hawaii. They represent a cultural link to the Hawaiian culture. We feel very fortunate to care for these animals and believe it is a privilege for the Mauna Lani Hotel to maintain these honu for the enjoyment and education of its guests. We know that you feel the same.

If Dr. Morris's recommendations are not immediately implemented as well as the recommendations contained in our report we will be gravely concerned. Any further deaths due to bristle worm infestation, which can be prevented, will cause us to reconsider housing honu at the Mauna Lani Hotel. I am sorry to be so blunt, but this is a serious, protracted problem that must be immediately addressed.

Concurrently, we wish to commend the efforts of Pi'i. He is providing excellent care and oversight for the honu, but lacks the necessary staff and capital support to correct the bristle worm problem without further resources.

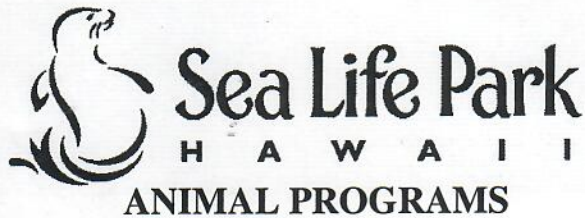
Please contact me if I might offer any further information. We look forward to assisting you in solving this problem and look forward to your response.

Thank you for your consideration.

Sincerely,

*Brian E. Joseph, DVM*

Brian E. Joseph, DVM  
Senior Veterinarian  
Sea Life Park Hawaii  
(530) 515-2001



## GREEN SEA TURTLE SITE INSPECTION

Date of Inspection: August 7, 2004

Inspected by: Brian Joseph, DVM & Mike Osborn

Accompanied by: Pi'i Laeha, Loko I'a Manager, Mauna Lani Hotel

### WATER QUALITY

1. Temperature – Ideal temperature 77 – 80 F  
Maximum range 70 – 83 F  
Facility water T 80.96 F (27.2 C)

- Water temperature be measured weekly and recorded on the monthly water quality report? Water temperature is measured daily.

Comments: Water temperature is constant.

2. Salinity - 28 – 32 ppt facility salinity 31 ppt  
Review of salinity records salinity is constant

- Salinity measured and recorded monthly in a closed system? NA
- Open system? Yes.

Comments: Salinity is measured weekly. One pump only is normally run. If the second pump is run, salinity drops to 17 ppt, but flow increases. Sea Life Park personnel approved running the second pump in an attempt to decrease salinity and decrease bristle worm infestation. This will provide the additional advantage of decreasing water temperature slightly through faster water turnover.

*Recommendation: Run second pump.*

*Recommendation: Install flow meters to accurately correlate determine water flow rate and correlate with degree of bristle worm infestation.*



**3. Total Coliforms Bacteria Counts, Chlorine and Ozonation.**

**A. Open System. Yes**

**Flow rate: unknown, but believed inadequate.**

**Coliforms are tested twice yearly.**

**Comments: Coliform and fecal coliform test results from 10/7/03 and 3/17/04 were reviewed and were within normal limits.**

**It is believed that the low flow rate coupled with the increase in pellets has resulted in more food for invertebrates and, subsequently, increased bristle worm populations. It is believed that an increase in flow will flush out the organic debris from the pellets and decrease the bristle worm population.**

**B. Closed System – total chlorine must be kept at < 1 ppm NA**

**Chlorine? NA**

**Chlorine Range NA**

**Ozone tested monthly? NA**

**Comments: NA**

**ENVIRONMENT**

**1. Lighting.**

**Outdoor? Yes**

**2. Beach – No**

**3. Foreign Objects and Substrate**

**Pool substrate? Sand & Concrete (dependent upon pool)**

**Rocks smaller than 4 cm in diameter? No**

**Foreign bodies present? None seen**

**Comments: Pools contain numerous medium sized rocks, too large for the turtles to ingest. These rocks provide habitat for bristle worms and the rocks will be removed as per previous agreement between Dr. Bob Morris and Pi'i.**

#### 4. Tank Mates

**Species:** A variety of reef fishes cohabit the sea turtle environments.

**Quarantine:** Quarantine tanks are located adjacent to the primary honu pool. The largest quarantine tank is currently inhabited by several honu while bristle worm treatments are performed in the main pool.

**Comments:** The fish pose no risk to the honu.

### NUTRITION

1. Fish - Fish can not be utilized as a type of feed for the turtles on loan. We are concerned that feeding the turtles fish will make these animals more likely to get caught in fishing traps and fishing hooks following release.

Fish used in diet? Yes

**Comments:** Small amounts of smelt and shrimp have been offered every other week on the advice of Dr. Bob Morris in an effort to alleviate low serum calcium and low serum hemoglobin that have been seen in some of the honu at the time of their physical examinations.

2. Pellet Diet - Complete turtle pellet diet from the Melick Aquafeed Company.

Melick Aquafeed pellets used? Yes

The following amounts are fed to the honu:

Hau Tree	½ cup each tid
Quarantine	½ cup each tid
Atrium	1 cup each tid

Melick Aquafeed Pellets were discontinued on 7/4/04 due to concern that animal deaths might be related to their use. Pi'i will inquire if pellet feeding can be resumed.

The above quantities translate to approximately 5 % of each turtle's body weight on a daily basis.

The type of pellet we recommend feeding is based on straight carapace lengths (SCL) of the individual turtles:

Average Straight Carapace Length: \_\_\_\_\_ cm

- SCL less than 15 cm should be fed exclusively developer pellets – Yes \_\_\_\_\_ No \_\_\_\_\_



- SCL greater than 15 cm, but less than 35 cm should be fed exclusively starter pellets – Yes \_\_\_\_\_ No \_\_\_\_\_
- SCL 35cm to 50 cm - Feed a 50:50 mix of starter to finisher pellets – Yes \_\_\_\_\_ No \_\_\_\_\_
- SCL 50cm and over - Feed exclusively finisher pellets – Yes \_\_\_\_\_ No \_\_\_\_\_

Recommendations for quantity of pellets to feed individual turtles are based on individual turtle weight.

- Turtles that have a SCL less than 15 cm should be 5 % of their weight in developer pellets daily
- Turtles that have a SCL greater than 15 cm, but less than 35 cm should be fed 4 % of their body weight in starter pellets daily.
- Turtles that have a SCL greater than 35cm, but less than 50 cm should be fed 3% their body weight in a 1:1 ratio of starter and finisher pellets daily.
- Turtles that have a SCL greater than 50 cm should be fed 2 % of their body weight in finisher pellets daily.
- It is recommended that the feeds be broken up into at least two feeds per day.
- Number of pellets per 10 grams:
  - Developer = 26
  - Starter = 20
  - Finisher = 12

Calculated amount of pellets that should be fed per day in g = approximate body weight of turtles x appropriate % of bw =

Comments: Only two people care for the turtles. This is probably not enough staffing to accomplish all that is necessary for adequate care of the turtles.

*Recommendation: Consider increased staffing to care for the turtles.*

#### 1. VEGETABLES – Are vegetables offered? Yes

What vegetables? Broccoli or ulva are fed twice weekly. The ulva has the advantage of remaining green while the broccoli turns white in the water.

### RECORDS / LOGS / REPORTS

1. Daily feeding and behavior records/logs – Are logs available? Yes  
Are records/logs up to date and complete? Recent records are up to date, but previous records are incomplete.

Comments: It appears that record keeping is a recent innovation.

Is a weekly or monthly summary present at the bottom of the log sheet? No

Comments? Current records are sufficient.

2. Quarterly Morphometric Information Record/Log – Are turtles weighed and measured every 3 months? No. Turtles are weighed and measured every month.

Comments: Staff is very attentive to morphometric measurements and accurately maintains these records.

3. Monthly Water Quality Record/Log – Are monthly water quality logs maintained?

Do water quality logs include:      temperature yes

Total coliform bacteria yes

Salinity yes

Chlorine no

Ozone no

4. Preventative Medical Program – Quarterly physical examinations including weighing, measuring and oral exams? No. They are performed monthly.

- Photographs taken each quarter and kept in record? No
- CBC and serum chemistry performed annually? No. Performed as needed.
- Annual fecal parasite exam? No
- Annual health report submitted to Sea Life Park Hawaii? No.
- All records submitted to Sea Life Park on a quarterly basis? No.

Comments: Records have not been received on a quarterly basis. Dr. Morris visits between quarterly and monthly dependent upon the health status of the turtles.

*Required recommendation: All results from Dr. Morris's visits should be submitted to Sea Life Park Hawaii as quarterly health reports at the end of each quarter.*

Fire worms: Drs. Morris and Work have postulated a link between ingestion of fire worms by the sea turtles and mortalities. This is strongly supported by the gross necropsy findings and histopathology. It is not clear why there are more fire worms presently, but the suspicion is that the increase in turtle numbers has been accompanied by an increase in



pelleted feed. The increase in pelleted feed likely results in an increase in small invertebrate herbivores which serve as prey for the fire worms.

Efforts to reduce the number of fire worms: Pi'i recognizes that the fire worm population must be reduced, although it probably can never be driven to zero since their larvae likely enter through make up water. However, Pi'i's investigations suggest that fire worms preferentially inhabit cover provided by rocks within the ponds. The rocks were placed in the various ponds under the instruction of a previous hotel general manager. Pi'i plans to remove the rocks, but a rate limiting step is a shortage of available staff. Pi'i has a single associate that regularly helps with the care of the turtles. Additional assistance will be necessary to complete this task.

A second step in reduction of fire worms will be treatment of individual ponds with freshwater. Freshwater causes the fire worms to die from exposure to an inappropriate osmotic gradient. Limited experimentation has been successful although it is also apparent that some fire worms survive in sediment where they are subjected to a less unfavorable osmotic gradient. A challenge in the implementation of this method is that all of the ponds are linked. It is very difficult to isolate individual ponds for freshwater treatment. All cohabitating fish must be removed to initiate this treatment

The third step under consideration is increasing water flow through use of the second pump which will also lower salinity from 31 ppt to 17 ppt. This will likely not have an adverse effect on the turtles, but probably provides insufficient salinity for the survival of the bristle worms. This level of salinity will provide the Mauna Lani the continued opportunity to maintain brackish water fishes with the turtles. However, this effort requires the removal of sharks and other species that have more narrow salinity tolerances prior to implementation.

*Recommendation: It is strongly recommended that Dr. Morris's recommendations are implemented immediately. This requires that the Mauna Lani Hotel dedicate sufficient personnel to implement these changes before additional honu mortalities occur.*

5. Any change in health status must be immediately reported to Sea Life Park Hawaii

Have changes in health status been reported immediately to Sea Life Park Hawaii? No

Comments: Inadequate communication from the Mauna Lani to Sea Life Park did not occur during the period of time that Marty Weisner managed the honu program. Quarterly reports, gross necropsy and histopathological results were not submitted to Sea Life Park during this time. Pi'i was not oriented by Marty that this was a requirement of the turtle loan program. Sea Life Park was lackadaisical in that it did not adequately follow up the lack of reports from the receiving institutions.

It was made very clear during the site visit that this reporting must improve. Pi'i understands the importance of forwarding this information to Sea Life Park Hawaii and informing Sea Life Park of any changes in the health status of the turtles.



**Mauna Lani Honu Inventory**

Turtle ID	Hatched	Transferred	Died	Released	Comments
1/WI 14/WC 02	8/02	7/2/03		7/4/04	
2/WI 16/WC 16	8/02	7/2/03		7/4/04	
4/WC 01/WI 22	8/02	7/2/03			Transferred NMFS 11/12/03 satellite tracking
5 WC 22/WI 24	8/02	7/2/03		7/4/04	3/04 abnormal swimming, amikacin
6/WC 21/WI 20	8/02	7/2/03		7/4/04	4/04 fireworm part in mouth
7/WC 20/WI 15	8/02	7/2/03		7/4/04	9/03 plaques on back of throat, peeling epidermal scales; 3/04 hard time swimming, amikacin
8/WI 17/-	8/02	7/2/03		7/4/04	
9/WC 07/WI 18	8/02	7/2/03		7/4/04	
10/WC 24/WI 23	8/02	7/2/03	3/16/04		2/25/04 neck abrasions, mouth lesions
11/WC 03/-	8/02	11/7/04		7/4/04	
12/WC 27/-	8/02	11/7/04		7/4/04	
13/WC 10/-	8/02	11/7/02		7/4/04	
14/WC 16/-	8/02	11/7/02		7/4/04	
15/WC 12/-	8/02	11/7/02			11/12/03 transferred NMFS for satellite tracking
16/ WC 19/-	8/02	11/7/02		7/4/04	4/28/04 fire worm in mouth, ruggated palate
17/ WC 15/-	8/02	1/7/02		7/4/04	
18/WC 08	8/02	11/7/02	2/24/04		
19/	8/02	11/7/02		7/4/04	
20/WI 30	9/2/03	1/9/04			Baytril in April for plaques on tongue & palate; bite wounds in May
21/WI 32	9/2/03	1/9/04			Mild bites in February
22/WI 33	9/2/03	1/9/04			Deceased
23/WI 36	9/2/03	1/9/04			Bite wounds in May
24/WI 37	9/2/03	1/9/04			
25/WI 39	9/16/03	1/9/04			Bites in May
26/WI 40	9/16/03	1/9/04			Amikacin, baytril, erythematous mouth
27/WI 44	9/17/03	1/9/04	2/15/04		Deceased
28/WI 46	9/17/03	1/9/04			Bites on rear flippers May
29/WI 48	9/17/03	1/9/04			
30/WI 51	9/2/03	1/9/04			Ruggated palate April, bites May 04
31/WI 64	10/2/03	1/9/04			
32/WI 66	10/2/03	1/9/04	4/2/04		Deceased
33/WI 67	10/2/03	1/9/04	7/21/04		April baytril and amikacin; necropsy report not currently available
34/WI 68	10/2/04	1/9/04			Baytril, plaques in April 04
35/WI 69	10/2/03	1/9/04	3/14/04		
36/WI 73	10/2/03	1/9/04			
37/WI 75	9/17/03	1/9/04			
38/WI 93	7/15/03	1/9/04			
39/WI 94	7/15/03	1/9/04			



